B.L.D.E.A's

Vachana Pitamaha Dr. P.G. Halakatti College of Engineering & Technology, Vijayapur – 586 103

COURSE FILE

2018-19

Semester IV

Department of Information Science & Engineering

Name :

USN :

Roll No. :

Dear student,

Wish you happy academic year 2016-17.

You can go through this course file which gives overview of each course you are going to study and its relevance to your program. You will find each course interesting / understandable if you have complete knowledge of prerequisites. Learning objectives are defined for each unit followed by lesson plan.

Assignment questions are given at the end of each unit which will help you to prepare well during I.A. Tests and VTU Exams. Portion for I.A. Tests is known to you in advance to plan your studies. VTU question papers are put at the end.

This course file will help you and your teacher in delivering curriculum systematically. Kindly note following to achieve academic excellence.

1) Ask for return of your assignments submitted for checking from teacher's atleast three days prior to commencement of I.A. Tests. This will help you in your preparation.
2) Ensure that each teacher solves VTU question papers in the class room / Tutorial class.
3) For subject difficulties, each teacher will be announcing contact hours in the class and display the same outside his cubicle. Utilize these contact hours to improve your performance.
4) Each teacher will display I.A. Marks within 3 days after completion of last subject Test.
5) To be eligible to appear for I.A. Tests, cumulative 85% attendance in theory classes is mandatory.
6) If you abstain from theory classes after II I.A. Test because of scoring well in I & II I.A. Tests, you will not be allowed to appear for laboratory internals.
7) Attend meetings with counselors whenever arranged. Speak freely to counselors about your academic difficulties.
8) Kindly request your parents to attend parents meet whenever your dept. organizes the same.

<u>If Sl.No. 1 to 4 are not fulfilled contact concerned HOD or Academic Coordinator immediately for necessary action.</u> If you have any suggestions for further improvement of course file kindly contact Academic Coordinator.

A.V. Kulkarni
Coordinator (Academic)

Dr. V.P. Huggi
Principal

B.L.D.E. Associations
V.P. Dr. P.G. Halakatti College of Engineering & Technology, Vijayapur.

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

VISION

To become a Centre of Excellence in Information Technology Education and Research that is adaptable to the ever-changing needs of the mankind.

MISSION

1. To provide quality technical education coupled with innovative research to boost the career of students in IT industry, entrepreneurship, higher education and research.
2. To instill moral values, professional ethics and leadership qualities in students to achieve professional success.

Program Educational Objectives (PEOs)

1. A graduate will be a successful IT professional, with ability to provide solutions to real-world problems.
2. A graduate will understand the need for and engage in life-long learning and research to contribute in IT domain.
3. A graduate develops project management techniques by the virtue of leadership qualities and team work capabilities.
4. A graduate inculcates moral values, understands professional, social and environmental responsibilities.

Program Outcomes (POs):

a) Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and engg. specialization to the solution of complex engineering problems.

b) Problem analysis: Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.

c) Design/development of solutions: Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d) Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e) Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f) The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g) Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i) Individual and team work: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

j) Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

k) Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

l) Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes:

The Graduates demonstrates the ability to

a) Apply the knowledge of basic science, mathematics and Information Technology to facilitate automation of various scientific applications.
b) Analyze, design, simulate and implement solutions to multi-disciplinary real-world problems using relevant hardware and software tools.
c) Develop the IT related product, with the understanding of business aspects and economic impacts, showcasing the leadership qualities required for IT project management, and exhibiting ethical, social and environmental responsibilities.

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VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B.E.SYLLABUS FOR 2017-2021

ENGINEERING MATHEMATICS-IV

(Common to all Branches)

Course Code: 17MAT41
Contact Hours/Week: 04
Total Hours: 50
Semester: IV
04(4:0:0)

CIE Marks: 40
SEE Marks: 60
Exam Hours: 03
Credits:

Course Learning Objectives:

The purpose of this course to make students well conversant with numerical methods to solve ordinary differential equations, complex analysis, sampling theory and joint probability distribution and stochastic processes arising in science and engineering.

MODULE	RBT Levels	No. of Hrs
MODULE-I **Numerical Methods:** Numerical solution of ordinary differential equations of first order and first degree, Taylor's series method, modified Euler's method, Runge - Kutta method of fourth order. Milne's and Adams-Bashforth predictor and corrector methods (No derivations of formulae – single step computation only).	**L1,L2**	**10**
MODULE-II **Numerical Methods:** Numerical solution of second order ordinary differential equations, Runge-Kutta method and Milne's method. (No derivations of formulae – single step computations only). **Special Functions:** Series solutions of Bessel's differential equation leading to $J_n\ (x)$ - Bessel's function of first kind. Basic properties and orthogonality. Series solution of Legendre's differential equation leading to $P_n(x)$ -Legendre's polynomials. Rodrigue's formula, problems.	**L3**	**10**
MODULE- III: **Complex Variables**: Review of a function of a complex variable, limits, continuity, differentiability. Analytic functions-Cauchy-Riemann equations in Cartesian and polar forms. Properties and construction of analytic functions. Complex line integrals-Cauchy's theorem and Cauchy's integral formula, Residue, poles, Cauchy's Residue theorem (with proof) and problems. **Transformations:** Conformal transformations- Discussion of transformations:	**L1 ,L3**	**10**

w = z^2, w = e^z, w = z + $\left(\frac{1}{z}\right)$ $(z \neq 0)$. Bilinear transformations-problems.	**L3**	
MODULE- IV : **Probability Distributions:** Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution, Exponential and normal distributions, Problems. **Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient.	**L3**	**10**
MODULE-V: **Sampling Theory:** Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. **Stochastic process:** Stochastic process, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition Probability, simple problems.	**L3** **L1,L2**	**10**

Course Outcomes: On completion of this course, students are able to:

1. Solve first and second order ordinary differential equations arising in flow problems using single step multi step numerical methods.

2. Illustrate problems of potential theory, quantum mechanics and heat conduction by employing notions and properties of Bessel's functions and Legendre's polynomials.

3. Explain concept of analytic function, residues, poles of complex potentials and describe conformal and bilinear transformation arising in field theory and signal processing.

4. Develop probability distribution of discrete, continuous random variables and Joint Probability distribution occurring in digital signal processing , information theory and design engineering.

5. Demonstrate testing of hypothesis of sampling distributions and illustrate examples of Markov chains related to discrete parameter stochastic process

Question Paper Pattern:

Note: - The SEE question paper will be set for 100 marks and the marks will be proportionately reduced to 60.

- The question paper will have **ten** full questions carrying equal marks.

- Each full question consisting of **20** marks.
- There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna publishers, 43rd Ed, 2015.

2. E. Kreyszig , Advanced Engineering Mathematics, John Wiley and sons, 10th Ed, 2015.

Reference Books:

1. N. P. Bali and Manish Goyal, A text book of Engineering mathematics- Laxmi publications, 7th edition 2010.
2. B.V. Ramana, Higher Engineering Mathematics Tata Mc. Graw-Hill, 2006
3. H. K. Dass and Er. RajnishVerma, Higher Engineering Mathematics S. Chand publishing, 1st edition, 2011.

1. Prerequisites of the course:

To learn this subject, the student must have the knowledge about differentiation, integration, set theory, permutation & combination and probability.

2. Overview of the course:

The primary goal of this course is to highlight the essential concepts of i) numerical methods ii) complex variables iii) series solution of differential equation iv) probability iv) Stochastic process.

Many differential equations of interest to engineers are not amenable to analytical solutions and hence we must resort to numerical solutions. Also the rapid development of high speed digital computers and the increasing desire for numerical answers to applied problems has led to the enhanced demands in the methods and techniques of numerical analysis.

Complex variables are useful in the study of fluid mechanics, thermodynamics, electric fields, aerodynamics, elasticity etc. Conformal mapping, which preserves angles in magnitude and sense, is useful in solving boundary value problems in two dimensional potential theories by transforming a complicated region to a simpler region.

The solutions to differential equation with variable co-efficient cannot be expressed as finite linear combination of known elementary functions, however in such cases solution can be

obtained in the form of infinite power series. In series solution of a differential equation with variable co-efficient we use power series method.

Probability is the measure of how frequently the same event occurs in an experiment. The study of probability provides a mathematical frame work to assess the chances of the predictions coming true and is essential in every decision making process.
Probability distribution is the theoretical counter part of frequency distribution, and plays an important role in the theoretical study of populations. eg: The shoes industry should know the sizes of foot of the population. Sampling aims at gathering the maximum information about the population with the minimum effort, time and cost.

Stochastic Process: Stochastic process technique, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability.

3. Relevance of the course to this program:

Numerical Methods:

Numerical techniques are applicable for determining the motion of a body falling through a viscous fluid arising in a wide variety of engineering contexts.

Complex variables:

In the theory of alternating current, the application of complex impedance involves functions having complex numbers as independent variables. The theory of complex variables has made a significant contribution in the design of aerofoil sections for aircraft and other lifting bodies. The strength of the theory in such applications is its ability to generate mappings which transforms complicated shapes, such as an aerofoil section into a simpler shape.

Complex Integration:

To express a complex function as a Taylor's series is applicable in the field of Control and communications theory

Series Solution of ordinary differential equations and special functions:

Heat equation, wave equation and Laplace's equation with cylindrical symmetry can be solved in terms of Bessel's functions, with spherical symmetry by Legendre's polynomials.

Probability distributions:

Probability distributions are applicable for problems concerning i) Radar detection ii) Number of rounds fired from a gun hitting a target. iii) Defective vehicles in a workshop. iv) Telephone calls. v) Errors made by chance in experimental measurements. vi) Reliability and queuing theory.

Joint Probability: Problems in Economics, Biology or social science needs statistical method analyzing two or more variables in such cases the concept of joint probability required.

Sampling:

It is quite often necessary to draw some valid conclusions concerning a large mass of population which is practically impossible and therefore it is preferred to examine a small part of the population called Sample with the motive of drawing some conclusion about the entire population.

Stochastic Process: Stochastic process can be used to analyze and solve diverse range of problems arising in production and inventory control, resource planning, service systems computer networks and many others.

4. Module wise Plan:

Module - 1	**Title : Numerical Methods**	**Planned Hours: 10**

Learning Objectives: At the end of this chapter student should be able to

1. Recall the various formulae
2**.** Apply the appropriate formula to solve the differential equations with initial conditions.
3 Interpret the multistep methods to solve the differential equations with more than one initial condition.
4. Apply Milne's and Adams-Bashforth's methods to solve the differential equations with one initial condition after using one step method to get the required number of initial conditions.

Lesson Plan:

Lecture no.	**Topics covered**	**Teaching Method**	**PSOs**	**POs Attained**	**COs Attained**	**Ref Book/ Chapter no.**
L1	Introduction of Numerical Methods: Numerical solution of ordinary differential equations of first order and first degree.					
L2	Taylor's series method and examples.					
L3	Modified Euler's method and examples.	Chalk	1	1, 2, 4,	1	T1/32,

L4	Examples continued..	and Board		5, 11		T2/21
L5	Runge - Kutta method of fourth order and examples.					
L6	Examples continued.					
L7	Milne's predictor and corrector methods (No derivations of formulae) and examples.					
L8	Examples continued.					
L9	Adams-Bashforth predictor and corrector methods (No derivations of formulae) and examples.					
L10	Examples continued.					

Assignment questions	**COs Attained**	**RBT Level**
1. Using Taylor's series method, compute the solution of the initial value problem $\frac{dy}{dx} = 2y + 3e^x$, y(0) = 0, at x = 0.1 and x = 0.2.		
2. Using Euler's modified method, obtain a solution of the equation $\frac{dy}{dx} = x + \lvert\sqrt{y}\rvert$, with y = 1 at x = 0, for the range $0 \le x \le 0.4$ in steps of 0.2.		
3. Using Runge-Kutta method of fourth order find y(0.2) for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$ taking h = 0.1.		
4. Using Milne's method find y(0.8). Given $\frac{dy}{dx} = x - y^2$ and the data x: 0 0.2 0.4 0.6 y: 0 0.02 0.0795 0.1762	**1**	**L1,L2**
5. Using Adams–Bashforth's predictor- corrector method find y(0.4) $\frac{dy}{dx} = \frac{1}{2}xy$ and the data y(0) = 1, y(0.1) = 1.0025, y(0.2) = 1.0101, y(0.3) = 1.0228.		

Module - 2	**Title : Numerical Methods**	**Planned Hours: 10**

Learning Objectives: At the end of this chapter student should be able to

1.	**Recall** the various formulae
2.	**Apply** the appropriate formulas to solve the second order ordinary differential equations with initial conditions.
3.	**Solve** the Bessel differential equation in series, Recurrence relations
4.	**Solve** the Legendre differential equation in series.
5.	**Apply** Rodrigue's formula to evaluate Legendre polynomials.

Lesson Plan:

Lecture no.	**Topics covered**	**Teaching Method**	**PSOs**	**POs attained**	**COs attained**	Ref Book/ Chapter no.
L11	Introduction to numerical solution of second order ordinary Differential equations	Chalk and Board	1	1, 2, 4, 5, 11	1	T1/32T 2/21,5
L12	Runge- Kutta method-examples					
L13	Milne's method- Examples					
L14	Series solution of Bessel differential equation leading to $J_n(x)$-Bessel's function of first kind				2	
L15	Basic properties, and examples					
L16	Some more Examples					
L17	Orthogonality					
L18	Series solution of Legendre Differential equation leading to $P_n(x)$					
L19	Legendre polynomials					
L20	Rodrigue's formula					

Assignment questions	**COs Attained**	**RBT level**

1. Using Runge-Kutta method find third approximation to the values $y'' = xy'^2 - y^2$ for x = 0.2 correct to four decimal places. Initial conditions are x = 0, y = 1, y′ = 0 2. Applying Milne's method compute $y(0.8)$ given that y satisfies the equation $y'' = 2yy'$ and $y \& y'$ are governed by the fallowing values x | 0 | 0.2 | 0.4 | 0.6 y | 0 | 0.2027 | 0.4228 | 0.6841 y' | 1 | 1.041 | 1.179 | 1.468 3. Prove $J_{-1/2}(x) = \sqrt{\frac{2}{\pi x}}\, cosx$ 4. Express the following polynomials in terms of Legendre polynomials $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ 5. If $x^3 + 2x^2 - x + 1 = ap_0(x) + bp_1(x) + cp_2(x) + dp_3(x)$ find the values of a, b, c, d.	**1** **1**	**L3**

Module: 3	Title : Complex variables	Planned Hours: 10

Learning Objectives: At the end of this chapter student should be able to

1. Recall the function of a complex variable, limits, continuity and differentiability.
2. **Apply** the C-R equations to show the complex functions are analytic.
3. **Recall** the properties of analytic function.
4. **Construct** the analytic function given real or imaginary part by using Milne Thompson method
5. **Evaluate** Complex Line Integrals by using Cauchy's theorem and formula
6. **Study** of Residue, Poles, Cauchy' Residue Theorem
7. **Interpret** the conformal mapping from z-plane to w-plane under some standard transformation

8. Find the Bilinear transformation and the corresponding invariant points

Lesson plan:

Lecture no.	Topics covered	Teaching Method	PSOs	POs attained	COs attained	RBT Levels	Ref Book/ Chapter No.
L21	Introduction to function of a complex variable. Limit, continuity, differentiability and analytic function	Chalk and Board	1	1, 2, 4, 5, 11	3	**L1, & L3**	T1/20 T2/13,14, 16,17
L22	Cauchy-Riemann equations in Cartesian form and polar form						
L23	Properties of analytic functions and construction of analytic function f(z) given its real or imaginary parts						
L24	Line integral of Complex valued functions, Examples						T1/20 T2/13,14, 16,17
L25	Cauchy's theorem and related examples.						
L26	Cauchy's integral formula and Generalized Cauchy's integral formula -examples						
L27	Residues, Poles, Cauchy's Residue theorem with proof and problem						
L28	Discuss the conformal transformation $w = z^{2,}$,$w = e^{z}$, examples						
L29	Discuss the transformation $w = z + \frac{1}{z}$ Examples						
L30	Bilinear transformations Problems						

Assignment questions	Co's	RBT level

1. Find the corresponding analytic function a) $u = e^{2x}(xcosy - ysin2y)$ b)$u = \left(r + \frac{1}{r}\right)cos\theta$ c) $v = \frac{-sin\theta}{r}$ 2. Construct analytic function f(z) = u + iv as a function of z using the following data a) $u - v = e^{x}(cosy - siny)$ b) $u + v = \frac{1}{r^2}(cos2\theta - sin2\theta)$ 3. Evaluate $\int_{1-i}^{2+3i}(z^2 + z)dz$ along the line joining the points (1, -1) & (2,3) 4.Verify Cauchy's theorem for the function f(z) = ze^{-z}over the unit circle with origin as the centre. 5. Evaluate $\int_C \frac{dz}{z^2-4}$ over a) C : | z | = 1 b) C: | z | = 3 c) C: | z + 2 | = 1 using Cauchy's integral formula. 6. Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and the residue at each pole. 7. Find the Bilinear transformation which maps the given points and the corresponding invariant points. a) z = 1, i, -1 into w = i, 0, -i b) z = i,1, -1 into w = 1, 0, ∞, into w = 1, -i, -1	3 3	L1 &L3 L3

Module - 4	Title **Probability Distributions**	**Planned Hours: 10**

Learning Objectives: At the end of this chapter student should be able to

1.	**Identify** Random variables, Discrete and continuous probability distributions.
2.	**Apply** the concept based on pdf & cdf and evaluate various problems based on it.
3.	**Interpret** mean, variance in Binomial, Poisson, Exponential and Normal distributions, classify and evaluate and make certain judgments.

Lesson Plan

Lecture no.	Topics covered	Teaching Method	PSOs	POs attained	COs attained	Ref Book/ Chapter no.
L31	Random variables, Discrete and continuous probability mass/density functions	Chalk and Board	1	1, 2, 4, 5, 11	4	T_1/27.1 T_2/26.8 T_2/26.9
L32	Examples on Probability functions.					
L33	Binomial distribution, mean and variance and examples					T_1/27.4 T_2/26.14
L34	Poisson distribution, mean and variance and examples					T_2/26.15
L35	Exponential distribution, mean and variance and examples					T_2/26.19(6)
L36	Normal distributions, mean and variance and examples				4	T_2/26.16
L37	Some more examples					
L38	Joint probability distribution for two discrete random variables and examples				4	T_1/27.3 T_1/31.1
L39	Expectation, covariance and examples.					T_1/31.1
L40	correlation coefficient and example					

Assignment questions	COs Attained	RBT Level

1. Find the value of k such that the following distribution represents a finite probability distribution.

x	0	1	2	3	4	5	6	7
y	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+7$

Hence find its mean and standard deviation.

Also find P(x < 6), P(x ≥ 6), P (3< x ≤ 6)

2. In a consignment of electric lamps 5% are defective. If a random sample of 8 lamps is inspected, what is the probability that one or more lamps are defective?
3. The number of accidents in a year to taxi drivers in a city follows a Poisson distribution with mean 3. Out of 1000 taxi driver's fond approximately the number of the drivers with i) no accidents in a year ii) more than 3 accidents in a year.

4 | L3

4. The length of telephone conversation has been an exponential distribution & found on an average to be 5 minutes. Find the probability that a random call made from this booth a) ends in less than 5 minutes b) between 5 & 10 minutes.
5. The marks of 1000 students in an examination follow a normal distribution with mean 70 & standard deviation 5. Find the number of students whose marks will be (a) less than 65 (b) more than 75
6. The joint distribution of two random variables X and Y is as follows.

X \ Y	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

Compute the following.(a) marginal distributions of X and Y ,
$(b)\ E(X)\ and\ E(Y)\ \ (c)\ \ E(XY)\ \ \ (d)\ \ \sigma_X\ and\ \sigma_Y\ \ (e)\ \ COV(X,Y)\ \ (f)\ \rho(X,Y)$

7.Find the joint distribution of x and y, which are independent random variables with the following respective distributions;

x_i:	1	2
$f(x_i)$:	0.7	0.3

And

y_i:	-2	5	8
$g(y_i)$:	0.3	0.5	0.2

Show that Cov $(X, Y) = 0$.

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MODULE:5	Title: SAMPLING THEORY & STOCHASTIC PROCESS	Planned Hours: 10

Learning Objectives: At the end of this chapter student should be able to

1. **Outline** the process of sampling made in daily life.
2. **Distinguish** between standard error, null and alternate hypothesis and Type I,II errors.
3. **Classify** and calculate the above said errors and apply known procedure to solve problems.
4. **Interpret** level of significance for means.
5. **Interpret** and explain confidence limits for means of large and small samples.
6. **Apply** known technique and solve the examples.
7. Interpret and evaluate chi square and t distribution.
8. **Outline** the random process that undergoes transitions from one state to another on a state space.

Lesson Plan:

Lecture no.	Topics covered	Teaching Method	PSOs	POs attained	COs attained	Ref Book/ Chapter no.
L41	Introduction to sampling and sampling distribution and simple examples	Chalk and Board	1	1, 2, 4, 5, 11	5	T1/31, T2/27
L42	Standard error, test of hypothesis for mean and proportions and examples					
L43	Confidence limits for means of large and small samples.					
L44	Student's t-distribution with examples.					
L45	Chi-square distribution as test of goodness of fit.					
L46	Introduction to Stochastic process,				5	
L47	Probability vector, stochastic					

	matrices.					
L48	Fixed points, regular stochastic matrices.					
L49	Markov chains, higher transition probability.					
L50	Examples.					

Assignment Questions	**COs Attained**	**RBT Level**
1. A die was thrown 9000 times & a throw of 5 or 6 was obtained 3240 times, on the assumption of random throwing, do the data indicate that the die is unbiased. 2. A random sample of 400 items chosen from an infinite population is found to have a mean of 82 and a standard deviation of 18. Find the 95% confidence limits for the mean of the population from which the sample is drawn. 3. In a city 'A' 20 % of a random sample of 900 school boys had a certain slight physical defect. In another city 'B' 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? 4. In an examination given to students at a large number of different schools the mean grade was 74.5 & S.D grade was 8. At one particular school where 200 students took the examination the mean grade 75.9. Discuss the significance of this result from the view point of a) one tailed test b) two tailed test at both 5 % & 1% level of significance. 5. From a random sample of 10 pigs fed on diet A, The increase in weight in the certain period were 10, 6,16,17,13,12,8,14,15,9 lbs. For another sample of 12 pigs fed on diet B, the increase in the same period were 7,13,22,15,12,14,18,8,21,23,10,17 lbs. Test whether diets A & B differ significantly as regards their effect on increase in weight.(Given $t_{0.05}$ for 20 d.f = 2.09)	**5**	**L3**

7. Show that P = $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ ½ & ½ & 0 \end{bmatrix}$ is a regular stochastic matrix. Also find the associate unique fixed probability vector. 8. Prove that the Markov chain whose transition probability matrix is P = $\begin{bmatrix} 0 & ⅔ & ⅔ \\ ½ & 0 & ½ \\ ½ & ½ & 0 \end{bmatrix}$ is irreducible. 10. A students study habits are as follows .If he studies one night he is 70%sure not to study the next night. On the other hand if he does not study one night he is 60%sure not to study the next night also. Supposing that he studies on Monday night, find the probability that he does not study on Friday night.	**5**	**L1,L2**

5. Portion for Internal Assessment Test

Test	Modules	COs attained
I IA test	1, 2	1& 2
II IA test	3,4	3 & 4
III IA test	5	5

OBJECT ORIENTED CONCEPTS **[As per Choice Based Credit System (CBCS) scheme]** **(Effective from the academic year 2017 -2018)** **SEMESTER – IV**			
Subject Code	17CS42	IA Marks	40
Number of Lecture Hours/Week	03	Exam Marks	60
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			

Module 1	**Teaching Hours**
Introduction to Object Oriented Concepts: A Review of structures, Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object Oriented Language with C, Console I/O, variables and reference variables, Function Prototyping, Function Overloading. **Class and Objects:** Introduction, member functions and data, objects and functions, objects and arrays, Namespaces, Nested classes, Constructors, Destructors. **Text book 1: Ch 1: 1.1 to 1.9 Ch 2: 2.1 to 2.6 Ch 4: 4.1 to 4.2**	**08 Hours**
Module 2	
Introduction to Java: Java's magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements. **Text book 2: Ch:1 Ch: 2 Ch:3 Ch:4 Ch:5**	**08 Hours**
Module 3	
Classes, Inheritance, Exceptions, Packages and Interfaces: Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. **Inheritance:** inheritance basics, using super, creating multi level hierarchy, method overriding. **Exception handling:** Exception handling in Java. Packages, Access Protection, Importing Packages, Interfaces. **Text book 2: Ch:6 Ch: 8 Ch:9 Ch:10**	**08 Hours**
Module 4	
Multi Threaded Programming, Event Handling: Multi Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer consumer problems. **Event Handling:** Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes. **Text book 2: Ch 11: Ch: 22**	**08 Hours**
Module 5	

The Applet Class: Introduction, Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface;Output to the Console. **Swings:** Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons;	**08 Hours**
JTabbedpane; JScrollPane; JList; JComboBox; JTable. **Text book 2: Ch 21: Ch: 29 Ch: 30**	

Course Outcomes: After studying this course, students will be able to

- Explain the object-oriented concepts and JAVA.
- Develop computer programs to solve real world problems in Java.
- Develop simple GUI int erfaces for a computer program to interact with users, and to **comprehend** the event-based GUI handling principles using Applets and swings.

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Sourav Sahay, Object Oriented Programming with C++ , 2nd Ed, Oxford University Press,2006
   (Chapters 1, 2, 4)
2. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.
   (Chapters 1, 2, 3, 4, 5, 6, 8, 9,10, 11, 21, 22, 29, 30)

Reference Book:

1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806
2. Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.
3. Stanley B.Lippmann, Josee Lajore, C++ Primer, 4th Edition, Pearson Education, 2005.
4. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java,
Tata McGraw Hill education private limited.
5. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning.
6. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.

Note: Every institute shall organize a bridge organize on C++ either in the vacation or in the beginning of even semester.

OBJECT ORIENTED CONCEPTS COURSE PLAN

1. PREREQUISITES:

1. Fundamentals of C and C++
2. Fundamentals templates

2. COURSE OVERVIEW AND ITS RELEVANCE TO PROGRAM:

This course contains the study of classes and objects. It will give the programming knowledge. It also contains information about a stream handling function. It gives good programming idea of C++. From this course it will setup different logic in programming. The C++ programming language provides a model of memory and computation that closely matches that of most computers. In addition, it provides powerful and flexible mechanisms for abstraction, that is, language constructs that allow the programmer to introduce and use new types of objects that match the concepts of an application. Thus, C++ supports styles of programming that rely on fairly direct manipulation of hardware resources to deliver a high degree of efficiency plus higher-level styles of programming that rely on user-defined types to provide a model of data and computation that is closer to a human's view of the task being performed by a computer. These higher-level styles of programming are often called data abstraction, object-oriented programming, and generic programming.

3. Applications:

1. General purpose applications.
2. Developing a banking package.
3. In Statistics.
4. In administration and finance

4. Module wise plan

Module -1

Module : 01	**No. of Hours: 08**

Learning Objectives: The main objectives of this module are to:

1	Analyze concepts of object oriented programming, Structures ,unions
2	Write simple c++ programs using classes and object.
3	Develop knowledge about inline functions.
4	Develop knowledge about friend functions and Static members.
5	Analyze the use of constructors and desructors.
6	Implement concept of passing objects, returning objects and nested classes.

Lesson Plan:

Lecture No.	**Topics Covered**	**Teaching Method**	**POs attained**	**COs attained**	**PSOs attained**	**Reference Book/ Chapter No.**
L1	A Review of structures	Chalk and Board	1,2,3,4,5,9 ,12	1,2,5,6	1,2	T1, R1
L2	Procedure–Oriented Programming system	Chalk and Board		1,2,5,6	1,2	T1, R1
L3	Object Oriented Programming System	Chalk and Board		1,2,5,6	1,2	T1, R1
L4	Comparison of Object Oriented Language with C, Console I/O	Chalk and Board		1,2,5,6	1,2	T1, R1
L5	variables and reference variables Function Prototyping	Chalk and Board		1,2,5,6	1,2	T1, R1
L6	**Class and Objects:** Introduction, member functions and data	Chalk and Board		1,2,5,6	1,2	T1, R1
L7	objects and functions, objects and arrays	Chalk and Board		1,2,5,6	1,2	T1, R1
L8	Namespaces, Nested	Chalk and		1,2,5,6	1,2	T1, R1

	classes, Constructors,	Board				

Text book 1: Ch 1: 1.1 to 1.9 Ch 2: 2.1 to 2.6 Ch 4: 4.1 to 4.2

Assignment Questions:

Assignment Questions	COs attained
1. Differentiate procedure oriented and object oriented programming	1,2
2. Discuss the issues of procedure oriented programming system with respect to data security. If object oriented programming solves it, then how?	1,2
3. Explain different data types, expression and statements.	1,2
4. Explain arrays, strings, pointers and user defined types	1,2
5. Why should be default arguments be given to function arguments in function prototype? Explain with an example.	1,2
6. What is an inline function? What are the advantages of making a function inline?	1,2,5
7. Write a C++ program to find the cube of a number using inline function.	2
8. Write a C++ program to add three numbers using function which has one or more default values.	1,2
9. Explain the necessity of structures in C with example.	1,2
10. Explain the function overloading with an example	1,2
11. Explain what do you mean by class specification, classes and objects?	1,2
12. Explain scope resolution operator.	1,2,5
13. What are access members?	1,2,5
14. Explain defining member functions, data hiding?	1,2
15. What do you mean by constructors and destructors?	1,2
16. Explain parameterized constructors, static data members.	1,2
17. Explain static functions w r t to classes.	1,2
18. Explain examples with respect to same.	1,2
19. What are the characteristics of constructors? Explain different types of constructors.	1,2
20. What are the characteristics of destructors? Explain.	1,2

Module -2

Module : 02	**No. of Hours: 08**

Learning Objectives: The main objectives of this module are to:

1	Incorporate concept of Arrays, Pointers, References, and the Dynamic Allocation Operators in Programming.
2	Express concepts of Copy Constructors
3	Implement applications using function Overloading.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	PSOs attained	Reference Book/ Chapter No.
L9	Java's magic: the Byte code	Chalk and Board	1,2,3,4,5,9,10,12	1,2,3,5,6	2	T1, R2
L10	Java Development Kit (JDK)	Chalk and Board		1,2,3,5,6	2	T1, R2
L11		Chalk and Board		1,2,3,5,6	2	T1, R2
L12	the Java Buzzwords, Object-oriented programming	Chalk and Board		1,2,3,5,6	2	T1, R2
L13	Simple Java Programs	Chalk and Board		1,2,3,5,6	2	T1, R2
L14	Data types, variables	Chalk and Board		1,2,3,5,6	2	T1, R2
L15	arrays, Operators	Chalk and Board		1,2,3,5,6	2	T1, R2
L16	Control Statements	Chalk and Board		1,2,3,5,6	2	T1, R2

Text book 2: Ch:1 Ch: 2 Ch:3 Ch:4 Ch:5

Assignment Questions:	**COs attained**
1. Explain the features of keyword "new" and "delete".	1,3
2. Explain how new and delete operators manage memory allocation / deallocation dynamically .	1,3,5

3. What is the benefit of copy constructor? Explain with example to illustrate the necessity of defining our own copy constructor through the default copy constructor exists	1,3
4. Write a C ++ program to illustrate the use of default arguments to functions.	1,2,3
5. Explain the ambiguity that arises in function overloading with an example.	1,3
6. Explain the concept of pointers to objects with an example.	1,3
7. Explain the concept of array of objects with an example.	1,3
8. Write a C ++ program illustrate the use of this pointer.	1,2,3,5

Module -3

Module : 03	**No. of Hours: 10**

Learning Objectives: The main objectives of this module are to:

1	Implement the operator overloading using friend functions
2	Write C++ program to overload various operators such as +,-, pre-increment, post-increment, [ ], new, delete, insertion and extraction operators.
3	Implement of different kinds of Inheritance.
4	Demonstrate the usage of base class and derived class pointers.
5	Differentiate between public, private, protected access specifiers and can demonstrate their usage under different conditions.
6	Demonstrate the concept of passing parameters to base-class constructors, granting access, virtual base classes.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	PSOs attained	Reference Book/ Chapter No.
L17	Classes: Classes Fundamentals	Chalk and Board		1,2,3,5, 6	2	T2, R3
L18	Declaring objects;	Chalk and		1,2,3,5,	2	T2, R3

	Constructors	Board	1,2,3,4,5,10, 12	6		
L19	this keyword, garbage collection	Chalk and Board		1,2,3,5, 6	2	T2, R3
L20	inheritance basics	Chalk and Board		1,2,3,5, 6	2	T2, R3
L21	using super, creating multi level hierarchy	Chalk and Board		1,2,3,5, 6	2	T1, R3
L22	method overriding	Chalk and Board		1,2,3,5, 6	2	T1, R3
L23	Exception handling in Java	Chalk and Board		1,2,3,5, 6	2	T1, R3
L24	Packages, Access Protection,	Chalk and Board		1,2,3,5, 6	2	T1, R3

Text book 2: Ch:6 Ch: 8 Ch:9 Ch:10

Assignment Questions:	**COs attained**
1. Write a C++ program to overload '+' operator to concatenate two string variables.	1,2,3
2. How does the compiler interpret the operator overloading? Write a C++ program to overload unary minus to change the sign of each of its data items of an object.	1,3,5
3. Explain different types of inheritances with example.	1,3
4. Explain deriving by different access specifiers	1,3
5. Explain the ambiguities that arise with multiple inheritance. Mention the different ways of resolving ambiguities.	1,3
6. Explain the concept of granting access to privately derived members in derived class with an example.	1,3
7. Illustrate the significance of virtual base classes.	1,3
8. Explain the concept of passing parameters to base class with example.	1,2,,3,5

Module -4

Module : 04	**No. of Hours: 10**

Learning Objectives: The main objectives of this module are to:

1	Demonstrate the importance of virtual functions, early and late binding.
2	Apply the knowledge of generic functions and generic classes.
3	Implement the concept of exception handling in C++.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	PSOs attained	Reference Book/ Chapter No.
L25	Multi Threaded Programming: What are threads?	Chalk and Board	1,2,3,4,5,7,11,12	1,2,3,4,5,6	2	T1, R3
L26	How to make the classes threadable, Extending threads;	Chalk and Board		1,2,3,4,5,6	2	T1, R3
L27	Implementing runnable; Synchronization; Changing state of the thread	Chalk and Board		1,2,3,4,5,6	2	T1, R3
L28	Bounded buffer problems, read-write problem	Chalk and Board		1,2,3,4,5,6	2	T1, R3
L29	producer consumer problems. **Event Handling:** Two event handling mechanisms	Chalk and Board		1,2,3,4,5,6	2	T1, R3
L30	The delegation event model; Event classes; Sources of events	Chalk and Board		1,2,3,4,5,6	2	T1, R3
L31	Event listener interfaces; Using the delegation event model	Chalk and Board		1,2,3,4,5,6	2	T1, R3
L32	Adapter classes;	Chalk and Board		1,2,3,4,5,6	2	T1, R3

Text book 2: Ch 11: Ch: 22

Assignment Questions:	COs attained
1. What are virtual functions? What is their use? Give an example. How compilers resolve a call to a virtual function?	1,3
2. Mention the need for virtual function. Write a C++ program to override a member function of base class in the derived class	1,2,3,5
3. Define pure virtual functions. Explain its significance with example	1,3,5
4. Explain the mechanism of making a class as abstract class.	1,3,5,6
5. What is the need for virtual function? Write a C++ program to override a member function of Base class in the derived class.	1,3,5
6. What is standard template library? Name some of the template classes that are available in STL. Write a C++ program to swap numbers using function template**.**	1,3,5
7. Write a C++ program to demonstrate the try, catch and throw keywords for implementing exception handling.	1,2,3,5
8. Which three keywords are provided by C++ for implementing exception handling? What is the need to those class objects instead of values of fundamental types? Give example.	1,2,3,4,5

Module -5

Module : 05	**No. of Hours: 10**

Learning Objectives: The main objectives of this module are to:

1	Demonstrate different formatted and unformatted I/O operators.
2	Write down different C++ programs to highlight the usage of I/O manipulators.
3	Demonstrate the concept of Fstream and the File classes.
4	Create different situation in the form of program to illustrate the usage of file operation

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	PSOs attained	Reference Book/ Chapter

						No.
L33	**The Applet Class:** Introduction, Two types of Applets;	Chalk and Board	1,2,3,4,5,7,11,12	1,4,5,6	2	T1, R1
L34	Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods	Chalk and Board		1,4,5,6	2	T1, R1
L35	Requesting repainting; Using the Status Window	Chalk and Board		1,4,5,6	2	T1, R1
L36	The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase()	Chalk and Board		1,4,5,6	2	T1, R1
L37	ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface;Output to the Console	Chalk and Board		1,4,5,6	2	T1, R1
L38	**Swings:** Swings: The origins of Swing; Two key Swing features	Chalk and Board		1,4,5,6	2	T1, R1
L39	Components and Containers; The Swing Packages; A simple Swing Application	Chalk and Board		1,4,5,6	2	T1, R1
L40	Create a Swing Applet; Jlabel and ImageIcon	Chalk and Board		1,4,5,6	2	T1, R1

Text book 2: Ch 21: Ch: 29 Ch: 30

Assignment Questions:	**COs attained**

1. Briefly describe the class hierarchy provided by C++ for stream handling.	1,4,5,6
2. List different library classes that handle streams in C++.	1,4,5,6
3. overload unary minus to change the sign of each of its data items of an object.	1,4,5,6
4. Explain how text o/p is achieved in C++. Give an example.	1,4,5,6
5. Describe the use of following manipulators: i) Setw() ii) setiosflags iii) setprecision() iv) setfill v) resetiosflags	1,4,5,6
6. Explain error handling and manipulators in C++.	1,4,5,6
7. Explain "write()" function of C++ to output the character type value to a disk file and to the display (monitor) device.	1,4,5,6

PORTION FOR THE I.A. TEST

Test	Units/Modules	Cos Attained
IA Test –I	Module-I,II	1,2,3,6,7
IA Test –II	Module-III,IV	4,5
IA Test –III	Module-V	6

Course coordinator Module coordinator

DESIGN AND ANALYSIS OF ALGORITHMS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2017 -2018)
SEMESTER – IV

Subject Code	**17CS43**	**IA Marks**	**40**
Number of Lecture Hours/Week	**04**	**Exam Marks**	**60**
Total Number of Lecture Hours	**50**	**Exam Hours**	**03**

CREDITS - 04

Course objectives: This course will enable students to

- Understand and analyse the asymptotic performance of algorithms.
  Demonstrate the familiarity with major kinds of algorithms.
- Understand and use of Divide and Conquer method, Greedy Method, Dynamic programming and Backtracking methods in solving problems
- Judge suitable algorithmic design paradigms for real life problems
- Synthesize efficient algorithms in common engineering design situations

Module -1	**Teaching Hours**	**RBT Levels**
Introduction: What is an Algorithm? (T2:1.1), Algorithm Specification (T2:1.2), Analysis Framework (T1:2.1), Performance Analysis: Space complexity, Time complexity (T2:1.3). Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples (T1:2.2, 2.3, 2.4). Important Problem Types: Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. Fundamental Data Structures: Stacks, Queues, Graphs, Trees, Sets and Dictionaries. (T1:1.3,1.4)	**10Hours**	**L1, L2,**
Module -2		
Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum (T2:3.1, 3.3, 3.4), Merge sort, Quick sort (T1:4.1, 4.2), Strassen's matrix multiplication (T2:3.8), Advantages and Disadvantages of divide and conquer. Decrease and Conquer Approach: Topological Sort. (T1:5.3)	**10 Hours**	**L2, L3, L4, L5, L6**
Module - 3		
Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines (T2:4.1, 4.3, 4.5). Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm (T1:9.1, 9.2). Single source shortest paths: Dijkstra's Algorithm (T1:9.3). Optimal Tree problem: Huffman Trees and Codes (T1:9.4). Transform and Conquer Approach: Heaps and Heap Sort (T1:6.4).	**10 Hours**	**L2, L3, L4, L5, L6**

Module-4		
Dynamic Programming: General method with Examples, Multistage Graphs (T2:5.1, 5.2). Transitive Closure: Warshall's Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem ((T1:8.2, 8.3, 8.4), Bellman-Ford Algorithm (T2:5.4), Travelling Sales Person problem (T2:5.9), Reliability design (T2:5.8).	**10 Hours**	**L2, L3, L4, L5, L6**
Module-5		
Backtracking: General method (T2:7.1), N-Queens problem (T1:12.1), Sum of subsets problem (T1:12.1), Graph coloring (T2:7.4), Hamiltonian cycles (T2:7.5). Branch and Bound: Assignment Problem, Travelling Sales Person problem (T1:12.2), 0/1 Knapsack problem (T2:8.2, T1:12.2): LC Branch and Bound solution (T2:8.2), FIFO Branch and Bound solution (T2:8.2). NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes (T2:11.1).	**10 Hours**	**L2, L3, L4, L5, L6**

Course outcomes:

After studying this course, the students will be able to

1. Asses the correctness of algorithms using inductive proofs and loop invariants.
2. Analyse and Compare the asymptotic behaviors of functions obtained by elementary composition of polynomials, exponentials, and logarithmic functions.
3. Describe the relative merits of worst-, average-, and best-case analysis.
4. Describe, apply and analyse the different algorithm design techniques: divide-and-conquer, dynamic programming, greedy paradigm, graph algorithms and their analysis.
5. Judge the applicability of appropriate method for solving real world problems

Graduate Attributes (as per NBA)

1. Engineering Knowledge
2. Problem Analysis
3. Design/Development of Solutions
4. Conduct Investigations of Complex Problems
5. Life-Long Learning

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module

Text Books:

T1.Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
T2.Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI
2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education)

DESIGN AND ANALYSIS OF ALGORITHMS COURSE PLAN

1. Prerequisites:

1. Logical Thinking.
2. Knowledge of Discrete Structures.
3. Mathematical knowledge.
4. Little C programming concepts.

2. Course Overview and its relevance to this programme:

Why do we need to study algorithms? If we want to become a computer professional, we need to study algorithms with both practical and theoretical standpoints. From a practical standpoint, we have to know a standard set of important algorithms from different areas of computing and also we should be able to design new algorithms and analyze their efficiency. From a theoretical standpoint, the study of algorithms, sometimes called Algorithmics, has come to be recognized as the cornerstone of computer science.

Algorithmics is more than a branch of computer science. It is the core of computer science and in all fairness can be said to be relevant to most of science, business, and technology.

There are two reasons to study algorithms, First computer programs would not exist without algorithms. And with computer applications becoming common in all aspects of our professional and personal lives, studying algorithms is necessity for all people. Second reason is, they help in developing analytical skills. Algorithms are special kinds of procedures to get the solution to the problems.

A person well trained in computer science knows how to deal with algorithms i.e. how to construct them, manipulate them, understand them, and analyze them. It is the preparation for much more than writing good program. It is general-purpose mental tool that will be a definite aid to understanding other subjects.

It is said that a person does not really understand something until after teaching it to someone else. Similarly a person does not *really* understand something until after teaching it to a *computer* i.e. expressing it as an algorithm. An attempt to formalize things as algorithms leads to a much deeper understanding than if we simply try to comprehend things in the traditional way.

3. Applications:

- This subject is preface for learning any subject.
- Helps to solve different problems.
- We can analyze any type of algorithm.
- It is very easy to find the Space efficiency and time efficiency after going through this subject.

- This subject helps the students to construct a procedure to find solution for any problem.
- We can give explanatory theoretical results for a problem.
- The procedure got by this can be applied in different fields.

4) Model wise plan

Module -1

Module : 01	**No. of Hours:10**
Title: Introduction	

Learning Objectives: The main objectives of this unit are to:

1.	Define an algorithm
2.	Explain Notations of algorithm
3.	Explain the performance analysis
4.	Explain Fundamental sorting and searching algorithm

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L1.	**Introduction:** What is an Algorithm?	Chalk and Board	1,2,3,5,11	1,2	1	T2/1
L2.	Algorithm Specification	Chalk and Board		1,2	1	T2/1
L3.	Performance Analysis: Space complexity, Time complexity	Chalk and Board		1,2	1,2	T1/2
L4.	Asymptotic Notations: Big-Oh notation, Omega notation, Theta notation and Little-oh notation	Chalk and Board		1,2	1,2	T1/2
L5.	Important Problem Types: Sorting,	Chalk and Board		1,2	1	T1/1
L6.	Searching			1,2		
L7.	String processing, Graph Problems	Chalk and Board		1,2	1	T1/1
L8	Combinatorial Problems			1,2		
L9	Fundamental Data Structures: Stacks	Chalk and Board		1,2	1	T1/1
L10	Queues, Graphs, Trees, Sets and Dictionaries	Chalk and Board		1,2	1	T1/1

T/1: Text book No.1 in VTU Syllabus and chapter No.1 in that text book.

Assignment Questions:

Assignment Questions	COs attained
1. What is an algorithm? Explain the notion of algorithm.(6 marks)	1
2. Explain various asymptotic notations used in analyzing algorithm. Give the examples (10 marks) .	1
3. If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then prove the following assertion $t_1(n) + t_1(n) \in O(\max(g_1(n)), (g_1(n)))$ (5 marks)	1
4. What is wrong with the following argument? $\sum_{1 \le k \le n} kn = \sum_{1 \le k \le n} O(n) = O(n^2)$ (5marks) 5. Order the following functions according to their order of growth. $(n-2)!$, $5\lg(n+100)^{10}$, 2^{2n}, $0.001n^4 + 3n^3 + 1$, $\ln^2 n$ (6 marks)	1
6. Explain the important problem types. (6 marks)	1
7. Write the algorithm to search the pattern in a given string. Analyze the algorithm using different case complexity (6 marks)	1,2

Module-2

Module: 02	**No of Hours: 10Hours**
Title: : Divide and Conquer, Decrease and Conquer Approach	

Learning Objectives: The main objectives of this unit are to:

1.	Explain Divide and Conquer Technique
2.	Design of Merge sort Algorithm and Quick sort Algorithm
3.	Design of Binary search algorithm
4.	Explain of Strassen's matrix multiplication, Convex Hull, Closest-pair problem

5.	Explain of Decrease and Conquer Technique
6.	Develop and analyze Topological Sorting algorithm

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/
L11	**Divide and Conquer**: General method, Recurrence equation for Divide	Chalk and Board	1,2,3,5, 8,11	2	2,3,4	T2/3
L12	Finding the maximum and minimum			2	2,3,4	T2/3
L13	Binary Search	Chalk and Board		2	2,3,4	T1/3
L14	Mergesort	Chalk and Board		2	2,3,4	T1/4
L15	Mergesort, Quicksort	Chalk and Board		2	2,3,4	T1/4
L16	Quicksort	Chalk and Board		2	2,3,4	T1/4
L17	Strassen's matrix multiplication, Convex Hull	Chalk and Board		2	3,4	T2/3
L18	Closest-pair problem	Chalk and Board		2	3,4	T1/5
L19	Advantages and Disadvantages of Divide and Conquer.	Chalk and Board		2	3,4	T1/5
L20	Decrease and Conquer Approach: Topological Sort	Chalk and Board		2	3,4	T1/5

T/2: Text book No.1 in VTU Syllabus and chapter No.2 in that text book.

Assignment Questions:

Assignment Questions	COs attained
1. Explain the divide and conquer methodology. Suggest a pseudo code for merge sort and analyze its complexities. Trace algorithm to the data set 8, 4, 1, 6, 7, 2, 3, 9. (10 Marks)	1
2. State the merge sort algorithm and analyze its complexity. (8marks)	1,2
3. Using an example for merge sort, sketch the divide-and-conquer technique. State if the merge sort is a stable sorting algorithm. (6 marks)	1

4. Write a quick sort algorithm. Derive a worst-case and average-case complexities for this algorithm (8marks)	1,2
5. Apply quick sort to sort the list 'M, E, R, G, E, S, O, R, T' in alphabetical order. Find the element whose position is unchanged in the sorted list. (8marks)	1,2
6. Compare the stabilities and the time complexities of quick sort and merge sort algorithms.	1,2
7. State and Explain Binary search algorithm and analyze its time complexity. (8 marks)	1,2
8. State the convex hull problem and analyze its complexity. (6marks)	1,2
9. What is Decerease and Conquer method? Implement the two topological sorting algorithms in the language of your choice. Run an experiment to compare their running times. (8 Marks)	1,2
10. Draw the tree of recursive calls made to sort the elements {C,O,M,P,U,T,I, N,G} in alphabetical order using Quick sort method. (10 Marks)	1,2
11.State and Explain Binary search algorithm and analyze its time complexity. (6Marks)	1,2
12.Explain the divide and conquer methodology. Suggest a pseudo code for merge sort and analyze its complexities. Trace algorithm to the data set 8, 4, 1, 6, 7, 2, 3, 9. (10 Marks)	1,2

Module-3

Module : 03	**No of Hours: 10**
Title: The Greedy Method, Transform and Conquer Approach.	

Learning Objectives: The main objectives of this unit are to:

1.	Learn Greedy Techniques
2.	Design and analysis of Knapsack and Job Sequencing problem algorithm
3.	Design and analysis of minimum-cost Spanning tree
4.	Design and analysis of Prim's algorithm.
5.	Design and analysis of Kruskal's algorithm.
6.	Design and analysis the single source shortest path algorithm
7.	Learn Transform and Conquer Approach

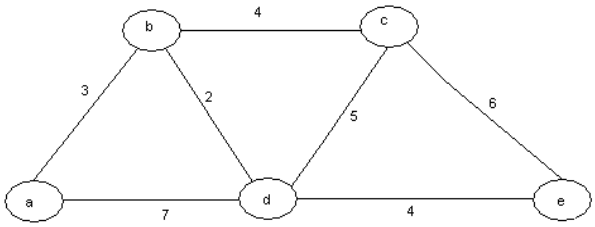
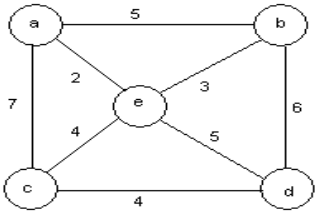
Lesson Plan:

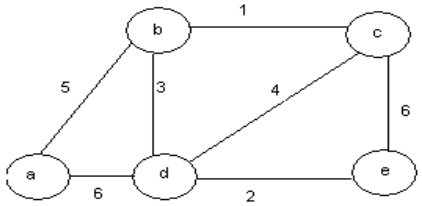
Lecture No.	Topics Covered	Teaching Method	POs attained	PsOs attained	COs attained	Reference Book/ Chapter No.
L21	The general method.	Chalk and Board	1,2,3, 5,11	2	1,3	T2/4
L22	Knapsack Problem	Chalk and Board		2	3,4	T2/4
L23	Job Sequencing with Deadlines.	Chalk and Board		2	3,4	T2/4
L24	Minimum-Cost Spanning Trees, Prim's Algorithm	Chalk and Board		2	3,4	T1/9
L25	Kruskal's Algorithm	Chalk and Board		2	3,4	T1/9
L26	Single Source Shortest Paths	Chalk and Board		2	3,4	T1/9
L27	Huffman Trees and Codes	Chalk and Board		2	3,4	T1/9
L28	Huffman Trees and Codes	Chalk and Board		2	3,4	T1/9
L29	Transform and Conquer Approach	Chalk and Board		2	3,4	T1/6
L30	Transform and Conquer Approach	Chalk and Board		2	3,4	T1/6

T2/4: Text book No.2 in VTU Syllabus and chapter No.4 in that text book.

T1/9, T1/10: Text book No.1 in VTU Syllabus and chapter No.9, chapter No.10 in that text book.

Assignment Questions:

Assignment Questions:	COs attained
1. Using greedy method trace the following graph to get the shortest path from vertex *a* to all other vertices. [5 marks] 	3,4
2. What are the requirements to be satisfied to apply greedy technique? Explain Prim's algorithm with an example. [7 marks]	3
3. Give an instance of the change making problem for which the greedy algorithm does not yield an optimal solution.	2,3
4. Apply prim's algorithm to the following graph. Include in the priority queue all the vertices not already in the tree. 	3,4
5. Prove the correctness of Kruskal's algorithm	1,2
6. Apply Kruskal's algorithm to find a minimum spanning tree of the following Graph. [6 Marks]	3,4

	
7. Explain the Knapsack problem with suitable example.	2,3
8. Explain Job Sequencing with Deadlines.	2,3
9. Explain the Huffman Trees problem.	2,3

Module-4

Module : 04	**No of Hours: 10**
Title: Dynamic Programming	

Learning Objectives: The main objectives of this unit are to:

1.	Define General method of dynamic programming
2.	Design Warshall's Algorithm
3.	Design Floyd's Algorithm
4.	Design single source shortest paths problem algorithm
5.	Define and develop algorithm for 0/1 Knapsack problem
6.	Define and develop algorithm for traveling salesman problem

Lesson Plan:

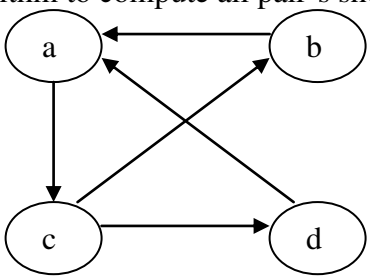
Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapte
L31	The General Method	Chalk and Board		2	2,3	T2/5
L32	Warshall's Algorithm	Chalk and Board		2	3,4	T1/8
L33	Floyd's Algorithm for the ALL-Pairs Shortest Paths Problem	Chalk and Board		2	3,4	T1/8

L34	Bellman-ford algorithm for Single-Source shortest Paths	Chalk and Board	1,2,3,5, 11	2	3,4	T2/5
L35	General Weights,0/1 Knapsack	Chalk and Board		2	3,4	T1/8
L36	General Weights,0/1 Knapsack	Chalk and Board		2	3,4	T1/8
L37	The Traveling Salesperson problem	Chalk and Board		2	3,4	T2/5
L38	The Traveling Salesperson problem	Chalk and Board		2	3,4	T2/5
L39	Optimal Binary Search Trees	Chalk and Board		2	3,4	T1/8
L40	Reliability design.	Chalk and Board		2	3,4,5	T2/5

T1/8: Text book No.1 in VTU Syllabus and chapter No.8 in that text book.
T2/5: Text book No.2 in VTU Syllabus and chapter No.5 in that text book.

Assignment Questions:

Assignment Questions	COs attained
1. Explain how dynamic programming is used to compute all pair of shortest paths for a weighted digraph. Write the Pseudo code for same and derive the time complexity	1,2,3
2. With the help of the Pseudo code, explain Warshall's algorithm to find the transitive closure of a directed graph. Apply it to the following graph. [10 marks] (a) a b c d a 0 0 0 0 b 0 0 1 1 c 0 1 0 0 d 1 0 1 0 (b) a b c d a 0 1 0 0 b 0 0 0 1 c 0 0 0 0 d 1 0 1 0	3,4

3. Explain how dynamic programming is used to compute all pair shortest paths for a weighted digraph. Write the pseudo code for same and derive the time complexity. [10 marks]	3,4
4. Apply Floyd's algorithm to compute all pair's shortest paths for the following graph. [10 marks] 	3,4
5. What does dynamic programming have in common with divide and conquer? What is a principal difference between the two techniques?	3
6. Explain the 0/1 Knapsack problem. How will find solution using dynamic programming Method?	3,4
7. Explain the Traveling Salesperson problem with example.	2,3
8. Explain the optimal binary search problem with suitable example.	2,3

Module-5

Module: 05	**No of Hours: 10**
Title: Backtracking, Branch and Bound, NP-Hard and NP-Complete problems	

Learning Objectives: The main objectives of this unit are to:

1.	Explain Cope with limitations of Algorithm Power
2.	Explain Backtracking methods.
3.	Explain N-Queens problem
4.	Explain Hamiltonian Circuit problem
5.	Explain Subset sum problem
6.	Explain Branch and Bound method.
7.	Define Polynomial, Non-Polynomial and NP-Complete Problems

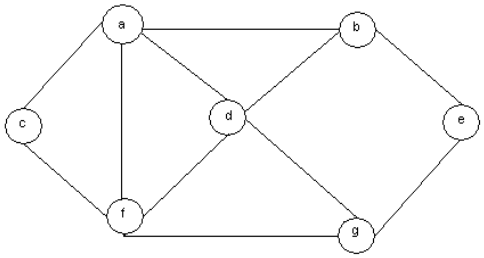
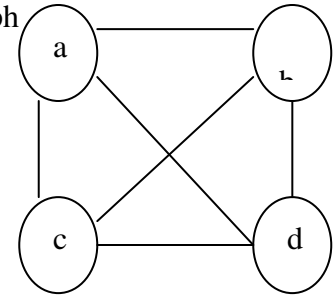
Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter
L41	Backtracking method, N-Queens problem, Subset sum problem,	Chalk and Board	1,2,3,5,8,11	2	3	T1/12
L42	Hamiltonian Circuit problem, Graph coloring	Chalk and Board		2	3,4	T2/7
L43	Branch and Bound method, Knapsack	Chalk and Board		2	3,4	T1/12 T2/8
L44	Traveling salesperson problem,	Chalk and Board		2	3,4	T1/12
L45	LC Branch and Bound solution	Chalk and Board		2	3,4	T2/8
L46	FIFO Branch and Bound solution	Chalk and Board		2	3,4,5	T2/8
L47	NP-Hard and NP-Complete problems: Basic concepts	Chalk and Board		2	4,5	T2/11
L48	NP-Hard and NP-Complete problems:	Chalk and Board		2	4,5	T2/11
L49	Non deterministic algorithms	Chalk and Board		2	4,5	T2/11
L50	NP - Hard and NP-Complete Classes	Chalk and Board		2	4,5	T2/11

T1/11: Text book No.1 in VTU Syllabus and chapter No.11 in that text book.

Assignment Questions:

Assignment Questions	COs attained
1. What is backtracking? Explain its usefulness with the help of an algorithm. What are the specific areas of its applications? [10 Marks]	3,4
2. Explain backtracking concept and apply same to n-queen's problem. [8 Marks]	3,4

3. Apply backtracking to the problem of finding a Hamiltonian circuit in the following graph.  	3,4
4. Generate all permutations of { 1,2,3,4 } by backtracking	3,4
5. Apply backtracking to solve the following instance of the subset sum problem: S = { 1,3,4,5 } and d=11.	3,4
6. Solve the following instance of the knapsack problem by the branch and bound algorithm. item weight value 1 10 $100 2 7 $63 3 8 $56 4 4 $12	3,4
7. Apply the branch and bound algorithm to solve the traveling salesman problem for the following graph  	3,4
8. Apply the nearest neighbor algorithm to the instance defined by the distance matrix below. Start the algorithm at the first city, assuming that the cities are numbered from 1 to 5 0 14 4 10 ∞	3,4

14 0 5 8 7 4 5 0 9 16 ∞ 7 16 32 0	
9. Write a note on P, NP and NP-complete problems [6 marks]	3,4,5

5) Portion for I. A. Tests:

Test	Units	COs Attained
I	Module 1, Module 2	1, 2
II	Module 3, Module 4 (4 hours)	3, 4, 5
III	Module 4(4 hours), Module 5	3,4, 5

Course Coordinator Module Coordinator

MICROPROCESSORS AND MICROCONTROLLERS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2017 -2018)
SEMESTER – IV

Subject Title:	MICROPROCESSORS AND MICROCONTROLLERS	Subject Code:	17CS44
Number of Lecture Hours/Week	04	IA Marks	40
Total Number of Lecture Hours	50	Exam Marks	60
Credits	04	Exam Hours	03

MODULE – 1 **10 Hours**

The x86 microprocessor: Brief history of the x86 family, Inside the 8088/86, Introduction to assembly programming, Introduction to Program Segments, The Stack, Flag register, x86 Addressing Modes. **Assembly language programming**: Directives & a Sample Program, Assemble, Link & Run a program, More Sample programs, Control Transfer Instructions, Data Types and Data Definition, Full Segment Definition, Flowcharts and Pseudo code.
Text book 1: Ch 1: 1.1 to 1.7, Ch 2: 2.1 to 2.7

MODULE - 2 **10 Hours**

x86: Instructions sets description, **Arithmetic and logic instructions and programs**: Unsigned Addition and Subtraction, Unsigned Multiplication and Division, Logic Instructions, BCD and ASCII conversion, Rotate Instructions. INT 21H and INT 10H Programming : Bios INT 10H Programming , DOS Interrupt 21H. 8088/86 Interrupts, x86 PC and Interrupt Assignment.
Text book 1: Ch 3: 3.1 to 3.5, Ch 4: 4.1 , 4.2 Chapter 14: 14.1 and 14.2

MODULE - 3 **10 Hours**

Signed Numbers and Strings: Signed number Arithmetic Operations, String operations. **Memory and Memory interfacing**: Memory address decoding, data integrity in RAM and ROM, 16-bit memory interfacing. **8255 I/O programming**: I/O addresses MAP of x86 PC's, programming and interfacing the 8255.
Text book 1: Ch 6: 6.1, 6.2. Ch 10: 10.2, 10.4, 10.5. Ch 11: 11.1 to 11.4.

MODULE - 4 **10 Hours**

Microprocessors versus Microcontrollers, ARM Embedded Systems :The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software**, ARM Processor Fundamentals** : Registers , Current Program Status Register , Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions .
Text book 2:Ch 1:1.1 to 1.4, Ch 2:2.1 to 2.5

MODULE – 5 **10 Hours**

Introduction to the ARM Instruction Set : Data Processing Instructions , Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants, Simple programming exercises.
Text book 2: Ch 3:3.1 to 3.6 (Excluding 3.5.2).

Text Books:

1.Muhammad Ali Mazidi, Janice Gillispie Mazidi, Danny Causey, The x86 PC Assembly Language Design and Interfacing, 5th Edition, Pearson, 2013.

2. ARM system developers guide, Andrew N Sloss, Dominic Symes and Chris Wright, Elsevier,Morgan Kaufman publishers, 2008.

Reference Books:

1. Douglas V. Hall: Microprocessors and Interfacing, Revised 2nd Edition, TMH, 2006.
2. K. Udaya Kumar & B.S. Umashankar : Advanced Microprocessors & IBM-PC Assembly Language Programming, TMH 2003.
3. Ayala : The 8086 Microprocessor: programming and interfacing - 1st edition, Cengage Learning
4. The Definitive Guide to the ARM Cortex-M3, by Joseph Yiu, 2nd Edition , Newnes, 2009
5. The Insider's Guide to the ARM7 based microcontrollers, Hitex Ltd.,1st edition, 2005
6. ARM System-on-Chip Architecture, Steve Furber, Second Edition, Pearson, 2015 7. Architecture, Programming and Interfacing of Low power Processors- ARM
7, Cortex-M and MSP430, Lyla B Das Cengage Learning, 1st Edition

MICROPROCESSORS AND MICROCONTROLLERS COURSE PLAN

1) Prerequisites:

1. The students should have good background on digital Logic Design circuits Basic knowledge of Digital logic circuits.

2. Fundamentals of elementary formal logic.

2) Course overview and its relevance to this programme:

This course will enable students to • Make familiar with importance and applications of microprocessors and microcontrollers • Expose architecture of 8086 microprocessor and ARM processor • Familiarize instruction set of ARM processor.

Applications:

Knowledge of microprocessors and microcontrollers is needed to understand the design, infrastructure of microprocessor and microcontrollers.

Microprocessor based systems are used in instructions, automatic testing product, speed control of motors, traffic light control , light control of furnaces etc.

Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

Course Outcomes:
After studying this course, students will be able to

CO1: Differentiate between microprocessors and microcontrollers
CO2: Design and develop assembly language code to solve problems
CO3: Gain the knowledge for interfacing various devices to x86 family and ARM processor
CO4: Demonstrate design of interrupt routines for interfacing devices

MODULE WISE PLAN

Module Number:1	**No. of Hours: 10**

Learning Objectives: The main objectives of this module are to

1.	Introduction to Microprocessor • Evolution of Microprocessor
2.	Assembly language programming
3.	Segmentation and registersin x86.
4.	Assembler directives and addressing modes
5.	Simple programming.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	Cos attained	Text or Reference Book/Chapter No.
L1.	Brief history of the x86 family, Inside the 8088/86	PPT Chalk and Board	1,2,3,12	1,2,3	1,2	T1/1
L2.	Introduction to assembly programming	PPT, Chalk and Board			1,2	T1/1,2
L3.	Introduction to	PPT,			1,2	T1/2

	Program Segments, The Stack, Flag register	Chalk and Board				
L4.	x86 Addressing Modes Assembly language programming: Directives	PPT, Chalk and Board			1,2	T1/2
L5.	Sample Program	PPT, Chalk and Board			1,2,3	T1/2
L6.	Assembly language programming: Directives & a Sample Program Assembly Language	PPT, Chalk and Board			1,2,3	T1/2
L7.	More Sample programs	PPT, Chalk and Board			1,2	T1/2
L8.	Control Transfer Instructions, Data Types and Data Definition	PPT, Chalk and Board			1,2	T1/2
L9.	Full Segment Definition, Flowcharts	PPT, Chalk and Board			2	T1/2
L10.	Pseudo code.	PPT, Chalk and Board			2,3	T1/2

Assignment Questions:

Questions	COs Attained
1. Briefly describe the history of x86 microprocessors.	1,2
2. With neat block explain the register organization of x86 microprocessor	1,2
3. Explain different addressing modes of x86 microprocessor .	1,2
4. Explain different assembler directives of x86 microprocessor.	1,2

5. What is addressing mode?Explain different addressing modes with example for each.	1,2

MODULE-2

Module Number: 2	**No. of Hours: 10**

Learning Objectives: The main objectives of this module are to

1.	Data Movement Instructions.
2.	Load-Effective Address.
3.	String Data Transfers.
4.	Arithmetic and Logic Instructions
5.	Multiplication and Division
6.	BCD and ASCII conversion, Rotate Instructions
7.	Programming : Bios INT 10H Programming ,DOS Interrupt 21H
8.	Interrupts

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs Attained	PSOs Attained	Cos Attained	Text or Reference Book/Chapter No.
L11.	Instructions sets description	PPT, Chalk and Board	1,2,3,12	1,2,3	1,2	T1/3

	Arithmetic and logic instructions and programs: Unsigned Addition and Subtraction,					
L12.	Instructions sets description Arithmetic and logic instructions and programs: Unsigned Addition and Subtraction,	PPT, Chalk and Board			1,2	T1/3
L13.	Unsigned Multiplication and Division, Logic Instructions, BCD and ASCII conversion	PPT, Chalk and Board			1,2	T1/3
L14.	Unsigned Multiplication and Division, Logic Instructions, BCD and ASCII conversion	PPT, Chalk and Board			1,2	T1/3
L15.	Rotate Instructions. INT 21H,	PPT, Chalk and Board			1,2	T1/3 T1/4
L16.	INT 10H,	PPT, Chalk and Board			1,2	T1/4
L17.	Programming : Bios INT	PPT, Chalk and			1,2	T1/4

	10H Programming	Board				
L18.	DOS Interrupt 21H.	PPT, Chalk and Board			1,2	T1/4
L19.	8088/86 Interrupts,	PPT, Chalk and Board			2	T1/14
L20.	USB Bus x86 PC and Interrupt Assignment	PPT, Chalk and Board			2,4	T1/14

Assignment Questions:

Questions	COs Attained
1. Write a note on Data Movement Instructions:	1,2
2. With examples, explain the PUSH/POP, Load-Effective Address	1,2
3. Explain String Data Transfers, Miscellaneous Data Transfer Instructions.	1,2
4. Explain Segment Override Prefix	1,2
5. Explain Arithmetic and Logic Instructions: Addition, Subtraction and Comparison	1,2
6. Explain Program Control Instructions	1,2
7. Describe Hardware Interrupts: INTR and INTA	1,2
8. Explain Interrupts- INT10H, INT-21H	1,2

MODULE-3

Module Number: 3	**No. of Hours: 10**

Learning Objectives: The main objectives of this MODULE are to

1.	Describe Basic Logic Instructions, Shift and Rotate, String Comparisons.
2.	Memory address decoding
3.	Data integrity in RAM and ROM
4.	Memory Interfacing: Memory Device
5.	Describe Programmable Peripheral Interface 82C55
6.	Initialise 8255 for simple,handshake input output.
7.	Programming and interfacing the 8255

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs Attained	PSOs Attained	Cos Attained	Text or Reference Book/Chapter No.
L21.	Signed number Arithmetic Operations	PPT, Chalk and Board	1,2,3,12	1,2,3	2,3,4	T1/6
L22.	String operations. Memory and Memory interfacing: Memory address decoding,	PPT, Chalk and Board			2,3,4	T1/6 T1/10
L23.	data integrity in RAM and ROM	PPT, Chalk and Board			2,3,4	T1/10
L24.	16-bit memory interfacing	PPT, Chalk and Board			2,3,4	T1/10
L25.	16-bit memory interfacing	PPT, Chalk and Board			2,3,4	T1/10
L26.	**8255 I/O programming**: I/O addresses MAP of x86 PC's	PPT, Chalk and Board			2,3,4	T1/11
L27.	8255 I/O programming:	PPT, Chalk and			2,3,4	T1/11

	I/O addresses MAP of x86 PC's	Board				
L28.	programming and interfacing the 8255	PPT, Chalk and Board			2,3,4	T1/11
L29.	programming and interfacing the 8255	PPT, Chalk and Board			2,3,4	T1/11
L30.	programming and interfacing the 8255	PPT, Chalk and Board			2,3,4	T1/11

Assignment Questions:

Questions	COs Attained
1. Explain String Data Transfers, Miscellaneous Data Transfer Instructions..	2,3
2. Explain, I/O Port Address Decoding	2,3
3. Briefly explain Basic I/O Interface	2,3,4
4. Discuss modes of operation of 8255 programmable peripheral interfaces	2,4
5. Explain Programmable Peripheral Interface 82C55	2,4
6. Explain 16-bit memory interfacing	2,3,4
7. Explain programming 8255 for interfacing with 8086	2,3,4

MODULE-4

Module Number:4	**No. of Hours: 10**

Learning Objectives: The main objectives of this Module are to

1.	Discussion on how the RISC (reduced instruction set computer) design philosophy was adapted by ARM to create a flexible embedded processor
2.	An example embedded device.
3.	Hardware and software technologies that surround an ARM processor.
4.	An overview of the processor core and describe how data moves between its different parts.

5.	They are implemented along with basic logic functions.
6.	Pipeline, Exceptions,Interrupts

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs Attained	PSOs Attained	Cos Attained	Text or Reference Book/Chapter No.
L31.	Microprocessors versus Microcontrollers	PPT, Chalk and Board	1,2,3,12	1,2,3	1,2	T2/1
L32.	ARM Embedded Systems :The RISC design philosophy,	PPT, Chalk and Board			2,3	T2/1
L33.	The ARM Design Philosophy,	PPT, Chalk and Board			2,3	T2/1
L34.	Embedded System Hardware	PPT, Chalk and Board			3	T2/1
L35.	Embedded System Software	PPT, Chalk and Board			2,3	T2/1
L36.	ARM Processor Fundamentals : Registers , Current Program Status Register	PPT, Chalk and Board			3,4	T2/2
L37.	Pipeline, Exceptions	PPT, Chalk and Board			2,3	T2/2
L38.	Interrupts, and the Vector Table	PPT, Chalk and Board			3,4	T2/2
L39.	Interrupts, and the Vector Table	PPT, Chalk and Board			2,4	T2/2
L40.	Core Extensions.	PPT, Chalk and Board			2,4	T2/2

Assignment Questions:

Questions	COs Attained
1. Explain the ARM instruction set suitable for embedded applications.	2
2. With neat block explain ARM-based embedded device, a microcontroller	2,3
3. *Write a note on memory in ARM Embedded Systems*	2
4. Four typical software components required to control an embedded device.	2,3
5. Explain ARM core dataflow model.	2
6. With neat block explain, Complete ARM register set.	4
7. Write a note on pipelining	2
8. With neat block explain Cache and Tightly Coupled Memory.	2,3,4

MODULE-5

Module Number:5	No. of Hours: 10

Learning Objectives: The main objectives of this module are to

1.	A typical computing task consists of a series of steps specified by a sequence of machine instructions that constitute a program.
2.	In this chapter we focus on the processing unit, which executes machine instructions and coordinates the activities of other units.
3.	Pipelining as a means for improvingperformance by overlapping the execution ofmachine instructions
4.	Embedded applications
5.	Microcontrollers for embedded systems

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs Attained	PSOs Attained	Cos Attained	Text or Reference Book/Chapter No.
L41.	Introduction to the ARM Instruction Set : Data Processing Instructions	PPT, Chalk and Board	1,2,3,12	1,2,3	2,3,4	T2/3
L42.	Instruction Set : Data Processing Instructions Branch Instructions,	PPT, Chalk and Board			2,3,4	T2/3
L43.	Software Interrupt Instructions	PPT, Chalk and Board			2,3,4	T2/3
L44.	Program Status Register Instructions coprocessor Instructions	PPT, Chalk and Board			2,3,4	T2/3
L45.	coprocessor Instructions	PPT, Chalk and Board			2,3,4	T2/3
L46.	Loading Constants	PPT, Chalk and Board			2,3,4	T2/3
L47.	Simple	PPT, Chalk and			2,3,4	T2/3

	programming exercises	Board				
L48.	Simple programming exercises	PPT, Chalk and Board			2,3,4	T2/3
L49.	Simple programming exercises	PPT, Chalk and Board			2,3,4	T2/3
L50.	Simple programming exercises	PPT, Chalk and Board			2,3,4	T2/3

Assignment Questions:

Questions	COs Attained
1. Explain diffetent Data Processing Instructions.	2,3,4
2. With example for each explain, Arithmetic Instructions.	2,3,4
3. With example for each explain ,Comparison Instructions.	2,3,4
4. With example for each explain, Branch Instructions.	2,3,4
5. Explain Multiple-Register Transfer	2,3,4
6. With example for each explain ,Software Interrupt Instruction	2,3,4
7. Explain Loading Constants.	2,3,4

COMPUTER ORGANIZATION IA PORTION

I. A. Test No.	Modules
I	1,2
II	3
III	4,5

SOFTWARE ENGINEERING

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2017 -2018)
SEMESTER - IV

Subject Code	**17CS45**	**IA Marks**	**40**
Number of Lecture Hours/Week	**04**	**Exam Marks**	**60**
Total Number of Lecture Hours	**50**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course will enable students to

- Understand software engineering principles in building large programs
- Analyse ethical and professional issues and to explain why they are of concern to software engineers
- Understand the process of requirements gathering and their validation
- Study the System models and design patterns
- Discuss the distinctions between validation testing and defect testing
- Understand software quality parameters

Module -1	**Teaching Hours**	**RBT Levels**
Introduction: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. Software Processes: Models: Waterfall Model (Sec 2.1.1), Incremental Model (Sec 2.1.2) and Spiral Model (Sec 2.1.3). Process activities. Requirements Engineering: Requirements Engineering Processes (Chap 4). Requirements Elicitation and Analysis (Sec 4.5). Functional and non-functional requirements (Sec 4.1). The software Requirements Document (Sec 4.2). Requirements Specification (Sec 4.3). Requirements validation (Sec 4.6). Requirements Management (Sec 4.7).	**12Hours**	**L1, L2,L3**
Module -2		
System Models: Context models (Sec 5.1). Interaction models (Sec 5.2). Structural models (Sec 5.3). Behavioral models (Sec 5.4). Model-driven engineering (Sec 5.5). Design and Implementation: Introduction to RUP (Sec 2.4), Design Principles (Chap 17). Object-oriented design using the UML (Sec 7.1). Design patterns (Sec 7.2). Implementation issues (Sec 7.3). Open source development (Sec 7.4).	**11 Hours**	**L2, L3, L4**
Module - 3		
Software Testing: Development testing (Sec 8.1), Test-driven development (Sec 8.2), Release testing (Sec 8.3), User testing (Sec 8.4). Test Automation (Page no 42, 70,212, 231,444,695). Software Evolution: Evolution processes (Sec 9.1). Program evolution dynamics (Sec 9.2). Software maintenance (Sec 9.3). Legacy system management (Sec 9.4	**9 Hours**	**L2, L3, L4, L5**
Module-4		
Project Planning: Software pricing (Sec 23.1). Plan-driven development (Sec 23.2). Project scheduling (Sec 23.3): Estimation techniques (Sec 23.5). Quality management: Software quality (Sec 24.1). Reviews and inspections (Sec 24.3). Software measurement and metrics (Sec 24.4). Software standards (Sec 24.2)	**10 Hours**	**L2, L3, L5**

Module-5		
Agile Software Development: Coping with Change (Sec 2.3), The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref "The SCRUM Primer, Ver 2.0") and Extreme Programming (Sec 3.3). Plan-driven and agile development (Sec 3.2). Agile project management (Sec 3.4), Scaling agile methods (Sec 3.5):	**8 Hours**	**L3, L4, L5**

Course outcomes:

After studying this course, the students will be able to

- Design a software system, component, or process to meet desired needs within realistic constraints.
- Assess professional and ethical responsibility
- Function on multi-disciplinary teams
- Make use of techniques, skills, and modern engineering tools necessary for engineering practice
- Comprehend software systems or parts of software systems.

Graduate Attributes (as per NBA)

1. Project Management and Finance
2. Conduct Investigations of Complex Problems
3. Modern Tool Usage
4. Ethics

Question paper pattern:

The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. (Listed topics only from Chapters 1,2,3,4, 5, 7, 8, 9, 23, and 24)
2. The SCRUM Primer, Ver 2.0, http://www.goodagile.com/scrumprimer/scrumprimer20.pdf

Reference Books:

1. Roger.S.Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill
2. **PankajJalote**: An Integrated Approach to Software Engineering, Wiley India

Web Reference for eBooks on Agile:

1. http://agilemanifesto.org/
2. http://www.jamesshore.com/Agile-Book/

SOFTWARE ENGINEERING

[As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2017 -2018)
SEMESTER – IV

MODULE 1

MODULE WISE PLAN

Module 01	**No. of Hours:12**
Unit Title: Introduction	

Learning Objectives: At the end of this chapter students will:

1) Express importance of Software Engineering.
2) Produce answers to key questions that provide an introduction to software engineering
3) Incorporate ethical and professional issues that are important for software engineers.
4) Analyze the socio-technical system.
5) Evaluate concept of emergent system properties and activities involved in system engineering

Lecture No	**Topics covered**	**Teaching Method**	**Pos Attained**	**PSOs attained**	**Cos attained**	**Reference Book/Chapter No**
L1	Introduction: FAQ's about software engineering, Professional and ethical responsibility.	Chalk and Board	c,g,b,d,h,j, f,k,e a,b,d,e, l,f,g,k	a,b,c a,b,c	1	T1
L2	Software Crisis, Need for Software Engineering..	Chalk and Board			2	T1
L3	Models: Waterfall Model	Chalk and Board			2,3	T1
L4	Incremental Model	Chalk and Board			6	T1
L5	Spiral Model Process activities	Chalk and Board			3	T1
L7	Requirements Engineering Processes	Chalk & Board			1,2	T1
L8	Requirements Elicitation and analysis	Chalk & Board			3	T1
L9	Functional and non-functional	Chalk & Board			3	T1
L10	The software Requirements Document	Chalk & Board			1,2,3	T1
L11	Requirements Specification	Chalk & Board			3	T1
L12	Requirements validation	Chalk & Board			1	T1

Assignment questions	Cos attained
Q1: What is software? What are the attributes of good software?	1
Q2: Explain the term Software Engineering. What are the Key challenges that a software Engineering is facing?	1
Q3: Describe the professional responsibilities of the Software engineer.	5
Q4: Software is a product. Justify this statement	1
Q5: Explain the activities involved in the system design process.	2
Q6: What are the most important dimensions of system dependability?	1,3
Q7: Give reasons why dependability is important in critical systems	1,3
Q8: What are the differences between System Engineering Process and the Software?	3
Q.9: What is System design? Explain its activities with a neat diagram.	1,3
Q.10: What is a Software Process? What are the fundamental process activities?	1,3
Q.11: What are Critical systems? What are the three main types of Critical Systems?	3
Q.12:.Explain Boehm's spiral model of the software process with a neat diagram.	1,3
Q.13: Explain Component- Based Software Engineering with a neat diagram**.**	3
Q.13: What are approaches to improve Reliability of a system?	3

MODULE 2

MODULE WISE PLAN

Module 02	**No. of Hours:11**
Unit Title: System Models	

Learning Objectives: At the end of this chapter students will:

1..Define the concept of user, system requirements
2.Organize requirements in a software requirements document
3.Express the principal requirements of engineering activities and their relationships.
4.Apply several techniques of requirements elicitation and analysis
5.Analyze the importance of requirements validation and how requirements reviews are used in this process
6.Analyze the requirement management and its support for other requirements engineering activities.
7.Incorporate interactive, incremental software development approach that leads to faster delivery of more useful software
8.Define the difference between agile and software development methods that rely on documented specifications and designs.
9.Define the principles, practices and limitations of extreme programming
10. Express different types of software maintenance and factors that affect maintenance cost.

Lecture NO	Topics Covered	Teaching Method	Pos attained	PSOs attained	Cos attained	Reference Book/Chapter No
L13	Context models Interaction models	Chalk & Board	b,d,j,l	a,b,c a,b,c	1,3,5	T1
L14	Structural models Behavioral models	Chalk & Board			1,3,5	T1
L15	Model-driven engineering	Chalk & Board			4	T1

L16	Design and Implementation:	Chalk & Board	b,c,d,g		4	T1
L17	Introduction to RUP	Chalk & Board			3	T1
L18	Design Principles	Chalk & Board			1,3	T1
L19	Object-oriented design using the UML	Chalk & Board			3	T1
L20	Design patterns	Chalk & Board			1,3	T1
L21	Implementation issues	Chalk & Board			3	T1
L22	Open source development	Chalk & Board			4	T1
L23	Requirements management.	Chalk & Board			1,3	T1

Assignment Questions:	**Cos attained**
Q.1.Explain types of system models	1,3
Q.2.Explain the data-flow diagram of an insulin pump	3
Q.3.Based on your experience with a bank ATM, draw a data flow diagram modeling the data processing involved when a customer withdraw cash from a machine	3
Q.4.Draw and explain the state machine model of a simple microwave oven	3
Q.5. what are the possible software risks? Explain briefly the risk management process	2
Q.6.Explain briefly the risk factors	2
Q.7 List the various steps that need to be followed for OOD process	**1**
Q.8 Explain with figure the dataflow model of an invoice processing system	**3**
Q.10 Illustrate with two examples of objects and objects classes	**1,3**
Q.11Discuss in detail event based control model with examples	**1,3**
Q.12what are the advantage and disadvantage of object oriented system	**1**
Q.13Draw and explain sequential diagram for typical weather system	**3**
Q.14what are the advantage and disadvantages of client server model	**1**
Q.15 Explain in detail of centralized control model.	**1,3**

MODULE 3

MODULE WISE PLAN

Module 03	**No. of Hours:9**
Unit Title: Software Testing	

Learning Objectives: At the end of this chapter students will:

1.	Analyze the importance of establishing the boundaries of a system model, and its context.
2.	Express the concept of behavioral modeling, data modeling and object modeling.
3.	Apply some of the notations defined in the UML and these notations may be used to develop system models.
4.	Define the principal tasks of the software project managers
5.	Analyze the need for project planning in all software projects
6.	Construct graphical representations to represent project schedule.

7. Define notation of risk management and some of the risks that can arise in software projects
8. Analyze Importance of architectural design of software
9. Express the decisions that have to be made about the system architecture during the architectural design process.
10. Define the reference architecture that are used to communicate architectural concepts and to asses system architecture.
11. Evaluate software design that may be represented as a set of interacting objects.
12. Construct the representation of these models in the UML

Lecture No	**Topics Covered**	**Teaching Method**	**Pos attained**	**PSOs attained**	**Cos attained**	**Reference Book/Chapter No**
L24	Software Testing: Development testing	Chalk & Board	b,c,d,g,l 2,3,4,7,12	a,b,c	1,2,3	T1
L25	Test-driven development	Chalk & Board			1,2,3	T1
L26	Release testing	Chalk & Board			2,3	T1
L27	User testing	Chalk & Board			2,3	T1
L28	Test Automation	Chalk & Board			1,2,3,5	T1
L29	Software Evolution: Evolution processes	Chalk & Board			1,2,3,5	T1
L30	Program evolution dynamics	Chalk & Board			3	T1
L31	Software maintenance	Chalk & Board		a,b,c	1,2,3,5	T1
L32	Legacy system management	Chalk & Board			1,2,3	T1

Assignment Questions:	**Cos attained**
Q.1. Explain integration testing	2
Q.2. Explain the structure of software test plain.	3,5
Q.3.What are the types of errors discovered through program inspection.	1
Q.4.Write a note on clean room software development process	1
Q.5 Explain the two distinct goals of a software testing	1,2
Q.6 Write a note on release testing	2
Q.7. Differentiate between release testing and integration testing	2
Q.1.Describe with a block diagram's people-CMM (Capability Maturity Model)	5
Q.2.Explain the cost estimation techniques	3,5
Q.3.Explain briefly the factors affecting software pricing	3
Q.4.What are the environmental factors identified in design study	3,5
Q.5.Discuss the factors in people management	5

MODULE 4

MODULE WISE PLAN

Module 04	**No. of Hours:10**
Unit Title: Project Planning:	

Learning Objectives: At the end of this chapter students will:

1. Define the differences between software verification and software validation
2. Express program inspections as a method of discovering defects in programs
3. Define automated static analysis and, clean room development process
4. Define differences between validation testing and defect testing
5.Define the principles of system testing and component testing
6. Analyze the essential characteristic of software tools that support test automation
7.Express different types of software maintenance and factors that affect maintenance cost

Lecture No	Topics Covered	Teaching Method	Pos attained	PSOs attained	Cos attained	Reference Book/Chapter
L33	Software pricing	Chalk & Board	b,d,l	a,b,c	4	T1
L34	Plan-driven development	Chalk & Board			4	T1
L35	Project scheduling	Chalk & Board			4	T1
L36	Estimation techniques	Chalk & Board			4	T1
L37	Quality management: Software quality	Chalk & Board			4	T1
L38	Reviews and inspections	Chalk & Board			4	T1
L39	Software measurement and metrics	Chalk & Board			4	T1
L40	Software standards	Chalk & Board			4	T1
L41	Project Planning:	Chalk & Board			4	T1
L42	Evolution process	Chalk & Board			4,5	T1

Assignment Questions:	**Cos attained**
Q.1. Explain integration testing	4
Q.2. Explain the structure of software test plan.	4
Q.3.What are the types of errors discovered through program inspection.	4
Q.4.Write a note on clean room software development process	4
Q.5 Explain the two distinct goals of a software testing	4
Q.6 Write a note on release testing	4

Q.7. Differentiate between release testing and integration testing	4
Q8.Express different types of software maintenance and factors that affect maintenance cost.	4

MODULE 5

MODULE WISE PLAN

Module 05	**No. of Hours:8**
Unit Title: Agile Software Development	

Learning Objectives: At the end of this chapter students will:

1.Evaluate the issues involved in selecting and retaining staff in a software development organization
2.Define the factors that influence individual motivation and their implications for software project
3.Express key issues of team working, including team composition, team cohesiveness, team communications and team organization
4. Define the fundamentals of software cost estimations.
5. Define three metrics that are used for software productivity assessment
6.Define the principals of the COCOMO II model for algorithmic cost estimation

Lesson Plan:

Lecture No	Topics Covered	Teaching method	Pos attained	PSOs attained	Cos attained	Reference Book/Chapter
L43	Agile Software Development	Chalk & Board	f,h,i,j,k	a,b,c	5,6	T2
L44	Coping with Change	Chalk & Board			5,6	T2
L45	The Agile Manifesto: Values and Principles.	Chalk & Board			5,6	T1/T2
L46	Agile methods: SCRUM (Ref "The SCRUM Primer, Ver 2.0")	Chalk & Board			3,5,6	T1
L47	Plan-driven and agile development	Chalk & Board			3,5,6	T1
L48	Agile project management	Chalk & Board			3,5,6	T1
L49	Scaling agile methods	Chalk & Board			5,6	T1
L50	Reviews of Agile software Development	Chalk & Board			3,5,6	T1

Assignment Questions:	**Cos attained**
Q.1.Give a brief description of five principles of agile methods	2,3
Q.2.What are the characteristics of the rapid software development	2,3,5
Q.3.Briefly describes the three types of software maintenance.	4
Q.4.Explain the activities involved in re-engineering process	3
Q.5.Explain the re-engineering process	3
Q.6.Explain the spiral model of development and evolution	4
Q.7 what are enduring and volatile requirements also give the classification of volatile requirement with brief explanation	3
Q.8 what are the problems in using natural languages for specifying system requirements?	3
Q.9 why elicitation and analysis is a difficult process? Explain giving reasons	3
Q.10 Explain different types of non functional requirements? Give example of each	2,3
Q11 Explain the structure of software requirements	3
Q.12 What are the requirement validation techniques which can be used in conjunction Individually?	4
Q13 Write a structure of requirement documents suggested by IEEE standards	3

3. SOFTWARE ENGINEERING IA PORTION

Tests	**Units/Modules**	**Cos attained**
I. A -I	Module 1,Module 2	1,2,3,5
I.A-II	Module 3, Module 4	1,2,3,4,5
I.A -III	Module 2,Module 5	2,3,5

DATA COMMUNICATION
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2017 -2018)
SEMESTER – IV

Subject Code	17CS46	IA Marks	40
Number of Lecture Hours/Week	04	Exam Marks	60
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Contents	**Teaching Hours**
Module 1	
Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration, **Networks Models**: Protocol Layering, TCP/IP Protocol suite, The OSI model, **Introduction to Physical Layer-1:** Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance, **Digital Transmission**: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding).	**10 Hours**
Module 2	
Physical Layer-2: Analog to digital conversion (only PCM), Transmission Modes, **Analog Transmission**: Digital to analog conversion, **Bandwidth Utilization**: Multiplexing and Spread Spectrum, **Switching**: Introduction, Circuit Switched Networks and Packet switching.	**10 Hours**
Module 3	
Error Detection and Correction: Introduction, Block coding, Cyclic codes, Checksum, Forward error correction, **Data link control**: DLC services, Data link layer protocols, HDLC, and Point to Point protocol (Framing, Transition phases only).	**10 Hours**
Module 4	
Media Access control: Random Access, Controlled Access and Channelization, **Wired LANs Ethernet**: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, **Wireless LANs:** Introduction, IEEE 802.11 Project and Bluetooth.	**10 Hours**
Module 5	
Other wireless Networks: WIMAX, Cellular Telephony, Satellite networks, **Network layer Protocols** : Internet Protocol, ICMPv4,Mobile IP, **Next generation IP**: IPv6 addressing, The IPv6 Protocol, The ICMPv6 Protocol and Transition from IPv4 to IPv6.	**10 Hours**

Course Outcomes: After studying this course, students will be able to

- Illustrate basic computer network technology.
- Identify the different types of network topologies and protocols.
- List and explain the layers of the OSI model and TCP/IP model.
- Comprehend the different types of network devices and their functions within a network
- Demonstrate subnetting and routing mechanisms.

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Book:

Behrouz A. Forouzan, Data Communications and Networking 5E, 5th Edition, Tata McGraw-Hill, 2013. (Chapters 1.1 to 1.5, 2.1 to 2.3, 3.1, 3.3 to 3.6, 4.1 to 4.3, 5.1, 6.1, 6.2, 8.1 to 8.3, 10.1 to 10.5, 11.1 to 11.4, 12.1 to 12.3, 13.1 to 13.5, 15.1 to 15.3, 16.1 to 16.3, 19.1 to 19.3, 22.1 to 22.4)

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007

• Demonstrate the skills of subnetting and routing mechanisms.
Graduate Attributes
1. Engineering Knowledge 2. Design Development of solution(Partly) 3. Modern Tool Usage 4. Problem Analysis
Question paper pattern:
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.
Text Book:
Behrouz A. Forouzan, Data Communications and Networking 5E, 5th Edition, Tata McGraw-Hill, 2013. (Chapters 1.1 to 1.5, 2.1 to 2.3, 3.1, 3.3 to 3.6, 4.1 to 4.3, 5.1, 6.1, 6.2, 8.1 to 8.3, 10.1 to 10.5, 11.1 to 11.4, 12.1 to 12.3, 13.1 to 13.5, 15.1 to 15.3, 16.1 to 16.3, 19.1 to 19.3, 22.1 to 22.4)
Reference Books:
1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004. 2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007. 3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007. 4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007

DATA COMMUNICATION

1. Prerequisites:

1. Basic understanding of concepts of Data and communications.
2. Basic knowledge of Computer Networks like LAN, WAN, MAN is an advantage.
3. Basic knowledge of analog and digital signals

2. Course Overview and its relevance to this programme:

Data communication and networking is fastest growing technologies today. This course covers the basics of Data Communications and networking: Protocols, Standards, reference Models. The focus is mainly on Physical and Data Link layers Concepts, with brief touch to network layer concepts. The course highlights various Analog & Digital Modulation techniques. It also covers the concept of Multiplexing and Spread spectrum for multiple signal transmission. It discusses several bandwidth utilization techniques, switching and different error coding techniques.

The data link layer discussion is split into two parts: Data Link Control (which deals with framing and flow control protocols) and multiple access control (which deals with medium access control techniques). The discussions are made about standard DLC protocols (HDLC,PPP) and different Medium access control protocols. The course provides an insight into Wired and Wireless LANs, WIMAX, Cellular telephony, and satellite networks.

Course outcomes

1. Illustrate basic computer network technology.
2. Identify the different types of network topologies and protocols.
3. Enumerate the layers of the OSI model and TCP/IP functions of each layer.
4. Make out the different types of network devices and their functions within a network
5. Demonstrate the skills of sub netting and routing mechanisms.
6. Explain the different wireless technologies like WIMAX, Cellular telephony and Satellite networks

3. Applications:

- Designing the networks for organization, universities, public and private communications
  And other requirements
- For developing network related programs using net simulators or on real time platforms.
- Design networks for all types of communications in electronic media.

Module -1

Module - 1	**No. of Hours: 10**
Title: Introduction: Networks Models, Introduction to Physical Layer-1, Digital Transmission	

Learning Objectives: The main objectives of this Module are to:

1.	Define the basic concepts of Networking with real Examples.
2.	Express the broad definition of Data Communication & Different types Network Topologies like Mesh, Star, Bus, Ring, and Hybrid Topologies
3.	Define Internet, Protocol & Key elements of protocol and Different standards for Data communication
4.	Study different layers in the OSI model and TCP/IP model
5.	Define concepts of Analog & Digital Data and Analog & Digital Signals
6.	Define different types of Transmission Impairments i.e. Attenuation, Distortion and Noise.
7.	Compute theoretical Data rate using- Nyquist Bit rate & Shannon Channel Capacity
8.	Discuss performance factors i) Latency ii) Bandwidth iii) Throughput
9.	Explain Line Coding characteristics and different Line Coding techniques.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Text Book/ Chapter No.
L1.	**Introduction:**Data Communications	Chalk & Board	1, 2, 3, 12	1	1	T/1
L2.	Networks, Network Types	Chalk & Board		1,2	1,2	T/1
L3.	Internet History, Standards and Administration	Chalk & Board		1,2,3	1	T/1
L4.	**Networks Models :** Protocol Layering,	Chalk & Board		1,2	1,2	T/2
L5.	TCP / IP Protocol Suite.	Chalk & Board		1,2	3	T/2
L6	The OSI model,	Chalk & Board		1	3	T/2
L7	**Introduction to Physical Layer-1:** Data and Signals.	Chalk & Board		1	3	T/3
L8	Digital Signals, Transmission Impairments	Chalk & Board		1	4	T/3

L9	Data Rate limits, Performance.	Chalk & Board		1	4	T/3
L10	**Digital Transmission:** Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding).	Chalk & Board		1	4	T/4

Assignment Questions:

Assignment Questions	**COs attained**
Q1. What is Data Communication? Explain the following w.r.t data communications: Fundamental characteristics of Data Communication, Components of Data Communications.	1
Q2. What is a Computer Network? Explain important network criteria.	2
Q3. Differentiate between the following. 1. LAN, WAN and MAN 2. Simplex, Half Duplex and Full Duplex 3. Point-to-point and Multipoint connections	2
Q4. Explain different topologies of computer networks.	2
Q5. Explain the functions of each layer in the 1. OSI Reference Model 2. TCP/IP Reference Model	3
Q6. Define and explain the term: Bandwidth of a signal, Bandwidth of a channel, Bit- Rate, Bit-Length, SNR, Decibel.	4
Q7. Briefly explain the types of transmission impairments. How they can be Overcome?	4
Q8. List the factors on which data rate of transmitted signal depends. Explain the following theoretical formula for data rate calculations- 1. Nyquist data rate for noiseless channel 2. Shannon's Capacity for Noisy channel.	4
Q9. Define line coding? List the important characteristics of line coding. Explain the different types of line coding techniques with example waveforms for digital signal 0011001.	4
Q10. A file contains 3 million bytes how long does it take to download this file using i) 100 kbps channel ii)10 Mbps channel	4
Q11. What is the theoretical capacity of the channel in each of the following cases? i) Bandwidth: 20 KHz $SNR_{dB} = 40$ ii) Bandwidth: 200 KHz $SNR_{dB} = 6$ iii)Bandwidth 1MHz $SNR_{dB} = 40$	4

MODULE-2

Module: 02	**No of Hours: 10 Hours**
Title: : Physical Layer-2, Analog Transmission, Bandwidth Utilization, Switching	

Learning Objectives: The main objectives of this Module are to:

1.	Define different Modulation techniques:PCM
2.	Demonstrate different types of Transmission modes i) Parallel ii) Serial
3.	Express Digital to Analog Conversion techniques
4.	Discuss different multiplexing techniques such as TDM, FDM & WDM
5.	Define Spread spectrum technique. Explain different Spread spectrum techniques.
6.	Define Switching. Differentiate between Circuit and Packet Switching

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Text Book/ Chapter
L11	**Physical Layer-2:**Analog to digital conversion (only PCM)	Chalk and Board	1,2,3,4,5,12	1	4	T/4
L12	PCM Continued	Chalk and Board & PPT		1	4	T/4
L13	Transmission Modes,	Chalk and Board		1,3	4	T/4
L14	Analog Transmission: Digital to analog conversion	Chalk and Board		1	4	T/5
L15	**Bandwidth Utilization:** Multiplexing	Chalk and Board & PPT		1	4	T/6
L16	TDM,FDM,WDM	Chalk and Board & PPT		1,3	4	T/6
L17	Spread Spectrum	Chalk and Board		1,3	4	T/6
L18	**Switching:** Introduction	Chalk and		1,3	4	T/6

		Board				
L19	Circuit Switched Networks And Packet switching.	Chalk and Board		1,3	4	T2/4
L20	Packet switching Networks	Chalk and Board		1,3	4	T/6

Assignment Questions:

Assignment Questions:	**Cos attained**
Q1.Explain different components of PCM (or Digitizer).	4
Q2. Write a note on Digital -to -Analog Conversion.	4
Q3. A speech of 4kHz bandwidth is encoded using 8-bit PCM. Find the data rate of the Signal and the amount of memory required to store 5 min speech.	4
Q4. Explain different transmission modes.	4
Q5. Define Multiplexing. Explain with neat diagrams multiplexing and Demultiplexing Of TDM, FDM and WDM.	4
Q6. Differentiate with neat diagram between Synchronous TDM and Statistical TDM.	4
Q7. Explain different data rate management techniques in Synchronous TDM.	4
Q8. Write a note on: Analog Hierarchy and Digital Hierarchy.	4
Q9. What is spread spectrum? Explain the principles of spread spectrum techniques. Explain FHSS and DSSS techniques for spread spectrum.	4
Q10. Differentiate between: i) Circuit and Packet Switching ii) Datagram and Virtual Circuits	4

MODULE-3

Module : 03	**No of Hours: 10**
Title: Error Detection and Correction, Data link control, Data link layer protocols	

Learning Objectives: The main objectives of this Module are to:

1	Define concepts of error detection and correction
2	Study different Error coding techniques- Block coding, Cyclic coding
3	Evaluate performances of different error coding techniques
4	Define concept of framing, Fixed Size Framing And Variable Size Framing.
5	Define concepts of flow & Error controls
6	Develop protocols for noiseless channels: Simplest Protocol & Stop & Wait Protocol.

7	Develop protocols for noisy channels: Stop & Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ.
8	Define frame format of HDLC.
9	Define frame format of PPP & Transition Phase

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L21	**Error Detection and Correction:** Introduction, Block coding,	Chalk and Board	c,e,j,k	1,3	4	T/10
L22	Cyclic codes, checksum	Chalk and Board		1,3	4	T/10
L23	Checksum, Forward Error Correction	Chalk and Board & PPT		1,2,3	4	T/10
L24	Checksum Examples	Chalk and Board & PPT		1	4	T/10
L25	**Data link control:** DLC services,	Chalk and Board		1	4	T/11
L26	**Data link layer protocols:** Noiseless Protocols.	Chalk and Board & PPT		1	4	T/11
L27	Noisy Protocols	Chalk and Board & PPT		1,2	4	T/11
L28	Noisy Protocols Continued…	Chalk and Board & PPT		1,2	4	T/11
L29	HDLC	Chalk and Board		1	4	T/11
L30	Point to Point protocol (Framing, Transition phases only).	Chalk and Board		1,2	4	T/11

Assignment Questions:	**Cos attained**
Q1. Differentiate between the following: 1. Single-bit error and Burst error 2. Error detection and error correction 3. Forward error correction and retransmission	4
Q2.What is Block coding? Explain error detection and correction in Block coding.	4
Q3. Define Hamming Distance and Minimum Hamming Distance (dmin). With the help of geometrical concept for dmin in Error detection and Error correction, Obtain the Expression for the number of errors detectable and correctable in a code.	4
Q4.What are Linear Block Codes (LBCs)? Explain with examples the following LBCs: 1. Simple Parity check code 2. 2D Parity check code	4
Q5.Define CRC. Give the steps for CRC calculation. Find the CRC for the data word 1001 Using generator polynomial $g(x) = x^3 + x^2 + 1$. Explain how CRC can be used For Error detection and correction using above example. Draw the hardware Circuit to Implement divisor.	4
Q6.Explain the performance analysis and advantages of cyclic code.	4
Q7.Explain the internet checksum algorithm with example. Discuss its performance.	4
Q8.Differentiate between-Character oriented and Bit-oriented protocols.	4
Q9.Explain Bit-stuffing and Byte stuffing with examples.	4
Q10. Explain *Simplest* and *Stop-and-wait* protocol for Noiseless Channel.	4
Q11. Explain in detail with flow diagram and Algorithm: 1. GO-Back-N ARQ. 2. Stop & Wait ARQ 3. Selective Repeat ARQ Compare the performance of the three.	4
Q12. Define piggybacking and its usefulness.	4
Q13. Explain the two transfer modes in HDLC (NRM and ABM).	4
Q14. Explain HDLC frame Format with Example.	4
Q15. Explain PPP frame format & also Explain PPP Transition phases	4

MODULE-4

Module : 04	**No of Hours: 10**
Title: Media Access control, Wired LANs Ethernet, Wireless LANs	

Learning Objectives: The main objectives of this Module are to:

1	Study different accessing methods - random access, controlled access & Channelization.
2	Discuss random access techniques such as ALOHA, CSMA, CSMA/CD, CSMA/CA
3	Discuss controlled access techniques such as Polling, Reservation, and Token Ring.
4	Discuss channelization techniques such as FDMA, TDMA, CDMA.
5	Define about IEEE 802.3 Medium standards.

6	Express different types of Ethernet Standards such as Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Ten-Gigabit Ethernet and their Physical implementations.
7	Develop architecture of 802.11: Basic Service Set (BSS) & Extended Service Set(ESS).
8	Explain addressing mechanism in 802.11
9	Explain Hidden & Exposed Station Problem.
10	Study Physical Layer of IEEE 802.11- FHSS, DSSS, Infrared, TFDM.
11	Explain architecture of Bluetooth.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L31	**MAC:** Random Access-Pure ALOHA & Slotted ALOHA	Chalk and Board	1,2,3,4,5,12	1,2	4	T/12
L32	Random Access: CSMA/CD & CSMA/CA	Chalk and Board		1,2	4	T/12
L33	Controlled Access: Reservation, Poling, Token Ring.	Chalk and Board & PPT		1,2	4	T/12
L34	Channelization: FDMA, TDMA, CDMA.	TPS		1,2	4	T/12
L35	**Wired LANs Ethernet:** Ethernet Protocol, Standard Ethernet	Chalk and Board		1,2	4	T/13
L36	Fast Ethernet, Gigabit Ethernet,10 Gigabit Ethernet	Chalk and Board		1,2	4	T/13
L37	**Wireless LANs:** Introduction	Chalk and Board & PPT		1,2,3	6	T/15
L38	IEEE 802.11	TPS		1,3	6	T/15
L39	IEEE 802.11 contd.	Chalk and Board		1,3	6	T/15
L40	Bluetooth	Chalk and Board		1,3	6	T/15

Assignment Questions:

Assignment Questions:	**Cos attained**
Q1. Explain different types of Multiple access Protocols with example.	4
Q2. Explain w.r.t ALOHA and Slotted ALOHA- 1. Principle of working 2. Vulnerable time 3. Throughput.	4
Q3. Explain the principle of CSMA. What is its Vulnerable time? Discuss different Persistence methods.	4
Q4. Explain with flow diagram CSMA/CD. Discuss Minimum Frame size, throughput and energy levels in CSMA/CD.	4
Q5. Why CSMA/CD is not possible in Wireless Networks? Explain with flow diagram, the working of CSMA/CA.	4
Q6. What is controlled access? Explain the different techniques: Reservation, Polling and Token Passing.	4
Q7. What is channelization? Explain in principles of TDMA, FDMA and CDMA.	4
Q8. Explain the two services supported by IEEE 802.11 standard (BSS and ESS).	5,6
Q9. Explain IEEE 802.11 MAC layer. Discuss the DCF,PCF in the 802.11 MAC layer.	5,6
Q10. Explain the in IEEE 802.11. 1. MAC layer frame format 2. Addressing mechanism	5,6
Q11. Explain different physical layer implementations of IEEE 802.11.	5,6
Q12. Write a note on Bluetooth	5,6

MODULE-5

Module: 05	**No of Hours: 10**
Title: Other wireless Networks, Network layer Protocols, Next generation IP.	

Learning Objectives: The main objectives of this Module are to:

1	Explains about WIMAX Technology
2	Explains about Cellular Telephony
3	Explains about Satellite networks
4	Define about Network layer basics and logical addressing
5	Explain IPv4 packets structure and Addressing
6	Explain IPv6 packets structure and Addressing
7	Compare - IPv4 and IPv6

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	*POs attained	*PSOs attained	COs attained	Reference Book/ Chapter
L41	**Other wireless Networks:** WIMAX	Chalk and Board &	2,3,5,6, 9,11,12	3	6	T/16
L42	Cellular Telephony	Chalk and Board &		3	6	T/16
L43	Satellite networks	Chalk and Board &		3	6	T/16
L44	**Network layer Protocols:** Internet	Chalk and		1,3	5,6	T/19
L45	ICMPv4	Chalk and		1,3	5,6	T/19
L46	Mobile IP	Chalk and		1,3	5,6	T/19
L47	**Next generation IP:** IPv6 addressing,	Chalk and Board &		1,3	5,6	T/22
L48	The IPv6 Protocol,	Chalk and Board &		1,3	5,6	T/22
L49	The ICMPv6 Protocol	Chalk and Board &		1,3	5,6	T/22
L50	Transition from IPv4 to IPv6.	Chalk and Board &		1,3	5,6	T/22

Assignment Questions:

Assignment Questions:	**Cos attained**
Q1.Explain with neat figure WIMAX Technology	6
Q2.Write a note on cellular telephony.	6
Q3.Write a note on satellite networks	6
Q4. Explain what do you mean by logical addressing..	5,6
Q5. Explain 1. IPv4 packet format. 2. IPv6 packet format. 3. IPv4 addressing 4. IPv6 addressing	5,6
Q6. Diffenetiate between IPv4 and IPv6 headers	5,6
Q7. Explain ICMP6 protocol.	
Q8. Explain how the migration can be done from IPv4 to IPv6.	

5) Portion for I. A. Test:

I.A. TEST	MODULES	COs
I IA Test	2 Modules	1,2,3,4
II IA Test	2 Modules	4,5,6
III IA Test	1 Module	

DESIGN AND ANALYSIS OF ALGORITHM LABORATORY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2017 -2018)
SEMESTER – IV

Subject Code	17CSL47	IA Marks	40
Number of Lecture Hours/Week	01 I + 02 P	Exam Marks	60
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 02

Description

Design, develop, and implement the specified algorithms for the following problems using Java language under LINUX /Windows environment.Netbeans/Eclipse IDE tool can be used for development and demonstration.

Experiments

1	A	Create a Java class called ***Student***with the following details as variables within it. (i) USN (ii) Name (iii) Branch (iv) Phone Write a Java program to create *nStudent* objects and print the USN, Name, Branch, and Phoneof these objects with suitable headings.
	B	Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
2	A	Design a superclass called ***Staff*** with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely ***Teaching*** (domain, publications), ***Technical*** (skills), and ***Contract*** (period). Write a Java program to read and display at least 3 *staff* objects of all three categories.
	B	Write a Java class called ***Customer*** to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as "/".
3	A	Write a Java program to read two integers *a* and*b*. Compute *a*/*b* and print, when *b* is not zero. Raise an exception when *b* is equal to zero.
	B	Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number andprints; third thread will print the value of cube of the number.
4		Sort a given set of ***n*** integer elements using **Quick Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000 and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using

	Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5	Sort a given set of ***n*** integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000, and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
6	Implement in Java, the **0/1 Knapsack** problem using (a) Dynamic Programming method (b) Greedy method.
7	From a given vertex in a weighted connected graph, find shortest paths to other vertices using **Dijkstra's algorithm**. Write the program in Java.
8	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal'salgorithm.** Use Union-Find algorithms in your program.
9	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Prim's algorithm**.
10	Write Java programs to (a) Implement All-Pairs Shortest Paths problem using **Floyd's algorithm**. (b) Implement **Travelling Sales Person problem** using Dynamic programming.
11	Design and implement in Java to find a **subset** of a given set **S** = {Sl, S2,.....,Sn} of ***n*** positive integers whose SUM is equal to a given positive integer ***d***. For example, if S ={1, 2, 5, 6, 8} and ***d***= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
12	Design and implement in Java to find all **Hamiltonian Cycles** in a connected undirected Graph G of *n* vertices using backtracking principle.

Course Outcomes: The students should be able to:

- Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
- Develop variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language.
- Analyze and compare the performance of algorithms using language features.
- Apply and implement learned algorithm design techniques and data structuresto solve real-world problems.

Conduction of Practical Examination:

All laboratory experiments (Twelve problems) are to be included for practical examination. Students are allowed to pick one experiment from the lot.
To generate the data set use random number generator function.
Strictly follow the instructions as printed on the cover page of answer script for

breakup of marks
Marks distribution: Procedure + Conduction + Viva: 15 + 70 + 15 (100).
Change of experiment is allowed only once and marks allotted to the procedure

MICROPROCESSOR AND MICROCONTROLLER LABORATORY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2017 -2018)
SEMESTER – IV

Subject Code	17CSL48	IA Marks	40
Number of Lecture Hours/Week	01 I + 02 P	Exam Marks	60
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 02

Description

Demonstration and Explanation hardware components and Faculty in-charge should explain 8086 architecture, pin diagram in one slot. The second slot, the Faculty in-charge should explain instruction set types/category etc. Students have to prepare a write-up on the same and include it in the Lab record and to be evaluated.

Laboratory Session-1: Write-up on Microprocessors, 8086 Functional block diagram, Pin diagram and description. The same information is also taught in theory class; this helps the students to understand better.

Laboratory Session-2: Write-up on Instruction group, Timing diagrams, etc. The same information is also taught in theory class; this helps the students to understand better.

Note: These TWO Laboratory sessions are used to fill the gap between theory classes and practical sessions. Both sessions are evaluated as lab experiments for 20 marks.

Experiments

- Develop and execute the following programs using 8086 Assembly Language. Any suitable assembler like MASM/TASM/8086 kit or any equivalent software may be used.
- Program should have suitable comments.
- The board layout and the circuit diagram of the interface are to be provided to the student during the examination.
- Software Required: Open source ARM Development platform, KEIL IDE and Proteus for simulation

SOFTWARE PROGRAMS: PART A

1. Design and develop an assembly language program to search a key element “X” in a list of ‘n’ 16-bit numbers. Adopt Binary search algorithm in your program for searching.
2. Design and develop an assembly program to sort a given set of ‘n’ 16-bit numbers in ascending order. Adopt Bubble Sort algorithm to sort given elements.
3. Develop an assembly language program to reverse a given string and verify whether it is a palindrome or not. Display the appropriate message.
4. Develop an assembly language program to compute nCr using recursive procedure. Assume that ‘n’ and ‘r’ are non-negative integers.
5. Design and develop an assembly language program to read the current time and Date

from the system and display it in the standard format on the screen.

6. To write and simulate ARM assembly language programs for data transfer, arithmetic and logical operations (Demonstrate with the help of a suitable program).
7. To write and simulate C Programs for ARM microprocessor using KEIL (Demonstrate with the help of a suitable program)

Note : To use KEIL one may refer the book: Insider's Guide to the ARM7 based microcontrollers, Hitex Ltd.,1st edition, 2005

HARDWARE PROGRAMS: PART B

8. a. Design and develop an assembly program to demonstrate BCD Up-Down Counter (00-99) on the Logic Controller Interface.
   b. Design and develop an assembly program to read the status of two 8-bit inputs (X & Y) from the Logic Controller Interface and display X*Y.
9. Design and develop an assembly program to display messages "FIRE" and "HELP" alternately with flickering effects on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages (Examiner does not specify these delay values nor is it necessary for the student to compute these values).
10. Design and develop an assembly program to drive a Stepper Motor interface and rotate the motor in specified direction (clockwise or counter-clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).
11. Design and develop an assembly language program to
    a. Generate the Sine Wave using DAC interface (The output of the DAC is to be displayed on the CRO).
    b. Generate a Half Rectified Sine waveform using the DAC interface. (The output of the DAC is to be displayed on the CRO).
12. To interface LCD with ARM processor-- ARM7TDMI/LPC2148. Write and execute programs in C language for displaying text messages and numbers on LCD
13. To interface Stepper motor with ARM processor-- ARM7TDMI/LPC2148. Write a program to rotate stepper motor

Study Experiments:

1. Interfacing of temperature sensor with ARM freedom board (or any other ARM microprocessor board) and display temperature on LCD
2. To design ARM cortex based automatic number plate recognition system
3. To design ARM based power saving system

Course Outcomes: After studying this course, students will be able to

- Summarize 80x86 instruction sets and comprehend the knowledge of how assembly language works.
- Design and develop assembly programs using 80x86 assembly language instructions
- Infer functioning of hardware devices and interfacing them to x86 family
- Choose processors for various kinds of applications.

Conduction of Practical Examination:

- All laboratory experiments (all 7 + 6 nos) are to be included for practical examination.
- Students are allowed to pick one experiment from each of the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
- PART –A: Procedure + Conduction + Viva: **08 + 35 +07 (50)**
- PART –B: Procedure + Conduction + Viva: **08 + 35 +07 (50)**
- Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

CBCS Scheme

USN | | | | | | | | | | |

15MAT41

Fourth Semester B.E. Degree Examination, June/July 2018
Engineering Mathematics – IV

Time: 3 hrs. Max. Marks: 80

Note: 1. *Answer any FIVE full questions, choosing one full question from each module.*
2. *Use of statistical tables is permitted.*

Module-1

1 a. Use Taylor's series method to find y at x = 1.1, considering terms upto third degree given that $\frac{dy}{dx} = x + y$ and y(1) = 0. **(05 Marks)**

b. Using Runge-Kutta method, find y(0.2) for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$; y(0) = 1, taking h = 0.2. **(05 Marks)**

c. Given $\frac{dy}{dx} = x^2 - y$, y(0) = 1 and the values y(0.1) = 0.90516, y(0.2) = 0.82127, y(0.3) = 0.74918, evaluate y(0.4), using Adams-Bashforth method. **(06 Marks)**

OR

2 a. Using Euler's modified method, find y(0.1) given $\frac{dy}{dx} = x - y^2$, y(0) = 1, taking h = 0.1. **(05 Marks)**

b. Solve $\frac{dy}{dx} = xy$; y(1) = 2, find the approximate solution at x = 1.2, using Runge-Kutta method. **(05 Marks)**

c. Solve $\frac{dy}{dx} = x - y^2$ with the following data y(0) = 0, y(0.2) = 0.02, y(0.4) = 0.0795, y(0.6) = 0.1762, compute y at x = 0.8, using Milne's method. **(06 Marks)**

Module-2

3 a. Using Runge-Kutta method of order four, solve $y'' = y + xy'$, y(0) = 1, y'(0) = 0 to find y(0.2). **(05 Marks)**

b. Express the polynomial $2x^3 - x^2 - 3x + 2$ in terms of Legendre polynomials. **(05 Marks)**

c. If α and β are two distinct roots of $J_n(x) = 0$ then prove that $\int_0^1 x J_n(\alpha x) J_n(\beta x) dx = 0$, if $\alpha \neq \beta$. **(06 Marks)**

OR

4 a. Given $y'' = 1 + y'$; y(0) = 1, y'(0) = 1, compute y(0.4) for the following data, using Milne's predictor-corrector method.

y(0.1) = 1.1103	y(0.2) = 1.2427	y(0.3) = 1.399
y'(0.1) = 1.2103	y'(0.2) = 1.4427	y'(0.3) = 1.699.

(05 Marks)

b. Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$. **(05 Marks)**

c. Derive Rodrigue's formula $P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n}\left[(x^2 - 1)^n\right]$. **(06 Marks)**

Module-3

5 a. Derive Cauchy-Riemann equations in polar form. **(05 Marks)**

b. Evaluate $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$ where C is the circle $|z| = 3$, using Cauchy's residue theorem. **(05 Marks)**

c. Find the bilinear transformation which maps $z = \infty$, i, 0 on to $w = 0$, i, ∞. **(06 Marks)**

OR

6 a. State and prove Cauchy's integral formula. **(05 Marks)**

b. If $u = \frac{\sin 2x}{\cosh 2y + \cos 2x}$, find the corresponding analytic function $f(z) = u + iv$. **(05 Marks)**

c. Discuss the transformation $w = z^2$. **(06 Marks)**

Module-4

7 a. Derive mean and standard deviation of the binomial distribution. **(05 Marks)**

b. If the probability that an individual will suffer a bad reaction from an injection of a given serum is 0.001, determine the probability that out of 2000 individual (i) exactly 3 (ii) more than 2 individuals will suffer a bad reaction. **(05 Marks)**

c. The joint probability distribution for two random variables X and Y is as follows:

X \ Y	-3	-2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

Determine: i) Marginal distribution of X and Y ii) Covariance of X and Y
iii) Correlation of X and Y **(06 Marks)**

OR

8 a. Derive mean and standard deviation of exponential distribution. **(05 Marks)**

b. In an examination 7% of students score less than 35% marks and 89% of students score less than 60% marks. Find the mean and standard deviation if the marks are normally distributed. Given $P(0 < z < 1.2263) = 0.39$ and $P(0 < z < 1.14757) = 0.43$. **(05 Marks)**

c. The joint probability distribution of two random variables X and Y is as follows:

Y \ X	-4	2	7
1	1/8	1/4	1/8
5	1/4	1/8	1/8

Compute: i) E(X) and E(Y) ii) E(XY) iii) COV(X, Y) iv) $\rho(X, Y)$ **(06 Marks)**

Module-5

9 a. Explain the terms: i) Null hypothesis ii) Type I and Type II errors. **(05 Marks)**

b. The nine items of a sample have the values 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ significantly from the assumed mean of 47.5? **(05 Marks)**

c. Given the matrix $A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}$ then show that A is a regular stochastic matrix. **(06 Marks)**

OR

10 a. A die was thrown 9000 times and of these 3220 yielded a 3 or 4, can the die be regarded as unbiased? **(05 Marks)**

b. Explain: i) Transient state ii) Absorbing state iii) Recurrent state **(05 Marks)**

c. A student's study habits are as follows. If he studies one night, he is 70% sure not to study the next night. On the other hand, if he does not study one night, he is 60% sure not to study the next night. In the long run, how often does he study? **(06 Marks)**

CBCS Scheme

USN | | | | | | | | | | |

15MAT41

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Engineering Mathematics – IV

Time: 3 hrs. Max. Marks: 80

Note: **1.** ***Answer any FIVE full questions, choosing one full question from each module.***
2. ***Use of statistical tables is permitted.***

Module-1

1 a. Employ Taylor's series method to find y at x = 0.1. Correct to four decimal places given $\frac{dy}{dx} = 2y + 3e^x$; y(0) = 0. **(05 Marks)**

b. Using Runge Kutta method of order 4, find y(0.2) for $\frac{dy}{dx} = \frac{y-x}{y+x}$; y(0) = 1, taking h = 0.2. **(05 Marks)**

c. If $y' = 2e^x - y$; y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.040 and y(0.3) = 2.090. Find y(0.4) using Milne's predictor corrector formula. Apply corrector formula twice. **(06 Marks)**

OR

2 a. Use Taylor's series method to find y(4.1) given that $(x^2 + y)y' = 1$ and y(4) = 4. **(05 Marks)**

b. Using modified Euler's method find y at x = 0.1, given $y' = 3x + \frac{y}{2}$ with y(0) = 1, h = 0.1. Perform two iterations. **(05 Marks)**

c. Find y at x = 0.4 given $y' + y + xy^2 = 0$ and $y_0 = 1$. $y_1 = 0.9008$, $y_2 = 0.8066$, $y_3 = 0.722$ taking h = 0.1 using Adams-Bashforth method. Apply corrector formula twice. **(06 Marks)**

Module-2

3 a. Given $y'' = xy'^2 - y^2$ find y at x = 0.2 correct to four decimal places, given y = 1 and y' = 0 when x = 0, using R-K method. **(05 Marks)**

b. If α and β are two distinct roots of $J_n(x) = 0$, then prove that $\int_0^1 xJ_n(\alpha x)J_n(\beta x)dx = 0$ if $\alpha \neq \beta$. **(05 Marks)**

c. If $x^3 + 2x^2 - x + 1 = ap_0(x) + bp_1(x) + cp_2(x) + dp_3(x)$ then, find the values of a, b, c, d. **(06 Marks)**

OR

4 a. Apply Milne's method to compute y(0.8) given that $y'' = 1 - 2yy'$ and the table.

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y'	0	0.1996	0.3937	0.5689

Apply corrector formula twice. **(05 Marks)**

b. Show that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$. **(05 Marks)**

c. Derive Rodrigue's formula $P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n}\left[(x^2 - 1)^n\right]$. **(06 Marks)**

Module-3

5 a. Define analytic function and obtain Cauchy Riemann equation in Cartesian form. **(05 Marks)**

b. Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$; c is the circle $|z| = 3$ by using theorem Cauchy's residue. **(05 Marks)**

c. Discuss the transformation $w = e^z$ with respect to straight line parallel to x and y axis. **(06 Marks)**

OR

6 a. Find the analytic function whose real part is $u = \frac{x^4y^4 - 2x}{x^2 + y^2}$. **(05 Marks)**

b. State and prove Cauchy's integral formula. **(05 Marks)**

c. Find the bilinear transformation which maps the points $z = 1, i, -1$ into $w = 2, i, -2$. **(06 Marks)**

Module-4

7 a. Find the constant c, such that the function $f(x) = \begin{cases} cx^2, & 0 < x < 3 \\ 0, & \text{otherwise} \end{cases}$ is a p.d.f. Also compute $p(1 < x < 2)$, $p(x \leq 1)$, $p(x > 1)$ **(05 Marks)**

b. If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals, more than two will get a bad reaction. **(05 Marks)**

c. x and y are independent random variables, x take the values 1, 2 with probability 0.7; 0.3 and y take the values -2, 5, 8 with probabilities 0.3, 0.5, 0.2. Find the joint distribution of x and y hence find cov(x, y). **(06 Marks)**

OR

8 a. Obtain mean and variance of binomial distribution. **(05 Marks)**

b. The length of telephone conservation in a booth has been an exponential distribution and found on an average to be 5 minutes. Find the probability that a random call made from this booth (i) ends less than 5 minutes, (ii) between 5 and 10 minutes. **(05 Marks)**

c. The joint distribution of two discrete variables x and y is $f(x, y) = k(2x + y)$ where x and y are integers such that $0 \leq x \leq 2$; $0 \leq y \leq 3$. Find: (i) The value of k; (ii) Marginal distributions of x and y; (iii) Are x and y independent? **(06 Marks)**

Module-5

9 a. Explain the terms: (i) Null hypothesis; (ii) Type I and type II errors; (iii) Significance level. **(05 Marks)**

b. A die thrown 9000 times and a throw of 3 or 4 was observed 3240 times. Is it reasonable to think that the die is an unbiased one? **(05 Marks)**

c. Find the unique fixed probability vector for the regular Stochastic matrix:

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$$ **(06 Marks)**

OR

10 a. A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure 5, 2, 8, –1, 3, 0, 6, –2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure. ($t_{0.05}$ for 11 d.f = 2.201) **(05 Marks)**

b. It has been found that the mean breaking strength of a particular brand of thread is 275.6 gms with $\sigma = 39.7$ gms. A sample of 36 pieces of thread showed a mean breaking strength of 253.2 gms. Test the claim at 1+.. and 5–*l*. level of significance. **(05 Marks)**

c. A man's smoking habits are as follows. If he smokes filter cigarettes one week, he switches to non filter cigarettes the next week with probability 0.2. One the other hand, if he smokes non filter cigarettes one week there is a probability of 0.7 that he will smoke non filter cigarettes the next week as well. In the long run how often does he smoke filter cigarettes? **(06 Marks)**

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15MAT41

Fourth Semester B.E. Degree Examination, June/July 2017
Engineering Mathematics–IV

Time: 3 hrs. Max. Marks: 80

Note: 1. *Answer FIVE full questions, choosing one full question from each module.*
2. *Use of statistical tables are permitted.*

Module-1

1 a. Find by Taylor's series method the value of y at x = 0.1 from $\frac{dy}{dx} = x^2y - 1$, y(0) = 1 (upto 4th degree term). **(05 Marks)**

b. The following table gives the solution of $5xy' + y^2 - 2 = 0$. Find the value of y at x = 4.5 using Milne's predictor and corrector formulae. **(05 Marks)**

x	4	4.1	4.2	4.3	4.4
y	1	1.0049	1.0097	1.0143	1.0187

c. Using Euler's modified method. Obtain a solution of the equation $\frac{dy}{dx} = x + |\sqrt{y}|$, with initial conditions y = 1 at x = 0, for the range $0 \le x \le 0.4$ in steps of 0.2. **(06 Marks)**

OR

2 a. Using modified Euler's method find y(20.2) and y(20.4) given that $\frac{dy}{dx} = \log_{10}\left(\frac{x}{y}\right)$ with y(20) = 5 taking h = 0.2. **(05 Marks)**

b. Given $\frac{dy}{dx} = x^2(1+y)$ and y(1) = 1, y(1.1) = 1.233, y(1.2) =1.548, y(1.3) = 1.979. Evaluate y(1.4) by Adams-Bashforth method. **(05 Marks)**

c. Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0) = 1 at x = 0.2 by taking h = 0.2 **(06 Marks)**

Module-2

3 a. Obtain the solution of the equation $2\frac{d^2y}{dx^2} = ux + \frac{dy}{dx}$ by computing the value of the dependent variable corresponding to the value 1.4 of the independent variable by applying Milne's method using the following data: **(05 Marks)**

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514
y'	2	2.3178	2.6725	3.0657

b. Express $f(x) = 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials. **(05 Marks)**

c. Obtain the series solution of Bessel's differential equation $x^2y'' + xy' + (x^2 + n^2)y = 0$ **(06 Marks)**

OR

4 a. By Runge-Kutta method solve $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$ for x = 0.2. Correct to four decimal places using the initial conditions y = 1 and y' = 0 at x = 0, h = 0.2. **(05 Marks)**

b. Prove that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ **(05 Marks)**

c. Prove the Rodrigues formula,

$$\rho_n(x) = \frac{1}{2^n n!} \frac{d^n(x^2-1)^n}{dx^n}$$ **(06 Marks)**

Module-3

5 a. State and prove Cauchy's-Riemann equation in polar form. **(05 Marks)**

b. Discuss the transformation $W = e^z$. **(05 Marks)**

c. Evaluate $\int_C \left\{\frac{\sin(\pi z^2) + \cos(\pi z^2)}{(z-1)^2(z-2)}\right\} dz$

using Cauchy's residue theorem where 'C' is the circle $|z| = 3$ **(06 Marks)**

OR

6 a. Find the analytic function whose real part is, $\frac{\sin 2x}{\cosh 2y - \cos 2x}$. **(05 Marks)**

b. State and prove Cauchy's integral formula. **(05 Marks)**

c. Find the bilinear transformation which maps z = ∞, i, 0 into ω = -1, -i, 1. Also find the fixed points of the transformation. **(06 Marks)**

Module-4

7 a. Find the mean and standard deviation of Poisson distribution. **(05 Marks)**

b. In a test on 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and S.D of 60 hours. Estimate the number of bulbs likely to burn for,

(i) more than 2150 hours.
(ii) less than 1950 hours
(iii) more than 1920 hours and less than 2160 hours.

[A(1.833) = 0.4664, A(1.5) = 0.4332, A(2) = 0.4772] **(05 Marks)**

c. The joint probability distribution of two random variables x and y is as follows:

x/y	-4	2	7
1	1/8	1/4	1/8
5	1/4	1/8	1/8

Determine:

(i) Marginal distribution of x and y.
(ii) Covariance of x and y
(iii) Correlaiton of x and y. **(06 Marks)**

OR

8 a. The probability that a pen manufactured by a factory be defective is $\frac{1}{10}$. If 12 such pens are manufactured what is the probability that, (i) Exactly 2 are defective (ii) at least 2 are defective (iii) none of them are defective. **(05 Marks)**

b. Derive the expressions for mean and variance of binomial distribution. **(05 Marks)**

c. A random variable X take the values -3, -2, -1, 0, 1, 2, 3 such that $P(x = 0) = P(x < 0)$ and $P(x = -3) = P(x = -2) = P(x = -1) = P(x = 1) = P(x = 2) = P(x = 3)$. Find the probability distribution. **(06 Marks)**

Module-5

9 a. In 324 throws of a six faced 'die' an odd number turned up 181 times. Is it reasonable to think that the 'die' is an unbiased one? **(05 Marks)**

b. Two horses A and B were tested according to the time (in seconds) to run a particular race with the following results:

Horse A:	28	30	32	33	33	29	34
Horse B:	29	30	30	24	27	29	

Test whether you can discriminate between the two horses.($t_{0.05}$=2.2 and $t_{0.02}$=2.72 for 11 d.f) **(05 Marks)**

c. Find the unique fixed probability vector for the regular stochastic matrix, $A = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$ **(06 Marks)**

OR

10 a. Define the terms: (i) Null hypothesis (ii) Type–I and Type–II error (iii) Confidence limits. **(05 Marks)**

b. Prove that the Markov chain whose t.p.m $P = \begin{bmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{bmatrix}$ is irreducible. Find the corresponding stationary probability vector. **(05 Marks)**

c. Three boys A, B, C are throwing ball to each other. A always throws the ball to B and B always throws the ball to C. C is just as likely to throw the ball to B as to A. If C was the first person to throw the ball find the probabilities that after three throws (i) A has the ball. (ii) B has the ball. (iii) C has the ball. **(06 Marks)**

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CBCS Scheme

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15CS42

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Software Engineering

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. What is software? List the fundamental software engineering activities. Mention and explain the key challenges or the general issues facing software engineering. **(05 Marks)**

b. List and explain any five software engineering code of ethics. **(05 Marks)**

c. Write block diagram for illustrating incremental development model. State at least two benefits and the problems in incremental development. **(06 Marks)**

OR

2 a. Explain functional, non-functional and domain requirements with at least one example for each. **(03 Marks)**

b. Write the structure of the requirement document as suggested by IEEE standards. **(10 Marks)**

c. List out all the stake-holders in Mental Health Cone Patient Management System (MHC-PMS). Write a note on interviewing stake-holders for requirements discovery. **(03 Marks)**

Module-2

3 Write short notes on:

a. Context models with context diagram for MHC-PMS. **(06 Marks)**

b. Interaction models **(05 Marks)**

c. Behavioral models **(05 Marks)**

OR

4 a. Write a neat block diagram and explain the phases of Rational Unified Process (RUP). **(06 Marks)**

b. List out all the activities in an object oriented design process. **(02 Marks)**

c. What is a sequence model? Write the diagram for sequence model of operations in collecting data from a weather station and explain. **(08 Marks)**

Module-3

5 a. State and explain development testing and its three levels - unit testing, component testing and system testing. **(04 Marks)**

b. List out all the guidelines for testing. **(04 Marks)**

c. Explain test-driven development (TDD), with a block diagram. Explain TDD activities and benefits of TDD. **(08 Marks)**

OR

6 a. With appropriate block diagram, explain the software evolution process. **(06 Marks)**

b. Define "program evolution dynamics". Discuss Lehman laws for program evolution dynamics. **(10 Marks)**

Module-4

7 a. Explain software pricing. List and briefly explain the factors affecting software pricing. **(06 Marks)**

b. List and explain various COCOMO cost estimation models. **(10 Marks)**

OR

8 a. List out the questions to be answered by the quality management team to divide whether or not the software is fit for its intended purpose. **(06 Marks)**

b. Explain the various inspection checklists for software inspection process. **(06 Marks)**

c. What are product metrics? Explain its two classes of metrics. **(04 Marks)**

Module-5

9 a. Draw the block diagram and explain the process of prototype development. What are the benefits of a prototype? Write briefly about throw away prototypes. **(10 Marks)**

b. List and explain any six extreme programming practices. **(06 Marks)**

OR

10 a. List all the four key features of testing in XP. **(02 Marks)**

b. What is pair programming? List the advantages of pair programming. **(04 Marks)**

c. Explain SCRUM. Draw and explain block diagram for the SCRUM process. List all the key characteristics of this process. Mention the advantages of SCRUM. **(10 Marks)**

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15CS42

Fourth Semester B.E. Degree Examination, June/July 2017
Software Engineering

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What are the fundamental activities of software engineering? **(04 Marks)**
b. With neat diagram, explain the water-fall model of software development process. **(06 Marks)**
c. With a diagram, explain the rational unified process. **(06 Marks)**

OR

2 a. What is requirement specification? Explain various ways of writing system requirements. **(06 Marks)**
b. Why the understanding of requirements from stake holders is difficult task? Explain. **(05 Marks)**
c Explain the different checks to be carried out during requirement validation process. **(05 Marks)**

Module-2

3 a. Draw a context model for patient information system. How the interactions are modeled? **(06 Marks)**
b. Explain the terms class diagram, generalization and aggregation. **(06 Marks)**
c. What is model Driven engineering? State the three types of abstract system models produced. **(04 Marks)**

OR

4 a. What are the things to be done for a design of object oriented system? How the objects are identified? **(05 Marks)**
b. What is design pattern? Explain four elements of design pattern. **(06 Marks)**
c. What is software reuse? State the general models of open source licenses. **(05 Marks)**

Module-3

5 a. State the two goals and three levels of granularity of software testing process. **(05 Marks)**
b. What is test driven development? State the benefits of test driven developments. **(05 Marks)**
c. Explain the six stages of acceptance testing process. **(06 Marks)**

OR

6 a. With neat diagram, show the software evolution process and explain the 'Lehman's Law' concern to system change. **(10 Marks)**
b. What is software maintenance? State the activities of re-engineering process. **(06 Marks)**

Module-4

7 a. Explain the factors to be considered for approval of change. **(05 Marks)**
b. Explain the features provided by version management systems. **(05 Marks)**
c. What is configuration management? State the four activities of configuration management. **(06 Marks)**

OR

8 a. What is system building? State the features available in the system building tools. **(10 Marks)**
b. Explain the factors to be considered for release planning of system. **(06 Marks)**

Module-5

9 a. Explain the ways of coping with change and reduction of rework cost. **(06 Marks)**
b. Explain the practices involved in the extreme programming. **(10 Marks)**

OR

10 a. State the principles of agile methods. **(05 Marks)**
b. How the agile methods are scaled? State the coping of agile methods for large system engineering. **(05 Marks)**
c. Write a note on pair programming. **(06 Marks)**

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15CS43

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define an algorithm. Discuss the criteria of an algorithm with an example. **(06 Marks)**

b. Prove that : If $t_1(n) \in 0(g_1(n))$ and $t_2(n) \in 0(g_2(n))$ then
$t_1(n) + t_2(n) \in 0(\max\{g_1(n), g_2(n)\})$ **(06 Marks)**

c. Explain the two common ways to represent a graph with an example **(04 Marks)**

OR

2 a. Consider the following algorithm
Algorithm GUESS (A[ ] [ ])
for i ← 0 to n – 1
  for j ← 0 to i
    A [i] [j] ← 0
  i) What does the algorithm compute?
  ii) What is basic operation?
  iii) What is the efficiency of this algorithm? **(03 Marks)**

b. List and explain important problem types that are solved by computer. **(07 Marks)**

c. Design an algorithm for checking whether all elements in a given array are distinct or not. Derive its worst complexity. **(06 Marks)**

Module-2

3 a. Explain divide and conquer technique. Write a recursive algorithm for finding the maximum and minimum element from a list. **(08 Marks)**

b. Apply quick sort to sort the list E, X, A, M, P, L, E in alphabetical order. Draw the tree of the recursive calls made. **(08 Marks)**

OR

4 a. Discuss Strassen's matrix multiplication and derive its time complexity. **(08 Marks)**

b. Design merge sort algorithm and discuss its best-case, average-case and worst-case efficiency. **(08 Marks)**

Module-3

5 a. Solve the greedy knapsack problem where
m = 10, n = 4, P = (40, 42, 25, 12), W = (4, 7, 5, 3). **(06 Marks)**

b. What is job sequencing with deadlines problem? Let n = 5, profits [10, 3, 33, 11, 40] and deadlines [3, 1, 1, 2, 2] respectively. Find the optimal solution using greedy algorithm. **(05 Marks)**

c. Define minimum cost spanning tree (MST). Write Prim's algorithm to construct minimum cost spanning tree. **(05 Marks)**

OR

6 a. Design Dijkstra's algorithm and apply the same to find the single source shortest path for graph taking vertex 'a' as source of Fig. Q6(a). **(08 Marks)**

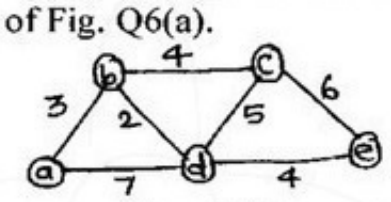

Fig. Q6(a)

b. Construct a Huffman code for the following data :

Character	A	B	C	D	
Probability	0.4	0.1	0.2	0.15	0.15

Encode the text ABACABAD and decode the text 100010111001010, using the above code. **(04 Marks)**

c. Construct the heap for the list 2, 9, 7, 6, 5, 8 by the bottom-up algorithm. **(04 Marks)**

Module-4

7 a. Define transitive closure. Write Warshall's algorithm to compute transitive closure. Find its efficiency. **(08 Marks)**

b. Apply Floyd's algorithm to find all pair shortest path for the graph of Fig. Q7(b). **(08 Marks)**

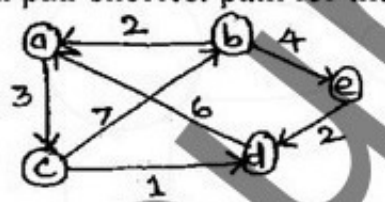

Fig. Q7(b)

OR

8 a. For the given cost matrix, obtain optimal cost tour using dynamic programming. **(08 Marks)**

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

Fig. Q8(a)

b. Write a pseudocode to find an optimal binary search tree by dynamic programming. **(08 Marks)**

Module-5

9 a. Write the pseudocode for backtracking algorithm. Let w = {3, 5, 6, 7} and m = 15. Find all possible subsets of w that sum to m. Draw the state space tree that is generated. **(09 Marks)**

b. Draw the portion of the state space tree for m – colorings of a graph when n = 4 and m = 3. **(07 Marks)**

OR

10 a. With the help of a state space tree, solve the Travelling Salesman Problem (TSP) of Fig.Q10(a), using branch-and-bound algorithm. **(08 Marks)**

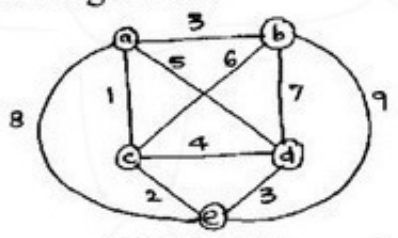

Fig. Q10(a)

b. Explain the classes of NP – Hard and NP – complete. **(08 Marks)**

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15CS43

Fourth Semester B.E. Degree Examination, June/July 2017
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define algorithm. Explain asymptotic notations, Big O, big Omega, big theta notations. **(08 Marks)**

b. Explain general plan of mathematical analysis of nonrecursive algorithms with example. **(08 Marks)**

OR

2 a. Define time and space complexity. Explain important problem types. **(08 Marks)**

b. Illustrate mathematical analysis of recursive algorithm for towers of hanoii. **(08 Marks)**

Module-2

3 a. Explain concept of divide and conquer. Write merge sort algorithm. **(08 Marks)**

b. Write a recursive algorithm for binary search and also bring out its efficiency. **(08 Marks)**

OR

4 a. Illustrate the tracing of quick sort algorithm for the following set of numbers:
25, 10, 72, 18, 40, 11, 64, 58, 32, 9 **(08 Marks)**

b. List out the advantages and disadvantages of divide and conquer method and illustrate the topological sorting for the following graph.

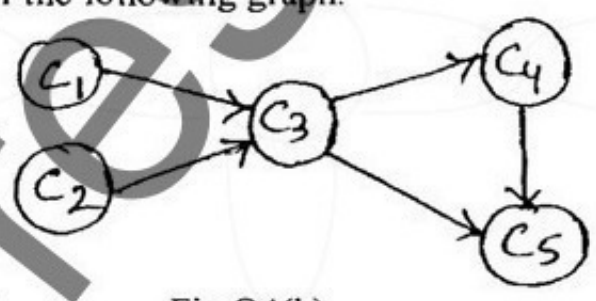

Fig.Q4(b) **(08 Marks)**

Module-3

5 a. Explain Greedy criterion. Write a Prim's algorithm to find minimum cost spanning tree. **(08 Marks)**

b. Sort the given list of numbers using heap sort: 2, 9, 7, 6, 5, 8. **(08 Marks)**

OR

6 a. Write an algorithm to find single source shortest path. **(08 Marks)**

b. Construct a Huffman tree and resulting code word for the following:

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

Encode the words DAD and ADD. **(08 Marks)**

Module-4

7 a. Explain the concept of dynamic programming, with example. **(08 Marks)**

b. Trace the following graph using Warshall's algorithm.

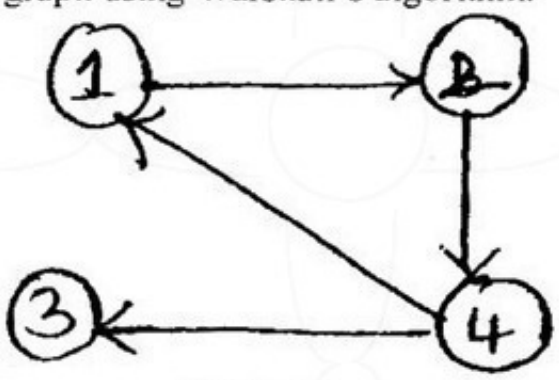

Fig.Q7(b) **(08 Marks)**

OR

8 a. Explain Multistage graphs with example. Write multistage graph algorithm to forward approach. **(08 Marks)**

b. Solve the following instance of Knapsack problem using dynamic programming. Knapsack capacity is 5.

Item	Weight	Value
1	2	$12
2	1	$10
3	3	$20
4	2	$15

(08 Marks)

Module-5

9 a. Explain backtracking concept. Illustrate N queens problem using backtracking to solve 4-Queens problem. **(08 Marks)**

b. Solve subset sum problem for the following example, s = {3, 5, 6, 7} and d = 15. Construct a state space tree. **(08 Marks)**

OR

10 a. Explain the concept of branch and bound and solve assignment problem for the following and obtain optimal solution.

Person	Job1	Job2	Job3	Job4
a	9	2	7	8
b	6	4	3	7
c	5	8	1	8
d	7	6	9	4

(08 Marks)

b. Explain LC Branch and Bound and FIFO branch and bound. **(08 Marks)**

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15CS44

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Microprocessor and Microcontroller

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain the architecture of 8086 microprocessor with a neat diagram along with functions of various blocks. **(06 Marks)**

b. With an example distinguish between physical address, logical address and offset address. If CS = 2000 h, DS = 3000 h, SS = 4000 h, ES = 5000 h, BX = 0020 h, BP = 0030 h. Find physical address for (i) MOV AL, [BP] (ii) MOV CX, [BX]. **(04 Marks)**

c. Explain the following addressing modes of 8086:
i) Register indirect
ii) Based indexed indirect
iii) Direct memory. **(06 Marks)**

OR

2 a. What are assembler directives? Explain the following assembler directives (i) PROC, (ii) Assume, (iii) PTR. **(04 Marks)**

b. Write assembly language program to add 5 bytes of data stored in data segment. **(04 Marks)**

c. With syntax, explain the following control transfer instructions:
i) Conditional transfer
ii) Unconditional transfer instruction. **(08 Marks)**

Module-2

3 a. Explain the syntax of following instructions with an example:
i) DAA ii) MUL iii) AND iv) SHR v) CMP vi) AAM **(06 Marks)**

b. Write a program to convert lower case to upper case by reading string from KB and print the converted string at 10^{th} row, 20^{th} column after clearing the screen. **(06 Marks)**

c. Write an ALP to count the number of one's and zero's in a given 8 bit data using rotate instructions. **(04 Marks)**

OR

4 a. Explain the syntax of following instructions with example: i) AAA, ii) Shl, iii) DIV, iv) RCR. **(04 Marks)**

b. What is an interrupt? Explain various types with an interrupt vector table. **(06 Marks)**

c. Write an ALP to sort a given set of 16 bit numbers in ascending order using any sorting method. **(06 Marks)**

Module-3

5 a. With an example, explain how to identify over flow and under flow using flags in a flag register for performing arithmetic operation on 16 bit number. **(06 Marks)**

b. Write the syntax of following instruction and explain with an example: (i) CBW, (ii) IDIV, (iii) CMPSB, (iv) Xlat. **(04 Marks)**

c. Design a memory system for 8086 with one 64 KB RAM and one 64 KB ROM at address 30000h and F0000h show the complete design along with memory mapping and draw the final diagram with address decoder. **(06 Marks)**

OR

6 a. With block diagram, explain 8255 and write control word register format for P_A output, P_B input in mode 0. **(06 Marks)**

b. Write an ALP to read P_B and check number of one's in a given 8 bit data at P_B and display FFh on P_A if it is even parity else 00h on P_A if it is odd parity. **(05 Marks)**

c. Write a program using string instructions to accept a string from keyboard and check for palindrome and accordingly display appropriate message. **(05 Marks)**

Module-4

7 a. Compare microprocessor with microcontroller. **(04 Marks)**

b. Explain the programmer's model of ARM processor with complete register sets available. **(04 Marks)**

c. With diagram explain the various blocks in a 3 stage pipeline of ARM processor organization. **(04 Marks)**

d. Explain registers used under various modes. **(04 Marks)**

OR

8 a. Explain the structure of ARM cross development tool kit. **(06 Marks)**

b. Describe the various modes of operation of ARM processor. **(05 Marks)**

c. Explain the various fields in Current Program Status Register (CPSR). **(05 Marks)**

Module-5

9 a. Explain the syntax with example the following instructions of ARM processor (i) MVN, (ii) RSB, (iii) ORR, (iv) MLA, (v) LDR. **(05 Marks)**

b. Write a program to display message "Hellow world" using ARM7 instructions. **(04 Marks)**

c. Explain various formats of add instructions based on operands of ARM7 processor. **(04 Marks)**

d. If $r_5 = 5$, $r_7 = 8$ and using the following instruction, write values of r_5, r_7 after execution MOV r_7, r_5, LSL # 2. **(03 Marks)**

OR

10 a. Explain software interrupt instruction of ARM processor. **(04 Marks)**

b. Explain various types of multiply instructions with syntax and example. **(04 Marks)**

c. What are the salient features of ARM instruction set? **(05 Marks)**

d. If $r_1 = 0b1111$, $r_2 = 0b0101$, find r_0 after BIC r_0, r_1, r_2. **(03 Marks)**

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CBCS Scheme

USN | | | | | | | | | | |

15CS44

Fourth Semester B.E. Degree Examination, June/July 2017
Microprocessors and Microcontrollers

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain execution unit (EU) and Bus interface unit (BIU) of 8086 µp with a neat diagram. **(08 Marks)**

b. Explain the different addressing modes used in 8086 µp with suitable example. **(08 Marks)**

OR

2 a. Explain all bits of flag register of 8086µp with a neat diagram. Show the setting and resetting of flag bits with a suitable example. **(06 Marks)**

b. Write an assembly level program (ALP) to add two bytes of data stored at data 1 and data 2 and save the result in sum with comments. Indentify all the directives found in the program. **(06 Marks)**

c. Show the memory dump for the following data section or data segment. **(04 Marks)**

```
                DATA
                ORG   0010H
DATA 1    DB    25
DATA 2    DB    10001001B
DATA 3    DB    12H
                ORG   0020H
DATA 4    DB    '2591'
                ORG   0030H
DATA 5    DW    9, 2, 7, 0CH, 00100000B, 5
                ORG   0040H
DATA 6    DW    4 DUP (00H)
```

Module-2

3 a. Explain Rotate instructions with suitable example. **(06 Marks)**

b. With a suitable program show how a packed BCD value is converted to ASCII value. **(04 Marks)**

c. Assume that there is a class of five people. With following grades: 69, 87, 96, 45, 75. Write an ALP to find the highest grade. **(06 Marks)**

OR

4 a. Write on ALP that adds the following two multiword numbers and saves the result:
Data 1 = 548FB9963CE7H and
Data 2 = 3FCD4FA23B8DH **(08 Marks)**

b. Write an ALP to perform the following :
i) Clear the screen
ii) Set the cursor at row 8 and column 5 of the screen.
iii) Prompt "There is a message for you from VTU : to read it enter Y. If the user enters 'Y' or 'y' then the message "Hello! All the best for your exams" will appear on the screen. If the user enters any other key, then the prompt "No more messages for you" should appear on the next line. **(08 Marks)**

Module-3

5 a. Explain handling of overflow problem arised in addition of signed numbers with a suitable example. **(06 Marks)**

b. Explain XLAT instruction with example. **(04 Marks)**

c. Explain 74138 decoder configuration to enable the memory address F0000H to F7FFFH to connect four 8k RAMS. **(06 Marks)**

OR

6 a. Briefly explain the control word format of 8255 in I/O mode and BSR mode. Find the control word if PA = out, PB = in, PC0 – PC3 = in and PC4 – PC7 = out. Use port addresses of 300H – 303H for the 8255 chip. Then get data from port B and send it to port A. **(08 Marks)**

b. Assume that we have 4 bytes of hexadecimal data: 25H, 62H, 3FH and 52H.
   i) Find the checksum byte
   ii) Perform the checksum operation to ensure data integrity.
   iii) If the second byte 62H had been changed to 22H. Show how checksum detects the error. **(08 Marks)**

Module-4

7 a. Differentiate between RISC and CISC processors. **(06 Marks)**

b. Explain ARM core data flow model with a neat diagram. **(06 Marks)**

c. Discuss briefly how coprocessors can be attached to ARM processor. **(04 Marks)**

OR

8 a. Explain the architecture of a typical embedded device based on ARM core with a neat diagram. **(08 Marks)**

b. Explain the concept of pipeline and interrupts used in ARM processor. **(08 Marks)**

Module-5

9 a. Explain the following instructions of ARM processor with suitable example.
i) MLA ii) QADD iii) SMULL iv) LSL. **(08 Marks)**

b. Write an ALP to copy a block of data (Block 1) to another block (Block 2) using ARM instructions. **(08 Marks)**

OR

10 a. Write an ALP using ARM instructions that calls subroutine fact to find factorial of a given number. **(08 Marks)**

b. Write short notes on memory access and branch instructions of ARM controller. **(08 Marks)**

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CBCS Scheme

USN | | | | | | | | | | |

15CS45

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Object Oriented Concepts

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. List out the difference between procedure oriented program and object oriented program. **(05 Marks)**

b. Explain function overloading with example. **(05 Marks)**

c. What is constructor? List the different type of constructors and explain default constructor with example. **(06 Marks)**

OR

2 a. Explain the concept of object oriented program
i) Encapsulation
ii) Polymorphism
iii) Inheritance
iv) Data initialization. **(08 Marks)**

b. Explain function prototyping with example. **(05 Marks)**

c. How do namespace help in preventing pollution of the global name space? **(03 Marks)**

Module-2

3 a. Explain how java is robust and interactive. **(05 Marks)**

b. Write java program to sum only first five elements of the array using for each looping. **(05 Marks)**

c. Explain the operation of the following operators with example.
i) % ii) > > > iii) && **(06 Marks)**

OR

4 a. Write java program to initialize and display different types of integer and floating point variables. **(06 Marks)**

b. What is type casting? Illustrate with an example. What is meant by automatic type promotion? **(06 Marks)**

c. How to declare two dimensional arrays in java? Explain with simple example. **(04 Marks)**

Module-3

5 a. Describe the various levels of access protections available for packages and their implications. **(08 Marks)**

b. Give the basic form of an exception handling block. **(04 Marks)**

c. What is the importance of the clause finally? **(04 Marks)**

OR

6 a. Define inheritance. List the different types of inheritance. **(05 Marks)**

b. Illustrate with example a super class variable can reference a subclass object. **(06 Marks)**

c. Compare and contrast method overloading and overriding. **(05 Marks)**

Module-4

7 a. What is Thread? Explain two ways of creation of thread. **(05 Marks)**
b. What is synchronization? When do we use it? **(05 Marks)**
c. Explain keyEvents and mouseEvent class. **(06 Marks)**

OR

8 a. Explain Delegation event model used to handle events in java. **(08 Marks)**
b. Explain the role of synchronization with producer and consumer problem. **(08 Marks)**

Module-5

9 a. What is an applet? Explain five main methods of applet. **(08 Marks)**
b. Explain with syntax the following :
i) JLabel
ii) JTextField
iii) JButton
iv) JCheckBox **(08 Marks)**

OR

10 a. Create swing applet that has two buttons named beta and gamma. When either of the buttons pressed, it should display "beta pressed" and "gamma was pressed" respectively. **(08 Marks)**
b. Explain getDocumentbase and getCodebase in applet class. **(08 Marks)**

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CBCS Scheme

USN | | | | | | | | | | |

15CS45

Fourth Semester B.E. Degree Examination, June/July 2017
Object Oriented Concepts

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. How do name space helps in preventing pollution of the global namespace. **(04 Marks)**

b. What is function polymorphism? Write a program in C++ using overloaded function area to find area of circle, triangle and rectangle. **(06 Marks)**

c. Explain how one can bridge two classes using friend function. Write a C++ program to find the sum of two numbers using bridge friend function add(). **(06 Marks)**

OR

2 a. Can you overload constructor and destructor? Justify with suitable program. **(06 Marks)**

b. What is reference variable? Explain. Also write a program in C++ to swap two int values and display the values before and after swapping. **(05 Marks)**

c. What are static member of a class? Write a C++ program to count the number of objects created. **(05 Marks)**

Module-2

3 a. How "compile once and run anywhere" is implemented in JAVA? Discuss. **(04 Marks)**

b. Write a program to calculate the average among the elements {8, 6, 2, 7} using for each in Java. How for each is different from for loop? **(06 Marks)**

c. Explain type conversion, with an example. **(06 Marks)**

OR

4 a. List and explain the java buzzwords. **(08 Marks)**

b. Explain the concepts of arrays in Java with examples. Also write a program that creates and initializes a four integer elements array. Find the sum and average of its values. **(08 Marks)**

Module-3

5 a. Briefly explain the role of interfaces while implementing multiple inheritances in Java. **(06 Marks)**

b. Compare and contrast method overloading and method overriding with suitable examples **(06 Marks)**

c. When constructors are called in the class hierarchy? **(04 Marks)**

OR

6 a. With example, give two uses of super. **(05 Marks)**

b. Define exception. Write a program which contains one method which will throw IllegalAcessException and use proper exception handlers so that exception should be printed. **(06 Marks)**

c. Define package. What are the steps involved in creating user defined package with an example. **(05 Marks)**

Module-4

7 a. How synchronization can be achieved for threads in Java? Explain with syntax. **(06 Marks)**
b. Explain the adaptor class with an example. **(04 Marks)**
c. With the syntax explain the use of isAlive( ) and Join( ) methods. **(06 Marks)**

OR

8 a. What are the differences between suspending and stopping the threads? **(05 Marks)**
b. Discuss delegation event model with suitable examples. **(06 Marks)**
c. Explain inner class with example. **(05 Marks)**

Module-5

9 a. What are the two types of applets? Explain the skeleton of an apple. Enlist applet tags. **(06 Marks)**
b. Write steps to create JTable, also write a program to demonstrate the same. **(05 Marks)**
c. Explain the applet architecture and demonstrate how to pass parameters for font size and font name in applets. **(05 Marks)**

OR

10 a. Explain briefly the components and containers used in swings. **(05 Marks)**
b. Explain JLabel and ImageIcon with program. **(06 Marks)**
c. What are applets? Explain different stages in the lifecycle of an applet. **(05 Marks)**

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CBCS Scheme

USN | | | | | | | | | | 15CS46

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Data Communication and Networking

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define data communication. Explain the fundamental characteristics of a data communication system. With a neat diagram, explain the components of data communication. **(06 Marks)**

b. Explain TCP/IP protocol suite of computer networks with a neat diagram. **(08 Marks)**

c. Assume that five devices are connected in a mesh topology. How many duplex links are needed? How many ports are needed for each? **(02 Marks)**

OR

2 a. Explain different causes for transmission impairments during signal transmission through media. **(06 Marks)**

b. Define line coding. List out its characteristics. Represent the sequence 10100110 using polar and biphase schemes. **(08 Marks)**

c. A network with a bandwidth of 10 Mbps can pass only an average of 18000 frames per minute with each frame carrying an average of 10000 bits. What is the throughput of this network? **(02 Marks)**

Module-2

3 a. Explain with suitable diagram PCM encoder used for analog to digital conversion with example. **(08 Marks)**

b. Define multiplexing. State and explain the data rate management to handle disparity in input data rates in TDM. **(05 Marks)**

c. Four 1 Kbps connections are multiplexed together. A unit is 1 bit. Find:
i) Duration of 1 bit before multiplexing.
ii) Transmission rate of link.
iii) Duration of each time slot. **(03 Marks)**

OR

4 a. Briefly explain with neat diagrams, ASK and FSK modulation techniques and specify the bandwidth requirement. **(06 Marks)**

b. We need to send data 3 bits at a time at a bit rate of 3 Mbps. The carrier frequency is 10 MHz. Calculate the number of levels (different frequencies, band rate and band width). **(04 Marks)**

c. Explain how message can be sent from one system to another using datagram approach and calculate the total delay with appropriate diagrams. **(06 Marks)**

Module-3

5 a. Find the code word at sender site using CRC given dataword 101001111 and generator 10111. **(05 Marks)**

b. Explain different frame types in HDLC. **(06 Marks)**

c. Explain transition phases of PPP protocol. **(05 Marks)**

OR

6 a. Explain with neat diagram, simple parity check code. **(06 Marks)**
b. Explain with examples, computation of internet checksum. List the steps undertaken by sender and receiver for error detection. **(05 Marks)**
c. Explain stop-and-wait protocol with appropriate diagrams. **(05 Marks)**

Module-4

7 a. Explain working of CSMA/CD with suitable flow diagram. **(07 Marks)**
b. A network using CSMA/CD has a bandwidth of 10 Mbps. If the propagation time is 25.6 μs, what is the minimum size of the frame? **(03 Marks)**
c. Define Bluetooth and explain the architecture of the same. **(06 Marks)**

OR

8 a. Define is channelization. Explain CDMA with an example. **(06 Marks)**
b. A pure ALOHA network transmits 200 bits frames on a shared channel of 200 kbps. What is the throughput if the system produces 1000 frames per second. **(04 Marks)**
c. Discuss 802.3 MAC frame format. **(06 Marks)**

Module-5

9 a. Explain the operation of cellular telephony. **(06 Marks)**
b. Explain transition from IPV4 to IPV6. **(06 Marks)**
c. Discuss special addresses supported by IPV6. **(04 Marks)**

OR

10 a. Explain IP datagram header format with neat diagram and give the description of each field. **(08 Marks)**
b. Explain the working of mobile IP with diagram. **(08 Marks)**

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CBCS Scheme

USN | | | | | | | | | | 15CS46

Fourth Semester B.E. Degree Examination, June/July 2017
Data Communication

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. What is data communication? With a neat diagram, explain the four basic topologies. **(05 Marks)**

b. Explain TCP/IP protocol suite with Encapsulation and decapsulation concepts. **(08 Marks)**

c. Explain different characteristics of periodic analog signal. Find the phase in degree and radian of a sine wave with offset $1/4$ cycle with respect to time '0' (zero). **(03 Marks)**

OR

2 a. Draw line code of the sequence 010011 using NRZ, NRZ-L, NRZ-I, Manchester, RZ and differential Manchester schemes. **(06 Marks)**

b. Explain digital signal transmissions methods. **(06 Marks)**

c. What is noiseless channel? Find out maximum bit rate in noiseless channel with bandwidth of 3000 Hz transmitting a signal with two signal level. **(04 Marks)**

Module-2

3 a. Explain PCM and quantization process with steps and example. **(08 Marks)**

b. Explain amplitude shift keying modulation process. **(04 Marks)**

c. Find out bit rate if available bandwidth is 100 kHz which spans from 200 to 300 kHz. Consider ASK with d = 1, r = 1. **(04 Marks)**

OR

4 a. What is multiplexing? define synchronous TDM with data rate management strategies. **(08 Marks)**

b. What is spread spectrum? Explain FHSS and bandwidth sharing. **(08 Marks)**

Module-3

5 a. How does datawords and codewords is represented in block coding and also explain how can errors be selected and corrected by using block coding. **(10 Marks)**

b. Find the code word using CRC given data is 1101 and generator is 1100. **(06 Marks)**

OR

6 a. With a neat diagram, explain any two protocols of noisy channel. **(12 Marks)**

b. Explain the frame format of HDLC protocol. **(04 Marks)**

Module-4

7 a. What is channelization? List and explain the channelization protocols. **(12 Marks)**

b. Describe Gigabit Ethernet. **(04 Marks)**

OR

8 a. Describe pure ALOHA and slotted ALOHA. **(06 Marks)**

b. Explain Carrier Sense Multiple Access with Collision Detection (CSMA/CD) **(06 Marks)**

c. Define Bluetooth and its architecture. **(04 Marks)**

Module-5

9 a. Explain satellite networks and its categories. **(12 Marks)**

b. Write a short note on Fixed WiMAX. **(04 Marks)**

OR

10 a. Explain mobile IP with phases. **(12 Marks)**

b. Write a short note on IPV6 addressing. **(04 Marks)**

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