FINDEX

CONTENTS	PAGE No.
Programme Educational Objectives	2
Programme Outcomes	2
Vision and Mission	4
Short term and Long Term Goals	5
Quality Policy & Quality Objectives	6
Automotive Chassis And Suspension	7
Heat and Mass Transfer	10
Design Of Machine Elements-II	13
Automotive Transmission	15
Automotive Pollution And Control	17
Engineering Economics And Cost Estimation	19
Automotive Chassis Components Lab	22
Engine Testing And Emission Measurement Laboratory	23
Question Papers	24

B.L.D.E.A's V. P. Dr. P. G. H. College of Engineering & Technology, Bijapur

DEPARTMENT OF AUTOMOBILE ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)

I. To provide Automobile students with a solid foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze Automobile engineering problems and to prepare them for higher studies.

II. To prepare students to succeed in entry-level engineering positions within the core Automobile and allied firms in regional, national, or international industries and with government agencies.

III. To train students with good scientific and engineering breadth so as to comprehend, analyze, design and create novel Automobile products and provide solution for the real life problems**.**

IV. To inculcate in students, professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, ability to relate engineering issues to broader social context and lifelong learning needed for a successful carrier.

PROGRAMME OUTCOMES (POs)

Automobile Engineering Graduates will gain:

a) A strong foundation in core Automobile Engineering, both theoretical and applied concepts.

b) An ability to apply the knowledge of mathematics, science, and engineering to real-world problems.

c) An ability to design and conduct experiments, interpret and analyze data, and report results.

d) An ability to design an automobile/mechanical system or a thermal system or a process that meets desired specifications and requirements.

e) An ability to function on engineering and science laboratory teams, as well as on multidisciplinary design teams.

f) An ability to identify, formulate and solve automobile/mechanical engineering problems.

g) An understanding of their professional and ethical responsibilities.

h) Effective verbal and written communication skills.

i) The confidence to apply engineering solutions in global and societal contexts.

j) Capability to self-educate and clearly understand the value of life-long learning.

k) An understanding of the impact of Automobile engineering on society and demonstrate awareness of contemporary issues.

l) Familiarity with modern engineering software tools and equipment to analyze automobile engineering problems.

DEPARTMENT V I S I O N

To be a trend setting Department in the Institution; providing highly competent, efficient manpower to meet the ever-changing needs of Automobile sector.

DEPARTMENT M I S S I O N

To provide quality Technical Education and Training to the students of Automobile Engineering enabling them to excel in their professions and careers with a high degree of integrity and ethical standards.

SHORT TERM GOALS

- To improve campus recruitment of Automobile students
- To organize technical workshops, seminars and training programs for students
- To conduct faculty development programs
- To improve teaching learning process

LONG TERM GOALS

- To start PG program in Automobile Engineering
- To establish centers of excellence in Automobile field
- To establish research facilities in the Department
- To have MoUs with reputed industries

QUALITY POLICY

We at B.L.D.E.A's engineering college are committed to provide quality Technical Education and Training to students in tune with the evolving challenges and social needs through a flexible and innovative learning process, enabling the students to excel in their professions and careers with a high degree of integrity and ethical standards by continual improvement.

QUALITY OBJECTIVES

1. To measure customer satisfaction level periodically through student feedback reports, Parents feedback, student placements through campus interviews and overall success in university examinations.
2. Employer Survey and Alumni Survey will be carried out periodically to understand the achievement of program Educational Objectives (PEO's) and Program Outcomes (PO).
3. Up gradation of faculty skills through enhancement of their knowledge by upgrading the academic qualifications, through involving them in Research and development activity, seminars, educational tours etc.
4. Use of innovative teaching methods and well equipped laboratories for quality education.
5. Conformity to the regulatory requirements of AICTE,VTU & Govt. of Karnataka.

AUTOMOTIVE CHASSIS & SUSPENSION

[As per Choice Based Credit System (CBCS) scheme]

Semester: VI **Year: 2017-18**

AUTOMOTIVE CHASSIS & SUSPENSION			
Subject Code	15AU61	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	04		

Course objectives: The objectives of this course is to

1. Explain different chassis layouts and frames solve for stability and weight distribution and suitability of frames.
2. Describe, about various Front Axles, factors of wheel alignment Steering Systems and Calculate dimensions of Front Axle.
3. Discuss about various types Propeller Shaft, Differential And Rear Axles and to solve numericals.
4. Compare various types of Brakes and solve numerical.
5. Describe Various Types of Suspensions, Wheels and Tyres.
6. Calculate dimensions of different suspensions.

Module-I	
Introduction: General consideration relating to chassis layout, power location, types of automobiles, layout of an automobile with reference to power plant, weight distribution, stability, Numerical problems. **Frames:** Types of frames ,general form & dimensions, materials, frame stresses, frame sections, cross members, proportions of channel sections, constructional details, loading points, sub frames, passenger car frames, X member type frame, Box section type frame, testing of frames, bending and torsion test, effect of brake application of frame stresses, truck frames, defects, Numerical problems.	10 Hours
Module-II	
Front axle and Steering systems: Axle parts and materials, loads and stresses, centre sections, section near steering head, spring pads, front axle loads, steering heads, factors of wheel alignment, wheel balancing, centre point steering, correct steering angle, steering mechanisms, cornering force, self righting torque, under steer and over steer, Steering linkages, steering gears, special steering columns, power steering, trouble shooting, Numerical problems.	10 Hours
Module-III	
Propeller shaft Construction & types of propeller shafts, whirling of propeller shaft, universal joints, analysis of Hooke's joint- ratio of shafts velocities, maximum & minimum speeds of driven shaft, condition for equal speeds of thee driving & driven shafts,	10 Hours

angular acceleration of the driven shaft, maximum fluctuation of speed, double Hooke's joint, Numerical problems. **Final drive** Construction details, types. **Differential** Principle, types of differential gears, conventional and non-slip differentials, backlash, differential lock, inter-axle differential, transaxle types. **Rear axle** Torque reaction, driving thrust, Hotchkiss drive, torque tube drive, construction of rear axle shaft supporting- fully floating and semi floating arrangements axle housings, trouble shooting, numericalproblems.	
Module-IV	
Brakes Necessity, stopping distance and time, brake efficiency, weight transfer, brake shoe theory, determination of braking torque, classification of brakes, types, construction, function, operation, braking systems - mechanical, hydraulic, disc, drum, details of hydraulic system, mechanical system and components, types of master & wheel cylinders, bleeding of brakes, brake drums, brake linings, brake fluid, factors influencing operation of brakes such as operating temperature, lining, brake clearance, pedal pressure, linkages etc, Brake compensation, Parking and emergency brakes, hill holder, automatic adjustment, servo brakes, Power brakes-Air brakes, vacuum brakes and electric brakes and components brake valve, unloaded valve, diaphragm, airhydraulic brakes, vacuum boosted hydraulic brakes, trouble shooting,Numerical problems.	10 Hours
Module-V	
Suspension: Objects, basic considerations, Types of suspension springs, construction , operation & materials, leaf springs, coil springs, torsion bar, rubber springs, plastic springs, air bellows or pneumatic suspension, hydraulic suspension, constructional details of telescopic shock absorbers, independent suspension, front wheel independent suspension, rear wheel independent suspension, types, stabilizer, trouble shooting, Numerical problems. **Wheels and Tyres:** Types of wheels, construction, structure and function, wheel dimensions, structure and function of tyres, static and dynamic properties of pneumatic tyres, types of tyres, materials, tyre section & designation, factors affecting tyre life, quick change wheels, special wheels, trouble shooting.	10 Hours
Course outcomes: After completion of above course, students will be able to 1. Explain different chassis layouts and frames and solve for stability and weight distribution and suitability cross sections for frames. 2. Describe various Front Axles, factors of wheel alignment Steering Systems and Calculate	

dimensions of Front Axle.
3. Describe various types Propeller Shaft, Differential and Rear axles and can find dimensions of these components.
4. Select type of brake required to given application and will be able to calculate basic dimension of brakes.
5. Describe, About Various Types of Suspensions, Wheels and Tyres.
6. Calculate dimensions of different suspensions.

Question paper pattern:
1. The question paper will have ten questions.
2. Each full question consists of 16 marks.
3. There will be 2full questions (with a maximum of four sub questions) from each module.
4. Each full question will have sub questions covering all the topics under a module.
5. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:
1. Automotive Chassis- Heldt .P. M, Chilton Co., (Nyack, N.Y., P.M. Heldt, 1945) Literary Licensing, LLC, 2012.
2. Automotive Mechanics- N.K. Giri, 8th Edition , Khanna Publications, New Delhi,2008.

Reference Books:
1. Automobile Engineering Vol. I- Kirpal Singh, 12th edition, Standard publications, New Delhi, 2009.
2. Automobile Engineering - K. K. Ramalingam, Scitech Publication, Chennai – 2011.
3. Automotive chassis and body- P. L. Kohli, TMH.
4. Steering, Suspension and Tyres- Giles. J. G,Iiiffe Book Co., London- 1988.
5. Automotive Chassis and Body- Crouse W. H., McGraw-Hill, New York- 1971.
6. Automobile Engineering -T.R. Banga&Nathu Singh, Khanna Publications, 1993.
7. Introduction to Automobile Engineering - N.R. Khatawate, Khanna pub. New Delhi.

HEAT AND MASS TRANSFER

[As per Choice Based Credit System (CBCS) scheme]

Semester: VI **Year: 2017-18**

HEAT AND MASS TRANSFER			
Subject Code	15AU62	IA Marks	20
Number of Lecture Hours/Week	04 +1T	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	04		

Course objectives: The objectives of this course is to

1. Explain fundamental principles and laws of conduction, convection and radiation modes of heat transfer.
2. Analyze one dimensional steady state heat transfer.
3. Analyze one dimensional one dimensional unsteady state heat transfer.
4. Analyze one dimensional forced convection heat transfer problems.
5. Analyze one dimensional free convection heat transfer problems.
6. Analyze one dimensional application like flow over flat plate etc.
7. Introduce basic principle of heat exchanger analysis and thermal design.
8. Apply laws of radiation heat transfer to solve engineering problems.

Module-I	
Introductory concepts: Modes of heat transfer: Basic laws governing conduction, convection, and radiation heat transfer; Thermal conductivity; convective heat transfer coefficient; radiation heat transfer; combined heat transfer mechanism. Boundary conditions of 1st, 2nd and 3rd Kind, Conduction: Derivation of general three dimensional conduction equation in Cartesian coordinate, special cases, discussion on 3-D conduction in cylindrical and spherical coordinate systems. (No derivation). One dimensional conduction equations in rectangular, cylindrical and spherical coordinates for plane and composite walls. Overall heat transfer coefficient. Thermal contact resistance, Numerical problems and Mathematical formulation.	10 Hours
Module-II	
Variable thermal conductivity Derivation for heat flow and temperature distribution in plane wall. Critical thickness of insulation without heat generation, Heat transfer in extended surfaces of uniform cross-section without heat generation, Long fin, and short fin with insulated tip and without insulated tip and fin connected between two heat sources. Fin efficiency and effectiveness. Numerical problems. **One-dimensional transient conduction** Conduction in solids with negligible internal temperature gradient (Lumped system analysis), Use of Transient temperature charts (Heisler's charts) for transient conduction in slab, long cylinder and sphere; use of transient temperature	10 Hours

charts for transient conduction in semi-infinite solids. Numerical Problems	
Module-III	
Concepts and basic relations in boundary layers: Flow over a body velocity boundary layer; critical Reynolds number; general expressions for drag coefficient and drag force; thermal boundary layer; general expression for local heat transfer coefficient; Average heat transfer coefficient; Nusselt number. Flow inside a duct- velocity boundary layer, hydrodynamic entrance length and hydro dynamically developed flow; flow through tubes (internal flow)(discussion only). Numericals based on empirical relation given in data handbook **Free or Natural Convection:** Application of dimensional analysis for free convection- physical significance of Grashoff number; use of correlations free convection from or to vertical, horizontal and inclined flat plates, vertical and horizontal cylinders and spheres, Numerical problems. **Forced Convections:** Applications of dimensional analysis for forced convection. Physical significance of Reynolds, Prandtl, Nusselt and Stanton numbers. Use of various correlations for hydro dynamically and thermally developed flows inside a duct use of correlations for flow over a flat plate, over a cylinder and sphere. Numerical	10 Hours
Module-IV	
Heat Exchangers: Classification of heat exchangers; overall heat transfer coefficient, fouling and fouling factor; LMTD, Effectiveness-NTU methods of analysis of heat exchangers. Numerical problems. **Condensation and Boiling:** Types of condensation (discussion only) Nusselt's theory for laminar condensation on a vertical flat surface; use of correlations for condensation on vertical flat surfaces, horizontal tube and horizontal tube banks; Reynolds number for condensate flow; regimes of pool boiling pool boiling correlations. Numericals.	10 Hours
Module-V	
Thermal radiation: Definitions of various terms used in radiation heat transfer; Stefan-Boltzman law, Kirchoff's law, Planck's law and Wein's displacement t law. Radiation heat exchange between two parallel infinite black surfaces, between two parallel infinite gray surfaces; effect of radiation shield; intensity of radiation and solid angle; Lambert's law; radiation heat exchange between two finite surfaces-configuration factor or view factor. Numerical problems.	10 Hours
Course outcomes: After completion of above course, students will be able to 1. Demonstrate fundamental principles and laws of conduction, convection and radiation modes of heat transfer. 2. Analyze one dimensional steady state heat transfer.	

3. Analyze one dimensional one dimensional unsteady state heat transfer.
4. Analyze one dimensional forced convection heat transfer problems.
5. Analyze one dimensional free convection heat transfer problems.
6. Analyze one dimensional application like flow over flat plate etc.
7. Introduce basic principle of heat exchanger analysis and thermal design.
8. Apply laws of radiation heat transfer to solve engineering problems.

Question paper pattern:

1. The question paper will have ten questions.
2. Each full question consists of 16 marks.
3. There will be 2full questions (with a maximum of four sub questions) from each module.
4. Each full question will have sub questions covering all the topics under a module.
5. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Heat transfer, by P.K. Nag, Tata McGraw Hill 2002.
2. Heat transfer-A basic approach, by Ozisik, Tata McGraw Hill 2002.

Reference Books:

1. Heat transfer, a practical approach-Yunus A- Cengel Tata McGraw Hill.
2. Principles of heat transfer by Kreith Thomas Learning 2001.
3. Fundamentals of heat and mass transfer by Frenk P. Incropera and David P. Dewitt, John Wileyand son's.
4. 4.Heat& Mass transfer-Tirumaleshwar,Pearson education 2006.

DESIGN OF MACHINE ELEMENTS -II

[As per Choice Based Credit System (CBCS) scheme]

Semester: VI **Year: 2017-18**

DESIGN OF MACHINE ELEMENTS -II			
Subject Code	15AU63	IA Marks	20
Number of Lecture Hours/Week	04 +1T	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	04		

Course objectives: The objectives of this course is to

1. Describe the basic types of curved beams and springs.
2. Analyze the stresses in the critical section of a curved beam.
3. Illustrate the design procedure to arrive at the proper specifications of springs/gears/clutches.
4. Select suitable size, module & type of gears for a required velocity ratio.
5. Calculate the dimensions and suggest suitable materialsfor Gears.
6. Define the terminology of gears and springs.
7. Demonstrate the suitability of a type and class of lubricant for a specific application.

Module-I	
Bending stresses in curved beams: Introduction, Analysis of stresses in curved beams, stresses in beams of standard cross sections. **Springs** Introduction, types of springs, terminology, stresses and deflection in helical coil springs of circular and non-circular cross sections, springs under fluctuating loads, concentric springs. Leaf Springs: stresses in leaf springs, equalized stresses, length of spring leaves.	10 Hours
Module-II	
Spur & helical gears: Introduction, spur gears, standard proportions of gear systems, stresses in gear tooth, Lewis equation and form factor, design for strength, dynamic load and wear load. Helical Gears: definitions, formative number of teeth, design based on strength, dynamic and wear loads.	10 Hours
Module-III	
Bevel and Worm Gear: Terminology, formative number of teeth, design based on strength, dynamic and wear loads. Worm Gears: terminology, design based on strength, dynamic, wear loads and efficiency of worm gear drives.	10 Hours
Module-IV	
Clutches &Brakes: Introduction, types of clutches, design of Clutches (single plate, multi plate	10 Hours

clutches). Brakes, energy absorbed by a brake, heat dissipated during braking, single block brakes and simple band brakes.	
Module-V	
Sliding bearings: Introduction, principle of hydro dynamic lubrication, assumptions in hydrodynamic lubrication, bearing characteristic number and modulus, Sommerfeld number, coefficient of friction, power loss, heat Generated and heat dissipated, selection of lubricant, grease, bearing failure- causes and remedies, design of journal bearings. **Rolling contact bearings:** Types of bearings, Principleof self-aligning, static equivalent load, dynamic load rating,bearing life, selection of ball and roller bearings, advantages and disadvantages of ball, roller and needle bearings, lubrication of bearing.	10 Hours
Course Outcomes: After completion of above course, students will be able to 1. Design the curved beams using the equations of stress. 2. Design helical spring and leaf spring using the equations of stress and deflection. 3. Design the spur gears and helical gears using different parameters and check the gears for dynamic and wear load. 4. Design the various types of bevel gears and worm gears for dynamic and wear load using various parameters. 5. Design sliding contact and rolling contact bearings to find coefficient of friction, heat generated, heat dissipated and average life of bearings. 6. Analyze and design given machine components and present their designs in the form of a Report.	
Question paper pattern: 1. The question paper will have ten questions. 2. Each full question consists of 16 marks. 3. There will be 2full questions (with a maximum of four sub questions) from each module. 4. Each full question will have sub questions covering all the topics under a module. 5. The students will have to answer 5 full questions, selecting one full question from each module.	
Design Data Hand Books: 1. Design Data Hand Book by K. Mahadevan and K.Balaveera Reddy, CBS, Publication. 2. Design Data Hand Book – K. Lingaiah, McGraw Hill, 2nd Ed. 2003. **Text Books:** 1. Mechanical Engineering Design- Joseph E Shigley and Charles R. Mischke McGraw Hill International edition, 2003. 2.Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., NewDelhi, 2nd Edition 2007.	
Reference Books: 1. Machine Design- Robert L. Norton, Pearson Education Asia, 2001. 2. Mechanical Engineering Design-Joseph E Shigley and Charles R. Mischke, McGraw Hill Internationaledition, 6th Edition 2003. 3. Machine Design-Hall, Holowenko, and Laughlin (Schaum's Outlines series) Adapted by S. K. Somani,Tata McGraw Hill Publishing Company Ltd. 4. Machine Design-II-J.B.K. Das, SapnaBook House, Bangalore.	

AUTOMOTIVE TRANSMISSION

[As per Choice Based Credit System (CBCS) scheme]

Semester: VI **Year: 2017-18**

AUTOMOTIVE TRANSMISSION			
Subject Code	15AU64	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	04		

Course objectives: The objectives of this course is to

1. Explain the Constructional, design and working principles of different types of clutches.
2. Explain the constructional and working principle of different types of fluid flywheel, torque converter and one way clutches.
3. Explain the constructional and working principle of different types of gear box.
4. Determine the gear ratio, speed of vehicle and number of teeth on driving and driven gears.
5. Explain the constructional and principle of operation of different types epicyclic gear box, Calculationof gear ratio for epicyclic gear box.
6. Explain the necessity, advantages, constructional and principle of operation of different types of automatic transmissions and hydraulic control.

Module-I	
Clutch: Necessity of clutch in an automobile, requirements of a clutch, Clutch materials, clutch lining,different types of clutches, friction clutches-Single plate clutch, multi plate clutch, cone clutch, centrifugal clutch, electromagnetic clutch, hydraulic clutches,Vacuum operated clutch, Clutch adjustment, Clutch troubles and their causes, Numerical problems.	10 Hours
Module-II	
Fluid Coupling & One way clutches: Constructional details of various types, percentage slip, one way clutches (Over running clutch) like sprag clutch, ball and roller one way clutches, necessity and field of application, working fluid requirements, fluid requirements, fluid requirements and fluid coupling characteristics. **Hydrodynamic Torque converters:** Introduction to torque converters, comparisons characteristics, slip, principles of torque multiplication, 3 and 4 phase torque converters, typical hydrodynamic transmission.	10 Hours
Module-III	
Power Required for Propulsion: Various Resistances to Motion of the Automobile, Traction, tractive effort Performance curves, acceleration gradeability, drawbar pull, Numerical Problems. **Transmission:** The need for transmissions, Necessity of gear box, Calculation of gear ratios for vehicles, Performance characteristics in different gears , Desirable ratios of 3speed & 4speed gear boxes, Constructional details of - Sliding-mesh gear box, Constant-mesh gear box, Synchromesh gear box, auxiliary transmissions, compound transmissions, numerical problems.	10 Hours

Module-IV	
Epicyclic Transmission: Principle of operation, types of planetary transmission, Calculation of gear ratio in different speeds, Wilson planetary transmission, Ford-T model gear box , Pre selective mechanism, Vacuum control, pneumatic control, hydraulic control in the planetary gear system , Over drives , Numerical problems.	10 Hours
Module-V	
Hydrostatic Drives: Principles of hydrostatic drives, different systems of hydrostatic drives, constant displacement pump and constant displacement motor, variable displacement pump and constant displacement motor and variable displacement motor, variable displacement pump and variable displacement motor, applications, plunger type pump and plunger type motor, advantages and limitations, typical hydrostatic drives, hydrostatic shunt drives. **Automatic transmission:** Principle, general description and Working of representative types like Borge-warner, 4-speed and 6-speed automatic transmission longitudinally mounted four speed automatic transmission, hydramatic transmission, the fundamentals of a hydraulic control system, basic four speed hydraulic control system.	10 Hours
Course outcomes: After completion of above course, students will be able to 1. Explain the Constructional, design and working principles of different types of clutches. 2. Explain the constructional and working principle of different types of fluid flywheel, torque converter and one way clutches. 3. Explain the constructional and working principle of different types of gear box. 4. Determine the gear ratio, speed of vehicle and number of teeth on driving and driven gears. 5. Explain the constructional and principle of operation of different types epicyclic gear box, Calculate gear ratio for epicyclic gear box . 6. Explain the necessity and advantages of automatic transmission. 7. Explain the constructional and principle of operation of different types of automatic transmissions and hydraulic control.	
Question paper pattern: 1. The question paper will have ten questions. 2. Each full question consists of 16 marks. 3. There will be 2full questions (with a maximum of four sub questions) from each module. 4. Each full question will have sub questions covering all the topics under a module. 5. The students will have to answer 5 full questions, selecting one full question from each module.	
Text books: 1. Automotive Mechanics-N.K. Giri,Khanna Publication, New Delhi, 2014. 2. Advanced Vehicle Technology, Heinz Heisler, 2002.	
Reference books: 1. Automotive Transmissions and Power trains- Crouse W.H., McGraw Hill Co. 5thedn, 1976. 2. Motor Vehicle- Newton K and Steeds. W., Butter Worth's & Co. Publishers Ltd, 1997. 3. Automobile Engineering –. Vol.1- Kirpal Singh, Standard Pub. 2011. 4. Automobile Engineering- G. B. S. Narang, Khanna publication, New Delhi. 5. Automotive mechanics - Joseph I Heitner, Affiliated East West Press, NewDelhi. 6. Fundamentals of Automatic Transmission - William HasselBee. 7. Torque converters- P.M. Heldt,, Oxford & IBH, 1975.	

AUTOMOTIVE POLLUTION AND CONTROL

[As per Choice Based Credit System (CBCS) scheme]

Semester: VI **Year: 2017-18**

AUTOMOTIVE POLLUTION AND CONTROL			
Subject Code	15AU654	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
Credits	03		

Course objectives: The objectives of this course is to

1. Explain air pollution and pollutants, their sources & their effects.
2. Describe different parameters responsible for pollutant formation.
3. Choose instruments for pollution measurements.
4. Analyze measurement of pollutants.

Module-I	
Laws and regulations: Historical background, regulatory test procedure (European cycles), Exhaust gas pollutants (European rail road limits), particulate pollutants, European statutory values, inspection of vehicle in circulation (influence of actual traffic conditions and influence of vehicle maintenance). **Effect of air pollution:** Effect of air pollution on Human Health, Effect of air pollution on animals, Effect of air pollution on plants.	08 Hours
Module-II	
Mechanism of pollutant formation in Engines: **Nitrogen oxides:** Formation of nitrogen oxides, kinetics of NO formation, formation of NO2, NO formation in spark ignition engines, NOx formation, in compression ignition engines. **Carbon monoxide:** Formation of carbon monoxide in SI and CI Engines. **Unburned Hydrocarbons:** Back ground, flame quenching and oxidation fundamentals, HC emissions from spark ignition engines, HC emission mechanisms in diesel engines. **Particulate emissions:** Spark ignition engine particulates, characteristics of diesel particulates, soot formation fundamentals, soot oxidation. **Crankcase emissions, piston ring blow by, evaporative emissions.**	08 Hours
Module-III	
Pollution control techniques: Pollution control measures inside SI Engines & lean burn strategies, measures in engines to control Diesel Emissions Pollution control in SI & CI Engines, Design changes, optimization of operating factors and Exhaust gas recirculation, fuel additives to reduce smoke &	08 Hours

particulates, Road draught crankcase ventilation system, positive crankcase ventilation system, fuel evaporation control. **Influence of Fuel Properties** Effect of petrol, Diesel Fuel, Alternative Fuels and lubricants on emissions.	
Module-IV	
Post combustion Treatments: Available options, physical conditions & exhaust gas compositions before treatment, Catalytic mechanism, Thermal Reactions, Installation of catalyst in exhaust lines, catalyst poisoning, catalyst light-off, NOx treatment in Diesel Engines, particulate traps, Diesel Trap oxidizer.	08 Hours
Module-V	
Sampling procedures: Combustion gas sampling: continuous combustion, combustion in a cylinder Particulate sampling: soot particles in a cylinder, soot in exhaust tube, Sampling Methods-sedimentations, and filtration, and impinge method selectrostatic precipitation thermal precipitation, centrifugal methods, determination of mass concentration, analytical methods- volumetric gravimetric-calorimetric methods etc. **Instrumentation for pollution measurements:** NDIR analyzers, Gas chromatograph, Thermal conductivity and flame ionizationdetectors, Analyzers for NOx, Orsat apparatus, Smoke measurement, comparison method, obscuration method, ringelmann chart, Continuous filter type smoke meter, Bosch smoke meter, Hart ridge smoke meter.	08 Hours
Course outcome: After completion of above course, the student will be able to 1. Explain air pollution and pollutants, their sources & their effects. 2. Describe different parameters responsible for pollutant formation. 3. Choose instruments for air pollution measurement. 4. Analyze measurement of pollutants.	
Question paper pattern: 1. The question paper will have ten questions. 2. Each full question consists of 16 marks. 3. There will be 2full questions (with a maximum of four sub questions) from each module. 4. Each full question will have sub questions covering all the topics under a module. 5. The students will have to answer 5 full questions, selecting one full question from each module.	
Text Books: 1. Automobiles and pollution - Paul degobert (SAE) **2.** Internal combustion engine fundamentals-John B. Heywood, McGraw Hill Book publications, 1998.	
Reference Books: 1. Internal combustion engines-V. Ganesan, Tata McGraw Hill Book Company, 1995. 2. Automotive Emission Control- Crouse William, Gregg Division /McGraw-Hill. 1980. 3. Combustion Generated Air Pollutions - Ernest, S., Starkman, Plenum Press, 1980. 4. Engine emissions, Pollutant Formation and Measurement- George, Springer and Donald J.Patterson,, Plenum press, 1972. 5. Internal Combustion Engines and Air Pollution- Obert, E.F.,Intext Educational Publishers, 1980.	

ENGINEERING ECONOMICS AND COST ESTIMATION

[As per Choice Based Credit System (CBCS) scheme]

Semester: VI **Year: 2017-18**

ENGINEERING ECONOMICS AND COST ESTIMATION			
Subject Code	15AU661	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
Credits	03		

Course objectives: The objectives of this course is to

1. Explain method to Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
2. Explain evaluation of payback period and capitalized cost on one or more economic alternatives.
3. Describe method to Carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives
4. Discuss Preparation of cost estimation report for any project.
5. Describe to evaluate cost accounting, replacement analysis.

Module-I	
Introduction Definition of various economic terms such as economic goods, utility, value, price, wealth, wants capital, rent and profit, Laws of returns **Demand and supply & wages** Law of diminishing utility and total utility. Demand Schedule, Law of demand. Elasticity of demand, Law of substitution, Law of supply, supply schedule, elasticity of supply. Nominal and real wages, Factors affecting real wages, theory of wages, Difference in wages, methods of wage payment	08 Hours
Module-II	
Money and exchange Theory of exchange, Barter, stock exchange, Speculation money qualities of a good money, function of a money, classification of money, value of money, index number, appreciation and depreciation of money value, Gresham's Law and its limitations **Taxation and insurance** Principle of taxation, characteristics of a good taxation system, kinds of taxes, and their merits and demerits, Vehicle Insurance, Loss Assessment.	08 Hours
Module-III	
Interest and depreciation Introduction, theory of interest, interest rate, interest from lender's and borrower's view point, simple and compound interest. Nominal and effective interest rates, interest formulae annual compounding, annual payments and continuous compounding annual payment, simplenumerical problems. Need for depreciation, causes of depreciation life and salvage value methods of depreciation, simple numerical problems.	08 Hours

Module-IV	
Costs: Standard costs estimated cost, First cost, Fixed cost, Variable costs, Incremental cost, Differential cost, Sunk and marginal cost, Breakeven and minimum cost analysis, simple numerical problems. **Cost Accounting:** Introduction, objectives of cost accounting, elements of cost material cost, labour cost, and expenses, allocation of overheads by different methods, simple numerical problems.	08 Hours
Module-V	
Book Keeping and accounts: Introduction, Necessity of book keeping, single entry and double entry system, Classification of assets, Journal, Ledger, Trial balance, Final accounts, trading, profit and loss account, Balance sheet, Numerical **Cost Estimation:** Introduction, importance, objectives and functions of estimating, principle factors in estimating, Functions and qualities of an estimator, estimating procedure. Estimation of material cost and manufacturing cost of simple automotive components, Estimation of cost of overhauling and servicing of automotive components - cylinder, valves, valve seats, crankshaft, FIP, Brake drum, body building, different types of repairs.	08 Hours

Course outcomes:

After completion of above course, the student will be able to

1. Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
2. evaluate payback period and capitalized cost on one or more economic alternatives.
3. Carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives
4. Prepare a cost estimate for any project.
5. Perform and evaluate cost accounting, replacement analysis

Question paper pattern:

1. The question paper will have Ten questions.
2. Each full question consists of 16 marks.
3. There will be 2full questions (with a maximum of four sub questions) from each module.
4. Each full question will have sub questions covering all the topics under a module.
5. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Engineering Economics, Tara Chand, Nem Chand and Brothers, Roorkee
2.Engineering Economy, Thuesen, G. J. and Fabrycky, W. J., Prentice Hall of India Pvt. Ltd.
3. Mechanical Estimating and Costing, T. R. Banga and S. C. Sharma, Khanna Publishers, Delhi

Reference Books:

1. Industrial Organization and Engineering Economics- T. R. Banga and S. C. Sharma, KhannaPublishers, New Delhi
2. Mechanical Estimating and Costing- D. Kannappan et al., Tata McGraw Hill Publishing CompanyLtd., New Delhi
3.A Text Book of Mechanical Estimating and Costing-O.P. Khanna, DhanpatRaiPublications Pvt.Ltd., New Delhi
4. Industrial Engineering and Management- O. P. Khanna, DhanpatRai and Sons, New Delhi
5. Financial Management-I. M. Pandey, Vikas Publishing House Pvt. Ltd., New Delhi
6. Engineering Economics-James L. Riggs, David D. Bedworth and Sabah U. Randhawa, Tata McGraw-Hill Publishing Co. Ltd., New Delhi

AUTOMOTIVE CHASSIS COMPONENTS LAB

[As per Choice Based Credit System (CBCS) scheme]

Semester: VI **Year: 2017-18**

AUTOMOTIVE CHASSIS COMPONENTS LAB			
Subject Code	15AUL 67	IA Marks	20
Number of Lecture Hours/Week	01I + 02P	Exam Marks	80
Total Number of Lecture Hours	39	Exam Hours	03
Credits	02		

Course objectives: the objectives of this course is to

1. Explain how to identify the various chassis frames of cars, bus (front engine & rear engine), truck and articulated vehicles.
2. List specifications of different two and four wheeled vehicles.
3. Describe procedure for Disassemble / assemble, cleaning, inspection and servicing of chassis sub-systems like suspension, clutch / gear box, final drive / differential, brake, steering and tyres / wheels.

PART-A

1. Writing technical specification of two wheeled and four wheeled vehicles (at least 10 vehicles)
2. Drawing the layouts of chassis frames of cars, bus (front engine & rear engine), truck and articulated vehicles
3. Disassembling, cleaning, inspection for wear and tear, servicing and assembling of single plate clutch and multi plate clutch. Checking the clutch springs and Clutch adjustments.
4. Disassembling, cleaning, inspection for wear and tear, servicing and assembling of different types of gear box and calculation of gear ratios.
5. Disassembling, cleaning, inspection for wear and tear, servicing and assembling of propeller shaft assembly including universal joint and slip joint.

PART-B

1. Disassembling, cleaning, inspection for wear and tear, servicing and assembling of final drive and differential.
2. Disassembling, cleaning, inspection for wear and tear, servicing and assembling of steering system and steering gears.
3. Disassembling, cleaning, inspection for wear and tear, servicing and assembling of braking system, bleeding in hydraulic brakes
4. Removing the wheels from the vehicle, inspection for wear of tyre tread, inspection of tube, vulcanizing the tube, refitting of wheel on vehicle
5. Disassembling, cleaning, inspection for wear and tear, servicing and assembling of front independent suspension, shock absorber and leaf spring suspension system

Course outcome:

At the end of this laboratory, students will be able to:

1. Identify the various chassis frames of cars, bus (front engine & rear engine), truck and articulated vehicles.
2. List specifications of different two and four wheeled vehicles.
3. Disassemble / assemble, clean, inspect and service chassis sub-systems like suspension, clutch / gear box, final drive / differential, brake, steering and tyres / wheels.

Scheme of Examination:

One Question from Part – A 30 marks
One Question from Part – B 40 marks
Viva - Voce 10 marks
Total: 80 marks

ENGINE TESTING AND EMISSION MEASUREMENT LABORATORY

[As per Choice Based Credit System (CBCS) scheme]

Semester: VI **Year: 2017-18**

ENGINE TESTING AND EMISSION MEASUREMENT LABORATORY			
Subject Code	15AUL68	IA Marks	20
Number of Lecture Hours/Week	01I + 02P	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
Credits	02		

Course objectives:the aim of this course is to

1. Explain and hands on experience for conduction of tests on various engines for determination of performance characteristics.
2. Describe procedure to Morse test on multi cylinder engine for finding FP, IP, BP.
3. Provide opportunity for conduction of tests on various engines with alternative fuels like alcohols, bio diesel for verifying their suitability for Internal combustion engines
4. Explain and hands on experience for conduction of mission tests on various engines.

Laboratory Experiments:

PART-A

1. Performance test on Single Cylinder and multi cylinder SI / CI engines
2. Study on SI and CI engines performance by changing parameters like valve timing, ignition timing, compression ratio, etc
3. Morse test on multi cylinder engine for finding FP, IP, Indicated thermal efficiency and Mechanical efficiency.
4. Study of engine performance using alternate fuels like alcohol blends/ bio diesel /LPG.

PART-B

1. Study and testing on MPFI Engine and Variable compression ratio Engine.
2. Tuning of engines using computerized engine analyzer.
3. Exhaust Emission test of S. I.Automotive engine.
4. Exhaust Emission test of C. I. Automotive engine.

Course outcome:

At the end of this laboratory, students will be able to:

1. Determination of performance characteristics of various types of engines.
2. Determine finding FP, IP, BP of multi Cylinder engines by conducting Morse test.
3. Verify suitability of various alternative fuels for internal combustion engines.
4. Conduct mission tests on various engines.

Scheme of Examination:

One Question from Part – A 30 marks
One Question from Part – B 40 marks
Viva - Voce 10 marks
Total: 80 marks

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06AU62

Sixth Semester B.E. Degree Examination, May/June 2010
Automotive Chassis and Suspension

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. How are the motor vehicles classified? Explain with examples. **(04 Marks)**

b. Explain the stability of a vehicle on slope, with a neat sketch. **(08 Marks)**

c. A vehicle of total weight 49050 N is held at rest on a slope of 10^{o}. It has a wheel base of 2.25 m and its centre of gravity is 1.0 m in front of rear axle and 1.5 m above the ground. Find : i) Normal reactions at wheel
ii) What is the angle of slope for vehicle over turn?
iii) What is the angle of slope for vehicle slides, when the co-efficient of adhesion between tyre and ground is 0.35? **(08 Marks)**

2 a. What are the various loads acting on chassis frame? What are the different cross-sections used for the construction of chassis frame? Mention their relative merits. **(12 Marks)**

b. Draw a layout of typical chassis frame and show all the components mounted on it. **(08 Marks)**

3 a. Explain the following terms: **(06 Marks)**
i) Camber ii) Castor
iii) King-pin inclination iv) Toe - in and Toe-out.

b. Explain the constructions and working of a power steering system. **(06 Marks)**

c. A motor car has a wheel base of 2.743 m and pivot centre of 1.065 m. The front and rear wheel track is 1.217 m. Calculate the correct angle of outside lock and turning circle radius of the outer front and inner rear wheels when the angle of inside lock is 40^{o}. **(08 Marks)**

4 a. What are the functions of final drive? Explain different types of final drives, with neat sketches. **(08 Marks)**

b. Why the differential is needed for an automobile? Explain with a neat sketch, a differential assembly. **(06 Marks)**

c. Sketch and explain the difference between semi-floating and fully floating axles. **(06 Marks)**

PART – B

5 a. What are the functions of automobile brakes? **(02 Marks)**

b. With a neat sketch, explain the working of disc brake system and differentiate between disc and drum brake systems. **(08 Marks)**

c. Explain with a neat sketch, the construction and operation of the hydraulic brake system. Also mention the functions of each component. **(10 Marks)**

6 a. Explain with a neat sketch, the working of pneumatic brakes used in automobiles. What are its merits and demerits compared to hydraulic brakes? **(10 Marks)**

b. A motor car has a wheel base of 2.64 m. The height of its C.G. above the ground is 0.61 m and it is 1.12 m infront of the rear axle. If the car is traveling at 40 km/hr on a level road, determine the minimum distance in which the car may be stopped, when:
i) The rear wheels are brakes ii) The front wheels are braked iii) All wheels are brakes.
The co-efficient of friction between tyre and road is 0.6. **(10 Marks)**

7 a. What is the purpose of independent suspension? How is it achieved in front and rear axles? Explain with neat sketches. **(10 Marks)**

b. Explain with neat sketches:
i) Hydraulic suspension
ii) Rubber suspension **(08 Marks)**

c. What are the common troubles in a suspension system? **(02 Marks)**

8 a. Describe with sketches, the construction of :
i) Disc wheel ii) Wire wheel.
Compare their advantages and disadvantages. **(10 Marks)**

b. Classify tyres from different view points. How does a tubeless tyres differs from a tubed tyre in its constructions? Also compare the merits and demerits of tubeless tyres. **(10 Marks)**

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06AU62

Sixth Semester B.E. Degree Examination, December 2011
Automotive Chassis and Suspension

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. How are the vehicles classified on different modes? **(08 Marks)**

b. A vehicle of total weight 49050 N is held at rest on a slope of 10°. It has a wheel base of 2.25 mt. Its centre of gravity is 1.0 mt in front of the rear axle and 1.5 mt above the ground level.
   i) What are the normal reactions at the wheels?
   ii) Assuming that sliding does not occur first, what will be the angle of slope, so that the vehicle will overturn?
   iii) Assuming all the wheels are to be braked, what will be the angle of slope, so that the vehicle will begin to slide, if the coefficient of adhesion between the tyre and the ground is 0.35? **(12 Marks)**

2 a. Draw and explain a layout of a generalized automotive transmission system and list the components. **(12 Marks)**

b. Explain the different cross sections used for frames and mention the materials used. **(08 Marks)**

3 a. Explain the steering geometry terms, with figures. **(08 Marks)**

b. Explain the terms : i) Under steering ; ii) Over steering ; iii) Neutral steering. **(12 Marks)**

4 a. With a neat sketch, explain the functions of a propeller shaft. **(06 Marks)**

b. Compare semi floating with fully floating rear axle. **(08 Marks)**

c. Discuss the principle of a differential unit. **(06 Marks)**

PART – B

5 a. Explain the terms : i) Braking distance ; ii) Braking time. **(04 Marks)**

b. Distinguish disc Vs drum brakes. **(06 Marks)**

c. Explain the working of a hydraulic braking system and state the advantages. **(10 Marks)**

6 a. List the desired properties of a brake fluid, give examples. **(07 Marks)**

b. A vehicle has a wheel base of 2.64 mt. The height of its c.g above the ground is 0.61mt and it is 1.12 mt in front of rear axle. If the car is travelling at 40 km/hr on a level road, determine the minimum distance in which the car may be stopped, when
   i) The rear wheels are braked.
   ii) The front wheels are braked.
   iii) All wheels are braked.
   The coefficient of friction between the tyre and the road is 0.6. **(13 Marks)**

7 a. What are the functions of a suspension system? **(05 Marks)**

b. State the advantages of the independent suspension system. **(05 Marks)**

c. Explain: i) Shock absorbers ; ii) Leaf springs. **(10 Marks)**

8 a. Compare : i) Tubed tyre and tubeless tyre ; ii) Wired wheel and disc wheel. **(12 Marks)**

b. Explain the structure of a tyre, with a figure. **(08 Marks)**

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06AU62

Sixth Semester B.E. Degree Examination, June/July 2011

Automotive Chassis and Suspension

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. Assume missing data suitably, if any.

PART – A

1 a. With a neat sketch, explain the layout of a four wheel drive of an automobile with reference to power plant. **(10 Marks)**

b. A car weighing 21336.75 N has a static weight distribution on the axles of 50 : 50. The wheel base is 3 m and the height of C.G, above ground is 0.55 m. The coefficient of friction on the highway is 0.6. Calculate the advantage of having rear wheel drive rather than front wheel drive as far as gradability is concerned, if engine power is not a limitation. **(10 Marks)**

2 a. What is the function of the frame? Explain type of forces and stresses the automobile frame has to withstand. **(06 Marks)**

b. Sketch and explain the factors of wheel alignment. **(08 Marks)**

c. A track has pivot pins 1.37 m apart, the length of each track arm is 0.18 m and the track rod is behind front axle and 1.27 m long. Determine the wheel base which will give true rolling for all wheels when the car is turning so that inner wheel stab axle is 60° to the centre-line of the car. **(06 Marks)**

3 a. Derive the equation for velocity ratio of a Double Hooke's joint. **(06 Marks)**

b. With a neat sketch, explain the basic principle of a differential. **(07 Marks)**

c. With a neat sketch, explain the working principle of a Hotch Kiss drive. **(07 Marks)**

4 a. Explain briefly the bending and torsion test of a frame. **(08 Marks)**

b. Write a note on "defects of frame". **(05 Marks)**

c. Sketch and explain the working principle of recirculating ball type steering gear. **(07 Marks)**

PART – B

5 a. Explain the principle of operation of hydraulic brake. **(06 Marks)**

b. What is bleeding of brakes? What are the requirements of a braking fluid? **(05 Marks)**

c. A motor car has a wheel base of 2.64 m. The height of its C.G. above the ground is 0.61 m and it is 1.12 m in front of the rear axle. If the car is traveling at 40 km/hr on a level track, determine the minimum distance in which the car may be stopped, when:
i) The rear wheels are braked
ii) The first wheels are braked
iii) All wheels are braked. **(09 Marks)**

6 a. Briefly discuss the following :
i) Parking brake ii) Emerging brake. **(06 Marks)**

b. Briefly explain the working principle of Wagner air braking system. **(08 Marks)**

c. Mention any three defects in a brake and give the causes and their remedies. **(06 Marks)**

7 a. What are the different types of suspension springs? Discuss the use of bag springs and coil springs in an automobile. **(06 Marks)**

b. Briefly explain the constructional details of a telescopic shock absorber. **(06 Marks)**

c. A vehicle spring of a semi-elliptic type has leaves of 75 mm width and 10 mm thickness and effective length 900 mm. If the stress is not to exceed 220725 KPa when the spring is loaded to 4905 N, estimate the required number of leaves and the deflection under this condition. If the spring is just flat under load, what is the initial radius? Take $E = 196.2 \times 10^6$ KPa. **(08 Marks)**

8 a. What are the functions of a wheel? What are the advantages of smaller wheels? **(06 Marks)**

b. Discuss briefly the dynamic properties of a pneumatic tyre. **(06 Marks)**

c. Discuss the effects of over-inflation and under inflation of tyres. **(08 Marks)**

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10AU61

Sixth Semester B.E. Degree Examination, June/July 2017
Automotive Chassis and Suspension

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss in detail classification of automobile. **(06 Marks)**
b. With neat sketch explain transmission system of front engine rear wheel drive vehicle. **(08 Marks)**
c. Derive expressions for wheel reactions in three wheeled vehicle resting on level road. **(06 Marks)**

2 a. With neat sketches discuss various loads acting on chassis frame. **(12 Marks)**
b. Draw and explain various tests to be carried out on chassis frame. **(08 Marks)**

3 a. Discuss construction of front axle with a neat sketch. **(08 Marks)**
b. Briefly explain following :
i) Caster angle ii) Camber angles iii) King pin inclination. **(06 Marks)**
c. With neat sketch explain :
i) Worm and sector steering gear ii) Rock and pinion steering gear. **(06 Marks)**

4 a. What is the need of differential in automobile? Explain construction and working of deferential with neat sketch. **(12 Marks)**
b. Explain semi floating and full floating arrangement of rear axle. Also mention loads acting on axle in each arrangement. **(08 Marks)**

PART – B

5 a. Write any four advantages of disc brakes over drum brakes. **(04 Marks)**
b. Explain with a neat sketch working of hydraulic brake system. Also mention its advantages. **(12 Marks)**
c. What are the requirements of brake fluid? **(04 Marks)**

6 a. Discuss working of air brakes. Also mention its advantages. **(10 Marks)**
b. Explain with neat sketch working of vaccume brakes. **(10 Marks)**

7 a. Explain with neat sketch construction of leaf spring. **(06 Marks)**
b. Write any four advantages of independent suspension system over rigid axle suspension system. **(04 Marks)**
c. Discuss construction and working of telescopic shock absorber. **(10 Marks)**

8 a. Explain any two types of wheels used in automobiles. **(06 Marks)**
b. Write advantages of radial ply tyres over cross ply tyres. **(04 Marks)**
c. Discuss various factors affecting the tyre life. **(10 Marks)**

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10AU65

Sixth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Heat and Mass Transfer

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Heat transfer data book and steam tables are permitted.

PART – A

1 a. Explain the various modes of heat transfer with their basic equations. **(12 Marks)**

b. A domestic refrigerator 0.5m × 0.5m × 1.5m is to be maintained at 10°C. The walls are made of two steel sheets of thickness 0.3cm (K = 60 W/m°C) with 7.5cm thick glass wool (K = 0.035 W/m°C) in between. Estimate the rate at which heat must be removed from the refrigerator if the ambient temperature is 35°C. Take average heat transfer coefficient for inner and outer surfaces of the refrigerator as 11.5 W/m^2°C and 17.5 W/m^2°C respectively. What is temperature of the outer wall surface of the refrigerator? **(08 Marks)**

2 a. Explain critical insulation thickness. Show that $r_c = \frac{k}{h_o}$. **(06 Marks)**

b. For a wall with variable thermal conductivity, show that the temperature distribution in terms of initial temperature T_1 and heat flow rate Q is given by

$$T = -\frac{1}{\alpha} + \sqrt{\left(\frac{1}{\alpha} + T_1\right)^2 - \frac{2Qx}{k_o A \alpha}}.$$ **(06 Marks)**

c. The handle of a laddle used for pouring lead at 327°C is 30cm long and is made of 2.5cm × 1.5cm mild steel bar stock (K = 37 W/m°C). Inorder to reduce grip temperature, it is proposed to make a hollow handle of mild steel plate 1.5mm thick and the same rectangular shape. If the surface heat transfer coefficient is 12.5 W/m^2°C and the ambient air is at 27°C, estimate the reduction in temperature of the grip. Neglect the heat transfer from the inner surface of the hollow space. **(08 Marks)**

3 a. Explain lumped system analysis. Show that $\frac{T - T_\infty}{T_o - T_\infty} = e^{-B_i \cdot F_o}$. **(08 Marks)**

b. An aluminium plate K = 160 W/m°C, ρ = 2790 kg/m^3, C_p = 0.85 kJ/kg°C of thickness L = 3cm and at a uniform temperature of 225°C is suddenly immersed at time t = 0 in a well stirred fluid maintained at a constant temperature of 25°C, h = 320 W/m^2°C. Determine the time required for the centre of the plate to reach 50°C. **(06 Marks)**

c. An Iron sphere K = 60 W/m°C; C_p = 460 J/kg°C; ρ = 7850 kg/m^3; α = 1.6×10^{-5} m^2/s of diameter 5cm is initially at a temperature of 225°C. Suddenly the surface of the sphere is exposed to ambient air at 25°C with heat transfer coefficient of 500W/m^2°C. Calculate:

i) Centre temperature at t = 2min.
ii) Temperature at a depth of 1cm from the surface at t = 2min.
iii) Energy removed during this period. **(06 Marks)**

4 a. With neat sketch, explain thermal boundary layer. **(06 Marks)**

b. Explain the significance of the following non dimensional numbers:
i) Reynolds number; ii) Nusselt number; iii) Prandtl number; iv) Grashoff number. **(08 Marks)**

c. A nuclear reactor with its core constructed of parallel vertical plates 2.2m high and 1.4m wide has been designed on free convection heating of liquid Bismuth. The maximum temperature of plate surfaces is limited to 960°C while the lowest allowable temperature of Bismuth is 340°C. Calculate the maximum possible heat dissipation from both sides of each plate. For convection coefficient the appropriate correlation is $N_u = 0.13\ (Gr.Pr)^{0.333}$ where different parameters are evaluated at the mean film temperature. **(06 Marks)**

PART – B

5 a. With the help of dimensional analysis, correlate the forced convection data. **(10 Marks)**

b. Air at 20°C is flowing over a flat plate which is 200mm wide and 500mm long. The plate is maintained at 100°C. Find the heat loss from the plate if air is flowing parallel to 500mm side with 2 m/s velocity. What will be the effect on heat transfer if the flow is parallel to 200mm side? **(10 Marks)**

6 a. Derive an expression for LMTD of a counter flow heat exchanger. **(10 Marks)**

b. A cross flow heat exchanger in which both fluids are unmixed is used to heat water with engine-oil. Water enters at 30°C and leaves at 85°C at a rate of 1.5 kg/s while the engine oil with C_p = 2.3 kJ/kg C enter at 120°C with a mass flow rate of 3.5 kg/s. The heat exchanger surface area is 30m^2. Calculate the overall heat transfer coefficient by LMTD method. **(10 Marks)**

7 a. With neat sketch explain: i) Film condensation; ii) Drop wise condensation. **(06 Marks)**

b. With the help of boiling curve explain the various regimes of boiling. **(10 Marks)**

c. A vertical plate 500mm high and maintained at 30°C is exposed to saturated steam at atmospheric pressure. Calculate the following:
i) Rate of heat transfer.
ii) Condensation rate/hr/m width for film condensation. **(04 Marks)**

8 a. Show that the total emissive power of a diffuse surface is π times its intensity of radiation. **(07 Marks)**

b. With neat sketch, explain the concept of black body. **(07 Marks)**

c. State: i) Kirchoff's law; ii) Plancks law; iii) Weins displacement law. **(06 Marks)**

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10AU65

Sixth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Heat and Mass Transfer

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART - A

1 a. Derive 3 – D heat conduction equation stating all the assumptions made in Cartesian co-ordinates Reduce the general conduction equation to Fourier – Biot equation, Poisson equation, Diffusion equation and Laplace equation. **(10 Marks)**

b. In an attempt to reduce the energy loss from a 2cm outer diameter pipe line with hot water, a plumber decides to insulate the line with 1cm thick insulation having K = 0.1W/mK. The entire metal tube can be considered to remain at a uniform temperature of 70^0C. The line is surrounded by air at 15^0C for which heat transfer coefficient is 6.5W/m^{2}K. Find the critical thickness of insulation and also justify the plumber's decision. **(10 Marks)**

2 a. Find the temperature distribution and heat transfer for a rectangular cross section fin of infinite length. State all the assumptions. **(10 Marks)**

b. One end of a long rod, 3cm in diameter is inserted into a furnace with outer end projecting into outside air. Once steady state is reached, the temperature of the rod are measured at two points 15cm apart and are found to be 140^0C and 100^0C. The atmospheric air temperature is 30^0C and convective heat transfer coefficient is 20W/m^{2}K. Calculate the thermal conductivity of the rod. State all assumptions made. **(10 Marks)**

3 a. For a lumped system, find the temperature distribution and heat transfer with usual notations. **(10 Marks)**

b. It is proposed to quench steel balls of a bearing 1cm in diameter, initially at 400^0C. These are placed in a cold chamber maintained at -20^0C. The steel balls pass through the chamber on a conveyor belt. Optimum bearing production requires that 75% of initial thermal energy content of the balls above -15^0C be removed. How long the balls should be placed on the conveyor belt? **(10 Marks)**

4 a. Define the following and mention their significances :
i) Reynold's number ii) Prandtl number iii) Grashof number
iv) Nusselt number v) Stanton number. **(10 Marks)**

b. A circular disc heater 0.2m in diameter is exposed to ambient air at 25^0C. One surface of the disc is insulated and the other surface is maintained at 130^0C. Calculate the amount of heat transferred from the disc when it is i) horizontal with hot surface facing up ii) horizontal with hot surface facing down. **(10 Marks)**

PART - B

5 a. Using Buckingham π – theorem, establish $\pi_3 = f(\pi_1, \pi_2)$ with usual notations for forced convection. **(10 Marks)**

b. Air at 1 atm, 40^0C flows with a velocity 8m/s along a flat plate 3m long, which is maintained at a uniform temperature of 100^0C, calculate the local heat transfer coefficient (h_x) at the end of the plate and also average head transfer coefficient over the entire length of the plate, given $R_{c_r} = 2\times10^5$. **(10 Marks)**

6 a. For a co-axial parallel flow heat exchanger, establish $\epsilon = \frac{1 - e^{-NTU(1+c)}}{1+c}$ with usual notation. **(10 Marks)**

b. A shell and tube condenser is constructed with 2.5cm OD. Single pass horizontal tube with steam condensing at 54^0C, the cooling water enters the tube at 18^0C at a flow rate of 0.7kg/s for tube and leaves at 36^0C. The overall heat transfer coefficient based on outer surface of the tube is 3509W/m^2 K. Calculate the tube length and heat transfer rate by NTD method. **(10 Marks)**

7 a. Draw the typical boiling curve for water and show all the boiling regimes, natural convection boiling, nucleate boiling, transition boiling and film boiling. Explain. **(10 Marks)**

b. An electric wire of 1.5mm diameter and 20cm length is laid horizontally and submerged in water at 1 atm/pressure. The current flowing through the wire is 40 amps while the voltage drop is 16V. Calculate the heat flux, heat transfer coefficient and excess temperature. Use appropriate correlation.

$[h = 1.54 \left(\frac{Q}{A}\right)^{3/4} = 5.58 (\Delta J_e)^3]$. **(10 Marks)**

8 a. Define the following : i) Black body ii) Emissive power iii) Irradiation iv) Gray body v) Diffuse and specular reflections. **(10 Marks)**

b. Two large parallel planes with emissivity 0.6 are at 900K and 300K. A radiation shield with on side polished and having emissivity of 0.05 and the other side with emissivity 0.4 is proposed. Which side of the shield must face the hotter plane in order to keep the temperature of shield minimum? Justify your answer. **(10 Marks)**

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10AU63

Sixth Semester B.E. Degree Examination, June/July 2017
Design of Machine Elements – II

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What are the assumptions made in finding stress distribution for a curved flexural member? List out the main differences between straight and curved beam. Also sketch the stress distribution pattern in a curved beam and compare it with a straight beam. **(10 Marks)**

b. A curved link mechanism made from a round steel bar is shown in Fig.Q1(b). The material for the link is plain carbon steel $30C_8$ with an allowable yield strength of 400 MPa. Determine the factor of safety. **(10 Marks)**

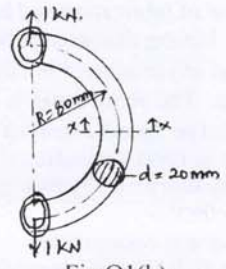

Fig.Q1(b)

2 a. Write the comparison between thin, thick and compound cylinders. **(06 Marks)**

b. A shrink fit assembly, formed by shrinking one tube over another, is subjected to an internal pressure of 60 N/mm^2. Before the fluid is admitted, the internal and the external diameters of the assembly are 120 mm and 200 mm and the diameter at the junction is 160 mm. determine using Lame's equations, the stresses at the inner, mating and outer surfaces of the assembly after the fluid has been admitted. Take the contact pressure at the junction after shrinking is 8 N/mm^2 **(14 Marks)**

3 a. Derive an expression for the deflection in a helical compression spring with usual notations. **(10 Marks)**

b. A truck spring has 12 number of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5400 N with a permissible stress of 0.28 GPa. The ratio of total depth of spring is 3 and modulus of elasticity = 210 GPa. Determine the thickness and width of the steel spring leaves. Also determine the deflection of the spring. **(10 Marks)**

4 a. A multiplate clutch has steel on bronze is to transmit 8 kW at 1440 rpm. The inner diameter of the contact is 80 mm and the outer diameter of contact is 140 mm. The clutch operate in oil with expected coefficient of friction of 0.1, the average allowable pressure is 0.35 N/mm^2. Assume uniform wear theory and determine the following:
i) Number of steel and bronze plates.
ii) Axial force required and
iii) Actual maximum pressure. **(12 Marks)**

b. Explain block brake and band brake. **(08 Marks)**

10AU63

PART – B

5 Design a pair of spur gears to transmit 20 kW from a shaft rotating at 1000 rpm to a parallel shaft which is to rotate at 310 rpm. Assume number of teeth on pinion 31 and 20° full depth tool form. The material for the pinion is C45 steel untreated and for gear cast steel 0.20% C untreated. Take service factor 1.5. **(20 Marks)**

6 A pair of bevel gear wheels with 20° pressure angle consist of 20 teeth pinion meshing with 30 teeth gear. The module is 4mm while the face width is 20mm. The surface hardness of both pinion and gear is 400 BHN. The pinion rotates at 500rpm and receives power from an electric motor. The starting torque of the motor is 150% of the rated torque. Determine the safe power that can be transmitted considering the dynamic load, wear strength and endurance strength. The allowable bending stress may be taken as 240 MPa. **(20 Marks)**

7 a. List the different forms of lubrication and bearing materials and properties. **(06 Marks)**

b. A full journal bearing having diameter of 50 mm and 100 mm long has a bearing pressure of 1.2 N/mm^2. The speed of the journal is 1000 rpm. The bearing is lubricated at 75°C having viscosity of 0.011 pas. The room temp is 35°C. Take minimum film thickness as $1/4^{th}$ of diametrical clearance. The specific heat of oil is 1850 J/kg°C. The ratio of journal diameter to diametric clearance is 1000. Calculate :

i) Load which can be supported by bearing
ii) Power lost due to friction
iii) Attitude of bearing and eccentricity
iv) The amount of artificial cooling required. **(14 Marks)**

8 a. A nylon core flat belt 200mm wide weighing 20 N/m, connecting a 300mm diameter pulley to a 900mm diameter driven pulley at a shaft spacing of 6m transmits 55.2 kW at a belt speed of 25m/s.

i) Belt length and the angle of wrap.
ii) Belt tensions based on a coefficient of friction 0.38. **(10 Marks)**

b. Select a wire rope for a vertical mine hoist to lift a load of 55 kN from a depth of 300 meters. A rope speed of 500 m/min is to be attained in 10 seconds. **(10 Marks)**

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10AU62

Sixth Semester B.E. Degree Examination, June/July 2014

Automotive Transmission

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the following terms:
i) Traction ii) Tractive effort iii) Gradiability iv) Drawbar Pull **(10 Marks)**

b. Discuss the various resistances offered by a vehicle in moving condition with graphs and equations. **(10 Marks)**

2 a. Explain the need of clutch and good requirements in automobiles. **(10 Marks)**

b. A centrifugal clutch is to transmit 25.8 KW at 750 rpm when engaged at 75 percent of the running speed. The inside dia is 0.36 mt and the radial distance of the centre of gravity of each shoe from the shaft axis is 0.15 mt assuming $\mu = 0.3$. Determine the necessary weight of each shoe of the above clutch. **(10 Marks)**

3 a. Compare dry clutch versus wet clutch. **(04 Marks)**

b. Explain the construction and working of a single plate clutch. State the advantages. **(10 Marks)**

c. List out the clutch troubles and causes. **(06 Marks)**

4 a. Sketch and explain the functioning of fluid coupling. State the advantages. **(10 Marks)**

b. With the help of graph, discuss the performance characteristics of a torque converter. **(10 Marks)**

PART – B

5 a. List out the functions of gear box in automobiles. **(04 Marks)**

b. With a neat line diagram, explain the construction and working of a sliding mesh gear box. **(08 Marks)**

c. A four speed gear box is to be designed for providing the ratio of 1.0, 1.46, 2.28 and 3.93 to 1 as nearly as possible. The diametrical pitch of each gear is 3.25 mm and the smallest pinion is to have atleast 15 teeth. Determine the suitable number of teeth of the different gears and distance between the main and lay shaft. **(08 Marks)**

6 a. Explain the construction and working of a overdrive with figure. **(10 Marks)**

b. Draw a neat sketch of epicyclic gear train, and discuss the working principle. State the advantages. **(10 Marks)**

7 a. Discuss the advantages and limitations of hydrostatic drive systems. **(08 Marks)**

b. What are the principles of hydrostatic drives? **(06 Marks)**

c. Draw a neat sketch of Borg-Warner automatic transmission. **(06 Marks)**

8 a. Explain the layout of electric transmission system and highlight the limitations. **(10 Marks)**

b. Discuss the functioning of the hydraulic control in an epicyclic planetary gear system. **(10 Marks)**

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10AU74

Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015
Automotive Air Pollution and Control

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the influence of actual traffic conditions and maintenance of vehicles with respect to exhaust. **(10 Marks)**

b. Define driving cycle. Explain European cycles in brief. **(10 Marks)**

2 a. With graph explain the effect of airfuel ratio on No_x and Co emission. **(05 Marks)**

b. Explain the formation of unburnt hydrocarbons in SI and CI engines. **(10 Marks)**

c. Explain the soot formation fundamentals and briefly describe the variables affecting it's formation. **(05 Marks)**

3 a. Briefly explain the effect of injection advance and optimization of injection systems on emissions in CI engine. **(08 Marks)**

b. Sketch and explain the evaporative loss control device. **(10 Marks)**

c. Explain the lean burn strategy. **(02 Marks)**

4 a. Discuss the effect of the following gasoline fuel properties on emission:
i) Volatility ii) Aromatic contents iii) Octane number
iv) Additives and v) Distillation interval. **(10 Marks)**

b. Explain the effects of following on pollution:
i) Volatility of fuel ii) Carbon content iii) Misfueling
iv) Lubricants and v) Bio-diesel **(10 Marks)**

PART – B

5 a. Write a short note on catalyst poisoning and thermal reactor. **(04 Marks)**

b. With sketch, explain the working of ceramic honeycomb type catalyst converter. **(08 Marks)**

c. With sketch, explain the working of wire mesh particulate trap and oxidizer. **(08 Marks)**

6 a. Discuss the harmful effects of the following on human health:
i) Lead ii) NO_x iii) Particulate iv) CO
v) Sulfur dioxide **(10 Marks)**

b. Discuss the harmful effects of the following on plants:
i) Sulfur dioxide ii) Hydrogen fluoride iii) Nitric oxides
iv) Smog v) Hydrogen chloride. **(10 Marks)**

7 a. Briefly discuss the following sampling methods:
i) Sedimentation ii) Filtration iii) Electrostatic precipitation
iv) Centrifugal methods v) Thermal precipitation **(10 Marks)**

b. Explain with a neat sketch of,
i) Hart ridge smoke meter and ii) Bosch smoke meter. **(10 Marks)**

8 a. Explain with a neat sketch the construction and working of NDIR analyser. **(10 Marks)**

b. Explain with a neat sketch the construction and working of FID. **(10 Marks)**

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10AU74

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016

Automotive Air Pollution and Control

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss the influence of actual traffic conditions and vehicle maintenance on emissions. **(10 Marks)**

b. Briefly explain the driving cycles followed in Europe for light and medium duty vehicles. **(10 Marks)**

2 a. What are the sources of HC formation in petrol engine? Explain the different factors which affects the HC formation. **(10 Marks)**

b. Explain the mechanism of oxides of nitrogen formation in engines. **(10 Marks)**

3 a. Explain with a neat sketch the significance and working of positive crankcase ventilation. **(10 Marks)**

b. Explain the different engine design modifications to control emission in SI engine. **(10 Marks)**

4 a. Discuss the effect of following gasoline properties on emissions:
i) volatility ii) Octane number iii) Additives iv) Sulphur content **(10 Marks)**

b. Explain the effect of following diesel fuel properties on emissions:
i) Viscosity and density ii) Aromatic content iii) Cetane number iv) Sulphur content. **(10 Marks)**

PART – B

5 a. Discuss the Thermal reactors used for exhaust gas treatment. **(08 Marks)**

b. Explain the following with a neat sketches :
i) Dual catalyst system ii) 3 – way catalytic converters. **(12 Marks)**

6 a. What is global warming? What are the effects on environment? **(08 Marks)**

b. What are effects of automobile engine pollutants on human health? **(12 Marks)**

7 a. Explain the particulate sampling method using sedimentation and filtration type. **(10 Marks)**

b. Briefly discuss the following sampling methods:
i) Electro static precipitation
ii) Thermal precipitation.
iii) Centrifugal methods. **(10 Marks)**

8 a. Sketch and explain Hartridge smoke meter. **(10 Marks)**

b. With a neat sketch explain the orsat apparatus used for exhaust gas analysis. **(10 Marks)**

CRASH COURSE

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10AU74

Seventh Semester B.E. Degree Examination, May 2017
Automotive Air Pollution and Control

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define the driving cycle. Explain the ECE used for the regulatory test with the help of a neat graph of speed versus time. **(10 Marks)**

b. Explain the trap technique and SHED technique, used for analyzing the evaporative losses. **(10 Marks)**

2 a. Explain the nitric oxide (NO) formation in SI engines. Also explain the following factors governing NO formation : i) Fuel – air ratio ii) Effect of burned gas function iii) Effect of ignition timing. **(12 Marks)**

b. Explain the various sources of UBHC. **(08 Marks)**

3 a. Briefly explain the following : i) Exhaust gas recirculation ii) Lean burn strategy. **(10 Marks)**

b. With neat sketch, explain the significance and working of positive crankcase ventilation. **(10 Marks)**

4 a. Discuss the effect of the following gasoline fuel properties on emissions : **(12 Marks)**
i) Olefins and aromatics ii) Volatility iii) Octane number iv) Additives.

b. Discuss the effect of following on emissions :
i) Alternative fuels ii) Lubricants. **(08 Marks)**

PART – B

5 a. With neat sketch, explain 3 – way catalytic converter. **(10 Marks)**

b. Explain the thermal reactor used to treat exhaust gases with a neat sketch. **(06 Marks)**

c. Briefly explain particulate traps. **(04 Marks)**

6 a. Explain the effect of air pollution on : i) Animals ii) Plants. **(12 Marks)**

b. Explain global warming and its effects. **(08 Marks)**

7 a. Briefly explain the following sampling methods :
i) Electrostatic precipitation ii) Thermal precipitation iii) Sedimentation iv) Filtration. **(12 Marks)**

b. Explain the following sampling methods :
i) Volumetric method ii) Gravimetric method. **(08 Marks)**

8 a. With neat sketch, explain gas chromatograph. **(10 Marks)**

b. Explain the following with neat sketch :
i) FID ii) Thermal conductivity gas analyser. **(10 Marks)**

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10AU762

Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015
Engineering Economics and Automotive Cost Estimation

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART - A

1 a. Classify wealth and state the attributes of wealth. **(05 Marks)**
b. State the characteristics of wants and explain. **(05 Marks)**
c. State the law of Diminishing utility and the Law of substitution. **(05 Marks)**
d. State and explain any two methods of wage payment. **(05 Marks)**

2 a. Define Money. State and explain functions of money (any three). **(05 Marks)**
b. State Greshem's law and any three limitations of Greshem's law. **(05 Marks)**
c. State any three principles of taxation. **(06 Marks)**
d. Write a note on vehicle insurance. **(04 Marks)**

3 a. Define Interest. Explain simple and compound interest. **(05 Marks)**
b. Explain Nominal and Effective interest rates. **(06 Marks)**
c. What is the purpose of cash flow diagram? Explain. Construct the cash flow diagram using the cash flows shown in the following table. **(09 Marks)**

Period (Years)	Gain (Rs)	Loss (Rs)
0	0	1,00,000
1	5000	25,000
2	10,000	5,000
3	20,000	0
4	2,000	0
5	25,000	0

4 a. Define Depreciation. State the reasons for depreciation. **(06 Marks)**
b. What is Salvage value? Explain the following : i) Straight line method and ii) Declining balance method to calculate depreciation. **(08 Marks)**
c. An equipment is purchased for Rs 70,000. The equipment has a 5 year life and a Rs 8000 residue value. Calculate the depreciation for each of the five years using the declining balance method at twice the straight line rate. **(06 Marks)**

PART - B

5 a. Define the following : i) Standard cost ii) Fixed cost iii) Variable cost iv) Incremental cost v) Differential cost. **(05 Marks)**
b. State the objectives of cost accounting. **(05 Marks)**
c. From the following information prepare a cost statement showing prime cost, works cost and cost of production of a particular commodity.

Raw materials used	Rs 13,600.00
Wages paid to labour	Rs 21,782.00
Salaries of works manager and department work heads	Rs 15,364.00

Carriage inward	Rs 1,655.00
Gas for manufacturing	Rs 3,819.00
Electricity	Rs 764.00
Rent & rates	Rs 2,400.00
Stationary : Works Office	Rs 316.00 Rs 632.00
Depreciation : Building Plant & Machinery	Rs 4200.00 Rs 3800.00
Postage & Telegram	Rs 264.00

The factory occupies ¾th of the building space. Electric points are evenly distributed all over the building. **(10 Marks)**

6 a. Explain the present worth method of comparing the alternatives. **(05 Marks)**

b. There are two alternatives for purchasing an automobile. Both the alternatives having the same useful life. The cash flow are as follows : **(10 Marks)**

Alternative 1 :	Initial purchase cost	Rs 3,00,000/-
	Annual operating and maintenance cost	Rs 20,000/-
	Expected salvage value	Rs 1,25,000/-
	Useful life	5 years
Alternative 2 :	Initial purchase cost	Rs 2,00,000/-
	Annual operating and maintenance cost	Rs 35,000/-
	Expected salvage value	Rs 70,000/-
	Useful life	5 years

Using present worth method find best alternative. Rate of interest = 10%.

c. State and explain the reasons for replacement. **(05 Marks)**

7 a. Explain the necessity of book keeping. **(04 Marks)**

b. Explain the classification of assets. **(04 Marks)**

c. What is a Journal? Journalise the following transactions : **(08 Marks)**

1998, June 1	Purchase goods worth Rs 300/- from Vimal and Rs 500/- from Kamal on credit.
June 3	Sale of goods worth Rs 1000/- to Balaram and Rs 700/- to Dhanaram.
June 5	Cash of Rs 900/- received from Ramasamy and Rs 800/- from Krishnasamy.
June 7	Paid Rs 800/- to Pradeep and Rs 500/- to Kuldeep.
June 9	Withdrawn from bank Rs 600/- for office use and Rs 300/- for personal use.

d. What is a Ledger? Show a sample ledger write up of any account (one or two entries). **(04 Marks)**

8 a. State and explain the objectives and functions of Estimation. **(06 Marks)**

b. State and explain the qualities and functions of an estimator. **(06 Marks)**

c. Calculate the total cost of cast iron cap shown in fig.Q8(c), an automobile component. Use the following data : Cost of molten metal at cupola spout : Rs 30/kg ;
Process scrap : 17% of net weight of casting ; Process scrap return value = Rs 5/kg.
Administrative overhead charges = Rs 2/kg of metal poured ;
Density of material used = 7.2 gm/CC.

Other expenditure details are : **(08 Marks)**

Process	Time per piece	Labour charges per hour	Shop overheads per hour
Moulding & pouring	10 min	Rs 30	Rs 30
Casting removal, gate cutting etc	4 min	Rs 10	Rs 30
Fettling and inspection	6 min	Rs 10	Rs 30

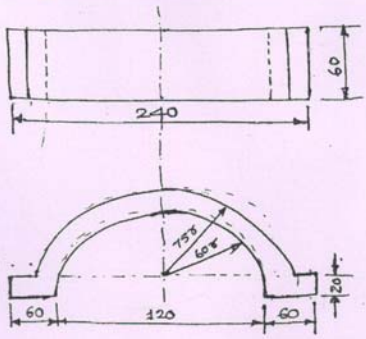

Fig 8(c) - All dimensions are in mm

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10AU762

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Engineering Economics & Automotive Cost Estimation

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define the following:
(i) Economic goods (ii) Utility (iii) Rent (iv) Profit (v) Wants **(05 Marks)**
b. State the attributes of wealth and explain each one of them in brief (2 – 3 lines). **(05 Marks)**
c. State and explain law of diminishing utility. **(05 Marks)**
d. What are different methods of wage payment? Explain. **(05 Marks)**

2 a. State the functions of money (explain each function in brief). **(05 Marks)**
b. State and explain Gresham's law. **(05 Marks)**
c. Explain the characteristics of a good taxation system. **(05 Marks)**
d. Explain the importance of vehicle insurance. State the types of vehicle insurance. **(05 Marks)**

3 a. Define interest rate from Lender's point of view and borrower's point of view. **(05 Marks)**
b. Explain nominal and effective interest rates. **(05 Marks)**
c. What is a cash flow diagram? Explain. Construct the cash flow diagram for the following problem. A mechanical device will cost ₹ 20,000 when purchased. Maintenance will cost ₹1000 per year. The device will generate revenues of ₹5000 per year for 5 years. The salvage value is ₹ 7000. **(10 Marks)**

4 a. What is depreciation? State the causes of depreciation. **(05 Marks)**
b. Define : i) Life value ii) Salvage value iii) Depreciation cost iv) Tangible assets v) Acquisition cost. **(05 Marks)**
c. A machine was purchased for ₹ 90,000.00 on 1st April 1960 and its installation and erection work cost is ₹ 8,000.00. The machine was replaced by a new one on 31st March 1975. If the scrap value of the machine was estimated at ₹ 5,000.00, what should be the rate of depreciation and depreciation fund on 1st August 1968. If after 10 years of running, some electric component are replaced at the cost of ₹ 2,000.00, what would be the rate of depreciation? **(10 Marks)**

PART – B

5 a. Define the following:
i) Standard cost ii) Estimated cost iii) First cost iv) Fixed cost
v) Variable cost. **(05 Marks)**
b. State the objectives of cost accounting. **(05 Marks)**
c. Find the prime cost, works cost, cost of production, total cost and profit from the following :
Direct materials – ₹ 20,000 /-
Direct labour – ₹ 10,000/-
Factory expenses – ₹ 7,000/-
Administrative expenses – ₹ 5,000/-
Selling expenses – ₹ 7,000/-
Sales – ₹ 60,000/- **(10 Marks)**

6 a. Explain present worth method of comparison of alternatives. **(05 Marks)**

b. State the reasons for replacement along with the factors to be considered while replacement. **(05 Marks)**

c. There are two alternatives A and B for the manufacture of a product. The details are given in table.

	Initial purchase cost (₹)	Annual operating & maintenance cost (₹)	Expected Salvage value (₹)	Useful life (years)
Alternative – A	3,00,000	20,000	1,25,000	5
Alternative – B	2,00,000	35,000	70,000	5

The annual revenue to be generated from manufacture of the product from Alternative-A and Alternative-B are ₹ 50,000/- & ₹ 45,000/- respectively. Compute the equivalent present worth of the alternatives at the rate of interest of 10% per year and find out economical alternative. **(10 Marks)**

7 a. What do you mean by Book-keeping? Explain. State the objectives of book-keeping. **(05 Marks)**

b. Explain : (i) Single entry and (ii) Double entry book-keeping systems. **(05 Marks)**

c. With respect to assets; define the following :
(i) Fixed assets (ii) Current assets (iii) Tangible assets (iv) Fictitious assets
(v) Contingent assets **(05 Marks)**

d. State the objectives of preparing a trial balance. **(05 Marks)**

8 a. State the objectives and functions of estimating. **(06 Marks)**

b. State the requisite qualities of an estimator. **(04 Marks)**

c. For an automobile component shown in Fig. Q8 (c), determine the cost of forging/piece. Use the following data :
(i) Density of the material = 7.86 gm/cc
(ii) Material cost = ₹ 80/kg
(iii) Labour cost = ₹ 5/piece
(iv) Overheads = 150% of labour cost. **(10 Marks)**

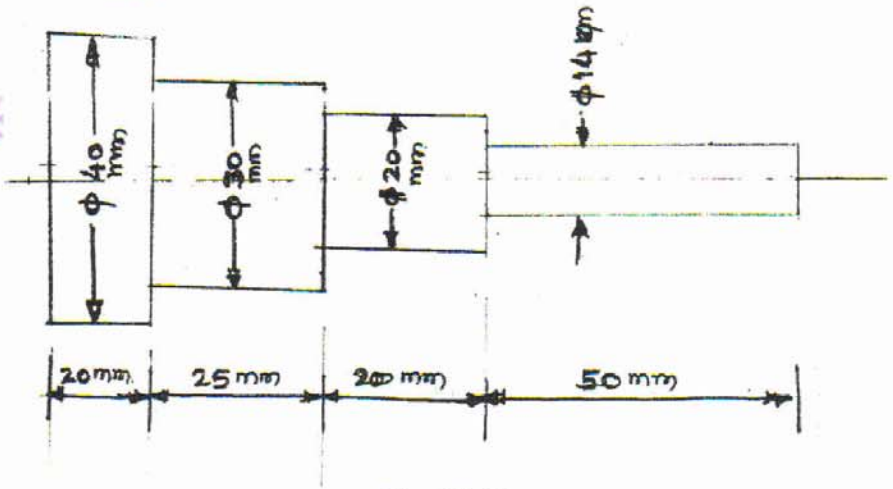

Fig. Q8 (c)

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10AU762

Seventh Semester B.E. Degree Examination, May 2017
Engineering Economics and Automotive Cost Estimation

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Use of interest factor tables permitted.

PART – A

1 a. Define the following economic terms :
i) economic goods ii) utility iii) value in exchange iv) price and wealth. **(04 Marks)**
b. Explain briefly the law of demand and supply. **(06 Marks)**
c. Define elasticity of demand and supply. What are the factors influencing the elasticity of demand and supply? **(06 Marks)**
d. Explain the law of returns with examples. **(05 Marks)**

2 a. Define money. What are the functions of money? Explain briefly. **(06 Marks)**
b. State the Gresham's law. What are the limitations of this law? **(05 Marks)**
c. What is the principle of taxation? Explain different kinds of taxes. **(05 Marks)**
d. Write a short notes on : i) value of money ii) index numbers. **(04 Marks)**

3 a. Discuss the interest rate form borrower's and lender's point of view with cash flow diagram. **(06 Marks)**
b. A person wishes to have a future sum of Rs. 20 lakhs for his son's engineering education 10 years from now. What is the single payment that he should deposit now so that he gets the desired amount after 10 years? the bank gives 12% rate of interest compounded annually. **(04 Marks)**
c. A person takes a loan of Rs. 10,000 from a ICICI bank at interest of 10% PA. find the amount if :
i) Interest is compounded annually
ii) Interest is compounded half yearly
iii) Interest is compounded quarterly
iv) Interest is compounded monthly (assume η = 1 years). **(08 Marks)**
d. Mention different types of compound interest problems. **(02 Marks)**

4 a. What is depreciation? List the causes of depreciation. **(04 Marks)**
b. A CNC machine coasts Rs. 30,00,000 is estimated to serve for 8 years after which its salvage value is estimated to be Rs. 2,50,000. Find :
i) Depreciation fund at the end of the 5^{th} year by fixed percentage method
ii) Book value of the machine after 4^{th} year and 6^{th} year by declining balance method. **(08 Marks)**
c. What are the different methods of depreciation charges? Explain any three of them. **(08 Marks)**

10AU762

PART – B

5 a. Explain briefly the components of cost. **(06 Marks)**

b. What is standard costing? What are the steps or procedure for standard costing? Explain briefly. **(04 Marks)**

c. A MICO factory produces 500 spark plugs a day involving direct material costs of Rs. 40,000, direct labour cost of Rs. 35,000 and factory overheads of Rs. 10,000. Assuming a profit of 15% of the selling price and selling overheads to be 30% of the factory cost. Determine the selling price of one spark plug. **(10 Marks)**

6 a. State the conditions for present worth comparisons. **(04 Marks)**

b. A company has three proposals for expanding its business operations. The details are as follows :

Alternative	Initial cost	Annual revenue	Life years
A_1	25,00,000	8,00,000	10
A_2	20,00,000	6,00,000	10
A_3	30,00,000	10,00,000	10

Each alternative has insignificant salvage value at the end of its life. Assuming an interest rate of 15% compounded annually. Find the best alternative for expanding the business operations of the company using the annual equivalent method. **(08 Marks)**

c. The cost of the machine is Rs. 6100 and its scrap value is Rs. 100. The maintenance cost found from experience are as follows :

Year	1	2	3	4	5	6	7	8
Maintenance cost in	100	250	400	600	900	1200	1600	2000

Where should the machine replaced? **(08 Marks)**

7 a. Define book keeping. What are the systems of book keeping? Explain briefly. **(08 Marks)**

b. Explain with suitable examples of a journal and ledger. **(06 Marks)**

c. Following is the financial status of a company as on 31st March 2016 :

Sunday debtors	Rs. 10,000
Cash in hand	Rs. 22,000
Bank loans	Rs. 40,000
Bills payable	Rs. 20,000
Equity shares	Rs. 1,13,000
Land and buildings	Rs. 50,000
Plant and machinery	Rs. 90,000
Inventories	Rs. 15,000
Creditors	Rs. 30,000
Bank balance	Rs. 1,60,000

Prepare a balance sheet as on 31st March 2016. **(06 Marks)**

8 a. What is cost estimation? What are the objectives and functions of cost estimation? **(08 Marks)**

b. What are the different steps involved in estimating procedure? Explain briefly. **(10 Marks)**

c. What are the qualities of an estimator? **(02 Marks)**

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