B.L.D.E Association"s

VACHANA PITAMAHA DR.P.G.HALAKATTI

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QUESTION PAPERS

3rd,4th 5th,6th 7th &8th SEMESTER

CIVIL

DEC 2017/JAN 2018

CIVIL QUESTION PAPERS

INDEX

CBCS SCHEME

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

15MATDIP31

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Express complex numbers $\frac{(5-3i)(2+i)}{4+2i}$ in the form a + ib. **(06 Marks)**

b. If $x = \cos\theta + i\sin\theta$, then show that $\frac{x^{2n}-1}{x^{2n}+1} = i\tan\theta$ **(05 Marks)**

c. Prove that the area of the triangle whose vertices are A, B, C is $\frac{1}{2}[B\times C + C\times A + A\times B]$. **(05 Marks)**

OR

2 a. Find the cube root of $\sqrt{3} + i$. **(06 Marks)**

b. Find the modulus and amplitude of $\frac{3+i}{2+i}$ **(05 Marks)**

c. Prove that the vectors $i - 2j + 3k$, $-2i + 3j - 4k$ and $i - 3j + 5k$ are coplanar. **(05 Marks)**

Module-2

3 a. Find the n^{th} derivative of $e^{ax}\sin(bx + c)$. **(06 Marks)**

b. If $y = e^{a\sin^{-1}x}$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + a^2)y_n = 0$ **(05 Marks)**

c. If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$. **(05 Marks)**

OR

4 a. Find the pedal equation $r = a(1 + \cos\theta)$. **(06 Marks)**

b. Expand $\tan x$ in ascending powers of x. **(05 Marks)**

c. If $u = x + y + z$, $v = y + z$, $w = z$ then find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ **(05 Marks)**

Module-3

5 a. Evaluate $\int_0^{\pi/2}\sin^n x\,dx$. **(06 Marks)**

b. Evaluate $\int_0^a \frac{x^3}{\sqrt{a^2-x^2}}\,dx$. **(05 Marks)**

c. Evaluate $\int_1^2\int_1^3 xy^2\,dxdy$ **(05 Marks)**

OR

6 a. Evaluate $\int_0^1 \int_0^2 \int_1^2 x^2 yz \, dx \, dy \, dz$ **(06 Marks)**

b. Evaluate $\int_0^{\pi/6} \cos^4 3x \, dx$. **(05 Marks)**

c. Evaluate $\int_0^2 \frac{x^4}{\sqrt{4-x^2}} dx$. **(05 Marks)**

Module-4

7 a. A particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where t is the time. Find the velocity and acceleration at $t = 1$ in the direction $i - 3j + 2k$. **(06 Marks)**

b. Find the unit vector normal to the surface $x^2 - y^2 + z = 2$ at the point $(1, -1, 2)$. **(05 Marks)**

c. Show that the vector $f = (2x - 5y)i + (x - y)j + (3x - z)k$ is a solenoidal. **(05 Marks)**

OR

8 a. If $f(x, y, z) = 3x^2y - y^3z^2$ then find grad f at the point $(1, -2, -1)$. **(06 Marks)**

b. Evaluate (i) div R, (ii) curl R, if $R = xi + yj + zk$. **(05 Marks)**

c. Find a, if $(axy - z^2)i + (x^2 + 2yz)j + (y^2 - axz)k$ is an irrotational vector. **(05 Marks)**

Module-5

9 a. Solve $(x^2 + y^2)dx + 2xydy = 0$ **(06 Marks)**

b. Solve $(e^x + 1)\cos x \, dx + e^y \sin x \, dy = 0$ **(05 Marks)**

c. Solve $(1 + xy)ydx + (1 - xy)xdy = 0$ **(05 Marks)**

OR

10 a. Solve $(x \log x)\frac{dy}{dx} + y = 2 \log x$ **(06 Marks)**

b. Solve $(x + 2y^3)\frac{dy}{dx} = y$ **(05 Marks)**

c. Solve $(1 + e^{x/y})dx + e^{x/y}\left(1 - \frac{x}{y}\right)dy = 0$ **(05 Marks)**

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CBCS Scheme

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

15CV34

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Basic Surveying

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define surveying. Explain briefly principles of surveying. **(07 Marks)**

b. What is 'Ranging'? Explain indirect or reciprocal ranging with neat sketch. **(06 Marks)**

c. A steel tape 20 m long standardized at 55°F with a pull of 10 kg was used for measuring a baseline. Find the correction per tape length, if the temperature at the time of measurement was 80°F and pull exerted was 16 kg. Weight of 1 cubic cm of steel is 7.86 gms. Weight of tape = 0.8 kg and $E = 2.109 \times 10^6$ kg/cm^2 coefficient of expansion of tape per 1°F = 6.2×10^{-6}. **(03 Marks)**

OR

2 a. Differentiate between plane and geodetic surveying. **(06 Marks)**

b. In passing an obstacle in form of a pond, stations A and D, on the main line were taken an opposite sides of the pond. On the left of AD, a line AB 200 m long was laid down and a second line AC 250 m long was ranged on AD, the points B, D and C being in the same straight line. BD and DC were then chained and found to be 125 m and 150 m respectively. Find length of AD. **(06 Marks)**

c. Distinguish between accuracy and precision in surveying. **(04 Marks)**

Module-2

3 a. What are the temporary adjustments to be carried out for theodolite? **(08 Marks)**

b. Following bearings were observed with a compass. Calculate the interior angles. **(05 Marks)**

Line	Fore Bearing
AB	60°30'
BC	122°0'
CD	46°0'
DE	205°30'
EA	300°0'

c. Define the terms: (i) True bearing. (ii) Magnetic bearing. (iii) Magnetic declination. **(03 Marks)**

OR

4 a. Explain step by step procedure of measuring horizontal angle by Repetition method. **(08 Marks)**

b. The following are the bearings of closed traverse ABCDA. At what station do you suspect the local attraction? Find the corrected bearings of the sides. If magnitude of magnetic declination at the place is 2°20' W, compute the true bearings of the lines. **(08 Marks)**

Line	Fore bearing	Back bearing
AB	124°30'	304°30'
BC	68°15'	246°0'
CD	310°30'	135°15'
DA	200°15'	17°45'

Module-3

5 a. Discuss transit method and Bawditch method. **(06 Marks)**

b. The following data is available for a closed traverse ABCDEA. Check for angular error and correct it if necessary. Determine closing error and adjust the traverse using "Transit rule". Taking coordinates of station 'A' as (400, 400), compute coordinates of all stations. **(10 Marks)**

Line	Length (m)	Bearing
AB	130	92°
BC	158	174°
CD	145	220°
DE	308	279°
EA	337	48°

OR

6 a. The elevation of point 'P' is to be determined by observations from two adjacent stations of a tacheometric survey. The staff was held vertically upon the point, and the instrument is fitted within an anallactic lens, the constant of the instrument being 100. Compute the elevation of the point 'P' from the following data, taking both observations as equally trustworthy. Also calculate the distance of A and B from 'P'. **(10 Marks)**

Inst. station	Height of axis	Staff point	Vertical angle	Staff readings	Elevation of station
A	1.42	P	$+2^0 24'$	1.230, 2.055, 2.880	77.750 m
B	1.40	P	$-3^0 36'$	0.785, 1.800, 2.815	97.135 m

b. Derive distance and elevation formulae for stadia tacheometry, when the staff held normal to line of sight and both for an angle of elevation and angle of depression. **(06 Marks)**

Module-4

7 a. Define the following terms:
(i) Bench mark (ii) Parallax (iii) Line of collimation (iv) Back sight
(v) MSL (vi) Reduced level **(06 Marks)**

b. The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eighth readings. Enter the readings and calculate RL of points by Rise and Fall method if first readings was taken with a staff held on BM = 432.384 m
2.228 m. 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 m. **(10 Marks)**

OR

8 a. What is sensitiveness of bubble tube? Explain any one method of determining sensitivity. **(06 Marks)**

b. In order to determine the elevation of top 'Q' of a signal on a hill, observations were made from two stations 'P' and 'R'. The stations P, R and Q were on the same plane. If angles of elevation of the top 'Q' of signal measured at 'P' and 'R' were 25°35' and 15°05' respectively. Determine the elevation of the foot of the signal if height of signal above its base was 4 m. The staff readings upon the B.M (RL 105.42) were respectively 2.755 and 3.855 m when the instrument was at 'P' and at 'R'. The distance between 'P' and 'R' was 120 m. **(10 Marks)**

Module-5

9 a. What are the characteristics of contours? **(08 Marks)**

b. The following perpendicular offsets were taken from a chain line to a hedge –

Chainage (m)	0	15	30	45	60	70	80	100	120	140
Offsets (m)	7.6	8.5	10.7	12.8	10.6	9.5	8.3	7.9	6.4	4.4

Calculate the area between survey line, the hedge and end offsets by,

(i) Trapezoidal rule.

(ii) Simpson's rule. **(08 Marks)**

OR

10 a. Discuss the methods for determining areas and volumes. **(06 Marks)**

b. A railway embankment 400 m long is 12 m wide at the formation level and has side slope of 2 to 1. The ground levels at every 100 m along the centre line are as under –

Distance	0	100	200	300	400
R.L	204.8	206.2	207.5	207.2	208.3

The formation level at zero chainage is 207.00 and the embankment has a rising gradient of 1 in 100. The ground is level across the centre line. Calculate the volume of earth work. **(10 Marks)**

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CBCS Scheme

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

15CV/CT32

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Strength of Materials

Time: 3 hrs. Max. Marks: 80

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

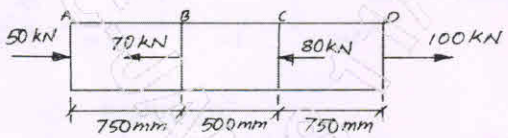
Module-1

1 a. Draw stress versus strain curve for mild steel specimen subjected to axial tension indicating the salient points. **(03 Marks)**

b. Derive the expression for elongation of tapering circular bar due an axial load P. Use standard notations. **(06 Marks)**

c. A circular bar of uniform cross sectional area of 1000mm^2 is subjected to forces as shown in fig. Q1(c). If Young's Modulus for the material is 200GPa, determine the total deformation. **(07 Marks)**

Fig.Q1(c)



OR

2 a. Define the four Elastic constants. **(04 Marks)**

b. A compound bar consists of a steel rod of 20mm diameter rigidly fitted into a copper tube of 20mm internal dia and 5mm thickness. Determine the stresses induced in the different materials when the compound bar is subjected to an axial tensile load of 50kN. Take Es = 200GPa and Ec = 120 GPa. **(06 Marks)**

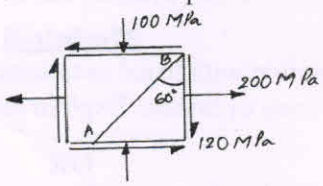
c. A steel bar is 20m long at a temperature of 20^{0}C. Find the free expansion of the rod, if the temperature is raised to 65^{0}C. Take E = 200GPa , $\alpha = 12 \times 10^{-6}/^0$C. Find the thermal stress produced when i) free expansion of the rod is completely prevented ii) the rod is permitted to expand by 5.8mm only. **(06 Marks)**

Module-2

3 a. Show that the shear stress on the principal plane is zero. **(06 Marks)**

b. At a point in a strained material the stresses acting are as shown in fig. Q3(b). Determine the
i) Principal stresses and their planes ii) Maximum shear stresses and their planes
iii) Normal and shear stresses on the inclined plane AB. **(10 Marks)**

Fig.Q3(b)



OR

4 a. Derive Lame's equations for radial and hoop stresses for thick cylinder subjected to internal and external fluid pressures. **(06 Marks)**

b. A closed cylindrical steel vessel of 4mm plate thickness with plane ends carries fluid under a pressure of 3MPa. The diameter of cylinder is 25cm and length is 75cm. Calculate the longitudinal and hoop stresses in the cylinder wall. Also determine the change in diameter , length and volume of cylinder. Take E = 210GPa , $\mu = 0.286$. **(10 Marks)**

Module-3

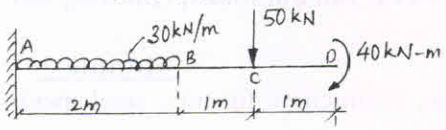
5 a. Derive the relationships between load intensity, shear force and bending moment. **(06 Marks)**

b. For a simply supported beam subjected to a UDL of intensity W/unit length throughout plot the SFD and BMD and prove that maximum Bending moment is $\frac{W\ell^2}{8}$. **(10 Marks)**

OR

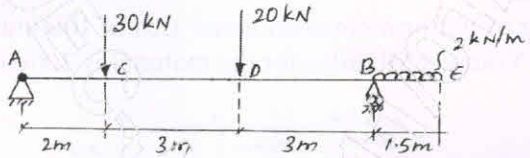
6 a. For the cantilever beam shown in fig.Q6(a), plot the SFD and BMD. **(06 Marks)**

Fig.Q6(a)



b. For the overhanging beam shown in fig.Q6(b), plot the SFD and BMD. Locate points of contra flexure if any. **(10 Marks)**

Fig.Q6(b)



Module-4

7 a. List the assumptions in theory of Simple bending. **(04 Marks)**

b. Define : i) Section modulus ii) Modulus of rupture iii) Moment of resistance. **(03 Marks)**

c. A T – beam with a flange of 100mm × 20mm and with a web of 20mm × 100mm is used as a simply supported beam over a span of 8m. It carries a UDL of 1.5kN/m throughout. Determine the maximum compressive and maximum tensile stresses and plot the variation across the depth of the beam. **(09 Marks)**

OR

8 a. Derive the Euler's equation for buckling load on an elastic column with both ends pinned or hinged. **(06 Marks)**

b. A hollow rectangular cast iron column has external dimensions of 150mm × 200mm and all round metal thickness of 25mm. The column is 5m long with both ends fixed. If E for column material is 120GPa, compute the critical value of load on this column by Euler's formula. Compare the value of load obtained by Rankine's formula. Take f_c = 500MPa and $\alpha = \frac{1}{1600}$. **(10 Marks)**

Module-5

9 a. Derive the torsion equation with usual notations. **(08 Marks)**

b. State the different theories of failure. Explain any two briefly. **(08 Marks)**

OR

10 a. Prove that a hollow circular shaft is stiffer and stronger than a solid circular shaft in torsion which have same material , length and weight. **(10 Marks)**

b. A solid shaft transmits 20kW of power, rotating at 2rps. Determine the required diameter of the shaft if the shearing stress is not to exceed 40MN/m^2 and angle of twist is limited to 6^0 in a length of 3m. Take G = 83 × 10^{3}N/mm^2. **(06 Marks)**

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CBCS Scheme

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

15CV/CT35

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Engineering Geology

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 Engineering Geology? Discuss its role in Civil Engineering Projects. **(08 Marks)**

b. With a neat sketch, explain the structure and composition of the earth. **(08 Marks)**

OR

2 a. Explain briefly i) Rock forming mineral ii) Economic mineral. **(04 Marks)**

b. Name the physical properties which are helpful to identify the minerals. Explain Luster and Fracture of a mineral, with suitable examples. **(06 Marks)**

c. Write the chemical composition , cleavages and uses of the following minerals :
i) Calcite ii) Quartz iii) Gypsum. **(06 Marks)**

Module-2

3 a. What are Igneous Rocks? Explain the classification of Igneous Rocks with suitable examples. Mention the Engineering considerations of Igneous Rocks. **(08 Marks)**

b. What is Rock Quality Designation (RQD)? How is RQD used for the rock mass classification? **(08 Marks)**

OR

4 a. With a neat sketch, explain the developments of folds , joints, faults and unconformities in Rocks. **(08 Marks)**

b. Mention the engineering considerations of folds, joints, faults and unconformities. **(08 Marks)**

Module-3

5 a. Discuss briefly the Geomorphological aspects in the selection of site for Dam construction. **(08 Marks)**

b. What are Tunnels? Explain the important Geological factors taken into account while Tunneling. **(08 Marks)**

OR

6 a. Explain briefly : i) Weathering of Rocks ii) Tectonic cause of Earth quake. **(08 Marks)**

b. What are the causes of Landslides? How can Landslides be prevented. **(08 Marks)**

Module-4

7 a. Briefly explain Hydrological cycle. **(04 Marks)**

b. Define Aquifers. Explain with neat sketches, various types of aquifers. **(08 Marks)**

c. Explain in brief zone of aeration and zone of saturation. **(04 Marks)**

OR

8 a. Explain in detail Ground water exploration by Electrical Resistivity method. **(10 Marks)**

b. Give an account of Artificial Recharge of ground water by various methods. **(06 Marks)**

Module-5

9 a. Discuss the application of Remote sensing and GIS Technique in Civil Engineering Projects. **(12 Marks)**

b. Write a note on Impact of Mining on Environment. **(04 Marks)**

OR

10 Write a note on :

a. Natural Disaster and Mitigation.
b. Landsat Imagery.
c. Impact of Reservoirs on Environment.
d. Uses of Topographic maps. **(16 Marks)**

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CBCS Scheme

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

15MAT31

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Engineering Mathematics – III

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Express $f(x)=(\pi - x)^2$ as a Fourier series of period 2π in the interval $0<x<2\pi$. Hence deduce the sum of the series $1+\frac{1}{2^2}+\frac{1}{3^2}+.....$ **(08 Marks)**

b. The turning moment T units of the Crank shaft of a steam engine is a series of values of the crank angle θ in degrees. Find the first four terms in a series of sines to represent T. Also calculate T when $\theta = 75^\circ$. **(08 Marks)**

θ:	0°	30°	60°	90°	120°	150°	180°
T:	0	5224	8097	7850	5499	2626	0

OR

2 a. Find the Fourier Series expansion of the periodic function,

$$f(x)=\begin{cases} l+x, & -l\le x\le 0 \\ l-x, & 0\le x\le l \end{cases}.$$ **(06 Marks)**

b. Obtain a half-range cosine series for $f(x)=x^2$ in $(0, \pi)$. **(05 Marks)**

c. The following table gives the variations of periodic current over a period:

t sec:	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$
A amp:	1.98	1.30	1.05	1.30	-0.88	-0.25

Show that there is a direct current part 0.75 amp in the variable current and obtain the amplitude of the first harmonic. **(05 Marks)**

Module-2

3 a. Find the Fourier transform of $f(x)=\begin{cases} 1 & \text{for } |x|<1 \\ 0 & \text{for } |x|>1 \end{cases}$ and evaluate $\int_0^\infty \left(\frac{\sin x}{x}\right)dx$ **(06 Marks)**

b. Find the Fourier cosine transform of, $f(x)=\begin{cases} x & \text{for } 0<x<1 \\ 2-x & \text{for } 1<x<2 \\ 0 & \text{for } x>2 \end{cases}$. **(05 Marks)**

c. Obtain the inverse Z-transform of the following function, $\frac{z}{(z-2)(z-3)}$. **(05 Marks)**

OR

4 a. Find the Z-transform of $\cos\left(\frac{n\pi}{2}+\alpha\right)$. **(06 Marks)**

b. Solve $u_{n+2}-5u_{n+1}+6u_n=36$ with $u_0=u_1=0$, using Z-transforms. **(05 Marks)**

c. If Fourier sine transform of f(x) is $\frac{e^{-a\alpha}}{\alpha}$, $\alpha\neq 0$. Find f(x) and hence obtain the inverse Fourier sine transform of $\frac{1}{\alpha}$. **(05 Marks)**

Module-3

5 a. Calculate the Karl Pearson's co-efficient for the following ages of husbands and wives: **(06 Marks)**

Husband's age x:	23	27	28	28	29	30	31	33	35	36
Wife's age y:	18	20	22	27	21	29	27	29	28	29

b. By the method of least square, find the parabola $y = ax^2 + bx + c$ that best fits the following data: **(05 Marks)**

x:	10	12	15	23	20
y:	14	17	23	25	21

c. Using Newton-Raphson method, find the real root that lies near x = 4.5 of the equation $\tan x = x$ correct to four decimal places. (Here x is in radians). **(05 Marks)**

OR

6 a. In a partially destroyed laboratory record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$ respectively. Calculate $\bar{x}$, $\bar{y}$ and the coefficient of correlation between x and y. **(06 Marks)**

b. Find the curve of best fit of the type $y = ae^{bx}$ to the following data by the method of least squares: **(05 Marks)**

x:	1	5	7	9	12
y:	10	15	12	15	21

c. Find the real root of the equation $xe^x - 3 = 0$ by Regula Falsi method, correct to three decimal places. **(05 Marks)**

Module-4

7 a. From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age of 46: **(06 Marks)**

Age:	45	50	55	60	65
Premium (in Rupees):	114.84	96.16	83.32	74.48	68.48

b. Using Newton's divided difference interpolation, find the polynomial of the given data: **(05 Marks)**

x	3	7	9	10
f(x)	168	120	72	63

c. Using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates. **(05 Marks)**

OR

8 a. Find the number of men getting wages below ₹ 35 from the following data: **(06 Marks)**

Wages in ₹ :	0 – 10	10 – 20	20 – 30	30 – 40
Frequency :	9	30	35	42

b. Find the polynomial f(x) by using Lagrange's formula from the following data: **(05 Marks)**

x:	0	1	2	5
f(x):	2	3	12	147

c. Compute the value of $\int_{0.2}^{1.4} (\sin x - \log_e x + e^x) dx$ using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule. **(05 Marks)**

Module-5

9 a. A vector field is given by $\vec{F} = \sin y\,\hat{i} + x(1+\cos y)\hat{j}$. Evaluate the line integral over a circular path given by $x^2 + y^2 = a^2$, $z = 0$. **(06 Marks)**

b. If C is a simple closed curve in the xy-plane not enclosing the origin. Show that $\int_C \vec{F}.d\vec{R} = 0$, where $\vec{F} = \frac{y\hat{i} - x\hat{j}}{x^2 + y^2}$. **(05 Marks)**

c. Derive Euler's equation in the standard form viz., $\frac{\partial f}{\partial y} - \frac{d}{dx}\left[\frac{\partial f}{\partial y'}\right] = 0$. **(05 Marks)**

OR

10 a. Use Stoke's theorem to evaluate $\int_C \vec{F}.d\vec{R}$ where $\vec{F} = (2x - y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$ over the upper half surface of $x^2 + y^2 + z^2 = 1$, bounded by its projection on the xy-plane. **(06 Marks)**

b. Show that the geodesics on a plane are straight lines. **(05 Marks)**

c. Find the curves on which the functional $\int_0^1 \left((y')^2 + 12xy\right)dx$ with $y(0) = 0$ and $y(1) = 1$ can be extremized. **(05 Marks)**

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CBCS SCHEME

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

15MATDIP31

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Express complex numbers $\frac{(5-3i)(2+i)}{4+2i}$ in the form a + ib. **(06 Marks)**

b. If $x = \cos\theta + i\sin\theta$, then show that $\frac{x^{2n}-1}{x^{2n}+1} = i\tan\theta$ **(05 Marks)**

c. Prove that the area of the triangle whose vertices are A, B, C is $\frac{1}{2}[B\times C + C\times A + A\times B]$. **(05 Marks)**

OR

2 a. Find the cube root of $\sqrt{3} + i$. **(06 Marks)**

b. Find the modulus and amplitude of $\frac{3+i}{2+i}$ **(05 Marks)**

c. Prove that the vectors $i - 2j + 3k$, $-2i + 3j - 4k$ and $i - 3j + 5k$ are coplanar. **(05 Marks)**

Module-2

3 a. Find the n^{th} derivative of $e^{ax}\sin(bx + c)$. **(06 Marks)**

b. If $y = e^{a\sin^{-1}x}$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + a^2)y_n = 0$ **(05 Marks)**

c. If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$. **(05 Marks)**

OR

4 a. Find the pedal equation $r = a(1 + \cos\theta)$. **(06 Marks)**

b. Expand $\tan x$ in ascending powers of x. **(05 Marks)**

c. If $u = x + y + z$, $v = y + z$, $w = z$ then find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ **(05 Marks)**

Module-3

5 a. Evaluate $\int_0^{\pi/2}\sin^n x\,dx$. **(06 Marks)**

b. Evaluate $\int_0^a \frac{x^3}{\sqrt{a^2-x^2}}\,dx$. **(05 Marks)**

c. Evaluate $\int_1^2\int_1^3 xy^2\,dxdy$ **(05 Marks)**

OR

6 a. Evaluate $\int_0^1 \int_0^2 \int_1^2 x^2 yz \, dx \, dy \, dz$ **(06 Marks)**

b. Evaluate $\int_0^{\pi/6} \cos^4 3x \, dx$. **(05 Marks)**

c. Evaluate $\int_0^2 \frac{x^4}{\sqrt{4-x^2}} dx$. **(05 Marks)**

Module-4

7 a. A particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where t is the time. Find the velocity and acceleration at $t = 1$ in the direction $i - 3j + 2k$. **(06 Marks)**

b. Find the unit vector normal to the surface $x^2 - y^2 + z = 2$ at the point $(1, -1, 2)$. **(05 Marks)**

c. Show that the vector $f = (2x - 5y)i + (x - y)j + (3x - z)k$ is a solenoidal. **(05 Marks)**

OR

8 a. If $f(x, y, z) = 3x^2y - y^3z^2$ then find grad f at the point $(1, -2, -1)$. **(06 Marks)**

b. Evaluate (i) div R, (ii) curl R, if $R = xi + yj + zk$. **(05 Marks)**

c. Find a, if $(axy - z^2)i + (x^2 + 2yz)j + (y^2 - axz)k$ is an irrotational vector. **(05 Marks)**

Module-5

9 a. Solve $(x^2 + y^2)dx + 2xydy = 0$ **(06 Marks)**

b. Solve $(e^x + 1)\cos x \, dx + e^y \sin x \, dy = 0$ **(05 Marks)**

c. Solve $(1 + xy)ydx + (1 - xy)xdy = 0$ **(05 Marks)**

OR

10 a. Solve $(x \log x)\frac{dy}{dx} + y = 2 \log x$ **(06 Marks)**

b. Solve $(x + 2y^3)\frac{dy}{dx} = y$ **(05 Marks)**

c. Solve $(1 + e^{x/y})dx + e^{x/y}\left(1 - \frac{x}{y}\right)dy = 0$ **(05 Marks)**

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CBCS Scheme

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15CV46

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Advanced Surveying

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. List the different methods of setting out simple circular curves. Explain the Linear method of setting out simple curve by the method of offset from long chord. **(06 Marks)**

b. Two tangents intersect at chainage 1000mt. The deflection angle being 28 degree, calculate the necessary data to set out a simple circular curve of 200mt radius by Rankines method of deflection angles. Take per interval as 10mt. **(10 Marks)**

OR

2 a. What is a Transition curve? List the functions and essential requirements of an ideal Transition curve. **(04 Marks)**

b. Two straights with a total deflection angle of 72^0 are to be connected by a compound curve of two branches of equal length. The Radius of the first branch is 300mt and that of the second branch is 400mt, chainage of intersection point is 1500 mt. Calculate the chainage of tangent points and that of Point of Compound Curvature (PIC). **(06 Marks)**

c. Two parallel straight gant apart are to be connected by a Reverse curve. If the distance between the two tangent points is 72mt, find the common radius of the two branches. If however, radius of the first branch is 100mt, find the radius of the second branch. **(06 Marks)**

Module-2

3 a. List the various factors that are to be considered in the selection of site for Base line and stations in Triangulations survey. **(08 Marks)**

b. Write a note on Classifications of Triangulations system. **(08 Marks)**

OR

4 a. State and explain Law of Weights. **(08 Marks)**

b. Find the most probable value of the angles A and B from the following equations :
$A = 40^0\ 15'\ 21.4"$; $B = 45^0\ 12'\ 18.4"$; $A + B = 85^0\ 27'\ 45.2"$. **(08 Marks)**

Module-3

5 a. Define the following terms : i) The a celestrial sphere ii) The azimuth iii) The sensible Horizon iv) The hour angle. **(08 Marks)**

b. The standard time meridian in India is $82^0\ 30'$E. If the standard time at any instant is 20 hours 24 min 6 seconds, find the local mean time for two places having longitudes i) 20^0 E ii) 20^0 W. **(08 Marks)**

OR

6 a. Define the following terms : **(08 Marks)**
i) The visible horizon ii) The Latitude (θ) iii) Hour circle iv) Zenith and Nadir.

b. Find the GMT corresponding to following LMT :
i) 9 hour 10 minutes 12 second AM at a place in longitude $42^0\ 36'$ W. **(08 Marks)**
ii) 4 hour 32 minutes 10 second AM at a place in longitude $56^0\ 32'$ E.

Module-4

7 a. Define the following terms : i) Vertical photograph ii) Flying height iii) Perspective projection iv) Exposure station. **(08 Marks)**

b. A vertical photograph was taken at an altitude of 1200mt above MSL. Determine the scale of the photograph for the terrain lying at elevation of 80mt and 300mt, if the Focal length of the camera is 15cm. **(08 Marks)**

OR

8 a. List the reasons for keeping overlap in photographs. **(06 Marks)**

b. Describe how mosaic differs from a map. **(04 Marks)**

c. The distance from the principal point to an image on a photograph is 6.44cm and the elevation of the object above the datum (sea level) is 250mt. What is the relief displacement at the point if the datum scale is 1 in 10,000 and the focal length of the camera is 20cm? **(06 Marks)**

Module-5

9 a. Explain the working principle of Total station and list the salient features of Total station. **(08 Marks)**

b. Define Remote sensing. List the applications of Remote sensing. **(08 Marks)**

OR

10 a. What is GIS? With a neat sketch, explain the components of GIS. **(08 Marks)**

b. Explain the working principle of GPS and distinguish between hand held GPS and differential GPS. **(08 Marks)**

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CBCS Scheme

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Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Differentiate between statically determinate and indeterminate structures. **(06 Marks)**

b. What are linear and non-linear systems? Explain. **(02 Marks)**

c. Determine the degree of static indeterminaly for the following structures [Fig.Q1(c)]:

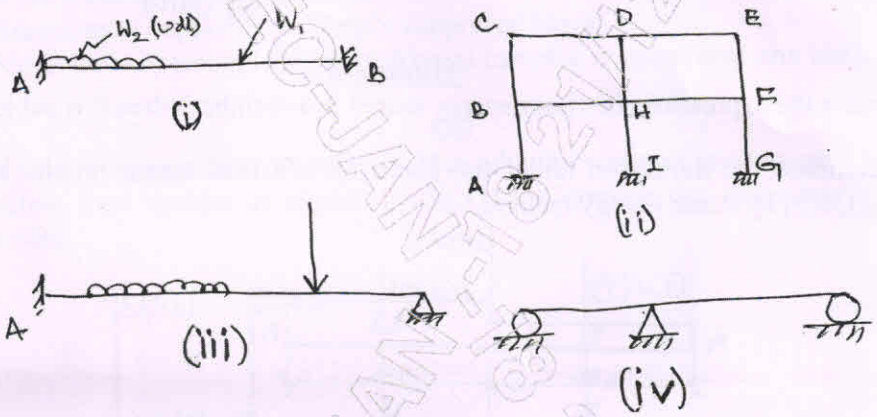

Fig.Q1(c) **(08 Marks)**

OR

2 Determine the forces in all the members of the truss shown in the Fig.Q2 by the method of joints and verify the forces in members BC, CF and FE by the method of sections.

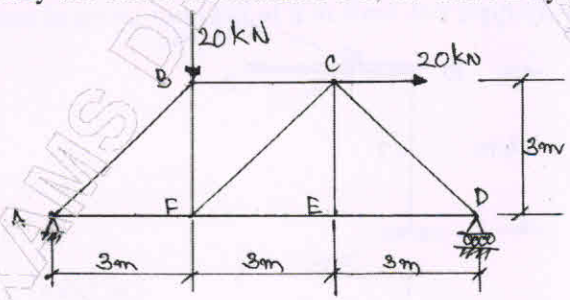

Fig.Q2 **(16 Marks)**

Module-2

3 a. Derive the moment-curvature equation for deflection. **(06 Marks)**

b. A simply supported beam AB has a span of 5m and carries a point load of 50 kN at a distance of 3m from left end A as shown in Fig.Q3(b). Find the deflection under the load and also maximum deflection in the beam.

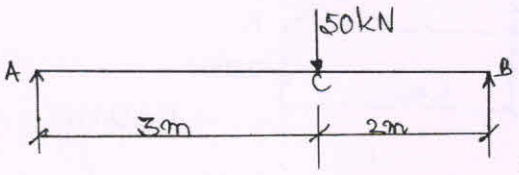

Fig.Q3(b) **(10 Marks)**

OR

4 a. Determine the slope and deflection at the free end of a cantilever shown in Fig.Q4(a) by the moment area method.

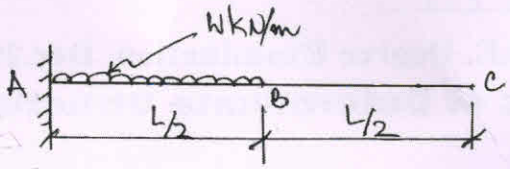

Fig.Q4(a) **(08 Marks)**

b. Determine the slope and deflection under the load for the beam shown in Fig.Q4(b) using conjugate beam method.

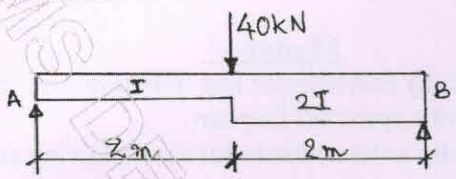

Fig.Q4(b) **(08 Marks)**

Module-3

5 a. Obtain the expression for strain energy stored in a member when it is subjected to axial load. **(08 Marks)**

b. Determine the deflection under the given 60 kN load acting on the beam as shown in Fig.Q5(b) by strain energy method.

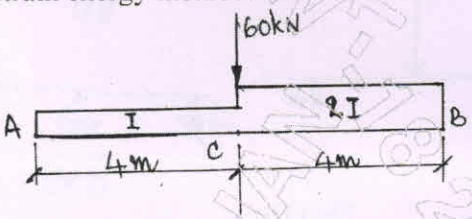

Fig.Q5(b) **(08 Marks)**

OR

6 a. Find the value of vertical deflection at C for the structure shown in Fig.Q6(a) by Castiglione's theorem.

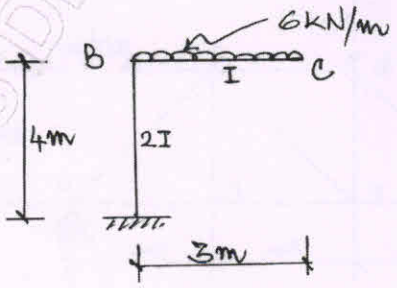

Fig.Q6(a) **(08 Marks)**

b. Determine the vertical and horizontal deflections at joint C of the truss shown in Fig.Q6(b). The cross sectional area of inclined member (tie) is 2000 mm^2 while the area of horizontal member is 1600 mm^2. Take E = 200 kN/mm^2.

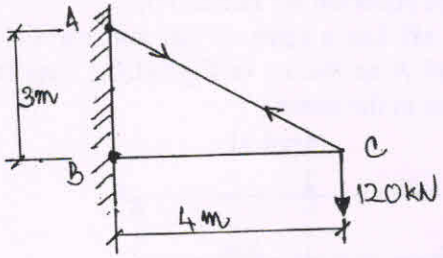

Fig.Q6(b) **(08 Marks)**

Module-4

7 A three hinged parabolic arch has a span of 30 m and rise of 6m. It carries a udl of 3 kN/m over the left half of the span and a point load of 6 kN at 9m from right end. Find the BM, normal thrust and radial shear at a section of 9m from left end support. Also find the maximum bending moment along the span. **(16 Marks)**

OR

8 A cable is suspended between two points A and B 120 m apart and a central dip of 8m. It carries a udl of 20 kN/m. Determine:

i) The maximum and minimum tension in the cable.
ii) Length of the cable.
iii) The size of cable if the permissible stress of cable material is 200 N/mm^2. **(16 Marks)**

Module-5

9 a. Define a influence line diagram and mention its applications. **(06 Marks)**

b. Draw the influence line diagrams for:

i) Reactions at supports of a simply supported beam.
ii) Shear force of a simply supported beam carrying concentrated unit load. **(10 Marks)**

OR

10 For a simply supported beam of span 25m with the series of concentrated loads to be taken as rolling load system as shown in Fig.Q10. Compute the following by influence line principles.

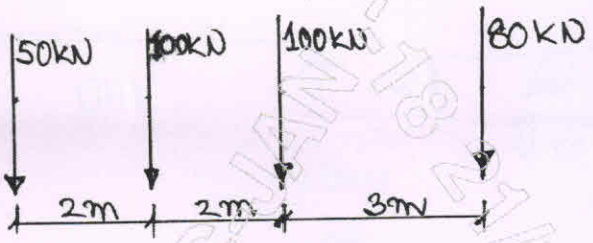

Fig.Q10

i) Maximum reactions.
ii) Maximum bending moment at 8 m from left support. **(16 Marks)**

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CBCS Scheme

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15MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find the rank of the matrix $A=\begin{bmatrix}2 & 3 & -1 & -1\\ 1 & -1 & -2 & -4\\ 3 & 1 & 3 & -2\\ 6 & 3 & 0 & -7\end{bmatrix}$ by applying elimentary row transformations. **(06 Marks)**

b. Solve the following system of equations by Gauss-elimination method: $x+y+z=9$, $x-2y+3z=8$ and $2x+y-z=3$. **(05 Marks)**

c. Find the inverse of the matrix $\begin{bmatrix}5 & -2\\ 3 & 1\end{bmatrix}$ using Cayley-Hamilton theorem. **(05 Marks)**

OR

2 a. Find the rank of the matrix $\begin{bmatrix}1 & 3 & -1 & 2\\ 0 & 11 & -5 & 3\\ 2 & -5 & 3 & 1\\ 4 & 1 & 1 & 5\end{bmatrix}$ by reducing it to echelon form. **(06 Marks)**

b. Solve the following system of equations by Gauss-elimination method: $x+y+z=9$, $2x-3y+4z=13$ and $3x+4y+5z=40$. **(05 Marks)**

c. Find the eigen values of $A=\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{bmatrix}$. **(05 Marks)**

Module-2

3 a. Solve $(D^4-2D^3+5D^2-8D+4)y=0$. **(05 Marks)**

b. Solve $\frac{d^2y}{dx^2}-4y=\cosh(2x-1)+3^x$. **(05 Marks)**

c. Solve by the method of variation of parameters $y''+a^2y=\sec ax$. **(06 Marks)**

OR

4 a. Solve $\frac{d^3y}{dx^3}-3\frac{d^2y}{dx^2}+4\frac{dy}{dx}-2y=e^x$. **(05 Marks)**

b. Solve $(D^2+5D+6)y=\sin x$. **(05 Marks)**

c. Solve by the method of undetermined coefficients $y''+2y'+y=x^2+2x$ **(06 Marks)**

Module-3

5 a. Find the Laplace transform of $\cos t.\cos 2t.\cos 3t$. **(06 Marks)**

b. Find the Laplace transform $f(t)=\frac{Kt}{T}$, $0<t<\pi$, $f(t+T)=f(t)$. **(05 Marks)**

c. Express $f(t)=\begin{cases}\cos t, & 0<t<\pi\\ \sin t, & t>\pi\end{cases}$ in terms of unit step function, and hence find L[f(t)]. **(05 Marks)**

OR

6 a. Find the Laplace transform of (i) $t\cos at$, (ii) $\frac{1-e^{-at}}{t}$. **(06 Marks)**

b. Find the Laplace transform of a periodic function a period 2a, given that $f(t)=\begin{cases}t, & 0\le t<a\\ 2a-t, & a\le t<2a\end{cases}$ $f(t+2a)=f(t)$. **(05 Marks)**

c. Express $f(t)=\begin{cases}1, & 0<t<1\\ t, & 1<t\le 2\\ t^2, & t>2\end{cases}$ in terms of unit step function and hence find its Laplace transform. **(05 Marks)**

Module-4

7 a. Find the inverse Laplace transform of (i) $\frac{(s+2)^3}{s^6}$, (ii) $\frac{s+5}{s^2-6s+13}$. **(06 Marks)**

b. Find inverse Laplace transform of $\log\left[\frac{s^2+4}{s(s+4)(s-4)}\right]$. **(05 Marks)**

c. Solve by using Laplace transforms $\frac{d^2y}{dt^2}+k^2y=0$, given that $y(0)=2$, $y'(0)=0$. **(05 Marks)**

OR

8 a. Find the inverse Laplace transform of $\frac{4s+5}{(s+1)^2(s+2)}$. **(06 Marks)**

b. Find the inverse Laplace transform of $\cot^{-1}\left(\frac{s+a}{b}\right)$. **(05 Marks)**

c. Using Laplace transforms solve the differential equation $y''+4y'+3y=e^{-t}$ with $y(0)=1$, $y'(0)=1$. **(05 Marks)**

Module-5

9 a. If A and B are any two events of S, which are not mutually exclusive then $P(A\cup B)=P(A)+P(B)-P(A\cap B)$. **(05 Marks)**

b. The probability that 3 students A, B, C, solve a problem are ½, ⅓, ¼ respectively. If the problem is simultaneously assigned to all of them, what is the probability that the problem is solved? **(05 Marks)**

c. In a class 70% are boys and 30% are girls. 5% of boys, 3% of girls are irregular to the classes. What is the probability of a student selected at random is irregular to the classes and what is the probability that the irregular student is a girl? **(06 Marks)**

OR

10 a. If A and B are independent events then prove that $\overline{A}$ and $\overline{B}$ are also independent events. **(05 Marks)**

b. State and prove Baye's theorem. **(05 Marks)**

c. A Shooter can hit a target in 3 out of 4 shots and another shooter can hit the target in 2 out or 3 shoots. Find the probability that the target is being hit:
(i) when both of them try (ii) by only one shooter. **(06 Marks)**

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CBCS Scheme

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15ME43

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Applied Thermodynamics

Time: 3 hrs. Max. Marks: 80

Note: 1. *Answer FIVE full questions, choosing one full question from each module.*
2. *Use thermodynamic data hand book and steam tables is permitted.*

Module-1

1 a. Compare the otto, diesel and dual cycles on P-V diagram and T-S diagrams, when heat is supplied to each cycle is same. **(08 Marks)**

b. Derive air standard efficiency expression for dual combustion cycle. **(08 Marks)**

OR

2 a. With a schematic diagram, explain a closed cycle gas turbine. **(04 Marks)**

b. With the help of neat diagram, explain a Rocket engine. **(04 Marks)**

c. The air enters the compressor of an open cycle constant pressure gas turbine at a pressure of 1 bar and temperature 20°C. The pressure of the air after the compression is 4 bar. The isentropic efficiencies of the compressor and turbine are 80% and 85% respectively. The air fuel ratio is 90 : 1. If flow rate of air is 3 kg/sec. Find (i) Power developed (ii) Thermal efficiency of the cycle.
Assume C_P = 1.0 kJ/kgK and γ = 1.4 for air and gases. Take calorific value of the fuel as 41800 KJ/kg. **(08 Marks)**

Module-2

3 a. List out the factors affecting the efficiency of the Rankine cycle. **(04 Marks)**

b. Compare the Rankine and the Carnot cycles of steam power plants. **(04 Marks)**

c. In a steam power cycle, the steam supply is at 15 bar and dry saturated. The condenser pressure is 0.4 bar. Calculate Carnot and Rankine efficiency of the cycle neglect the pump work. **(08 Marks)**

OR

4 a. What do you mean by Regenerative cycle? With help of neat diagram, explain the working of a regenerative Rankine cycle and derive the efficiency of the cycle. **(08 Marks)**

b. Consider a regenerative vapour power cycle with open feed water heater. Steam enters the turbine at 9 MPa and 350°C and expands to 0.9 MPa where some of the steam is extracted and passed to the open feed water heater operating at 0.9 MPa. The remaining steam expands through the remaining part of the turbine to the condenser pressure of 0.01 MPa. Saturated liquid exits the open feed water heater at 0.9 MPa. If the net power output of the cycle is 120 MW. Determine
(i) Thermal efficiency (ii) Mass flow rate of steam entering the turbine. **(08 Marks)**

Module-3

5 a. Explain the following terms with reference to a combustion process:
(i) Enthalpy of formation (ii) Adiabatic flame temperature
(iii) Enthalpy of combustion (iv) Heat of reaction **(08 Marks)**

b. Methane is burned with atmospheric air. The analysis of the products on a dry basis is as follows:
CO_2 = 10%, O_2 = 2.37%, CO = 0.53%, N_2 = 87.10%
(i) Determine the combustion equation.
(ii) Calculate the air fuel ratio on mass basis.
(iii) Percent theoretical air. **(08 Marks)**

OR

6 a. Explain the combustion phenomenon in C.I. engine. **(08 Marks)**

b. A single cylinder 4 stroke diesel engine gave the following results while running on full load. Area of indicator card = 300 mm^2, Spring constant = 1 bar/mm, Length of the diagram = 40 mm, Speed of the engine = 450 rpm, Load on the brake = 370 N, Spring balance reading = 50 N, Diameter of the brake drum = 1.2 m, Diameter of the cylinder = 160 mm, Stroke of the piston = 200 m, C.V of the fuel = 41800 KJ/kg.
Calculate (i) IMEP
(ii) BP and brake mean effective pressure
(iii) BSFC (Brake Specific Fuel Consumption)
(iv) Brake thermal and indicated thermal efficiency. **(08 Marks)**

Module-4

7 a. With the help of a neat sketch, explain a simple vapour absorption cycle. **(05 Marks)**

b. Explain the various factors affecting the performance of a vapour compression system. **(04 Marks)**

c. A vapour compression refrigerator uses methyl chloride (R-40) and operates between temperature limits of −10°C and 45°C. At the entry to the compressor, the refrigerant is dry and after compression it acquires a temperature of 60°C. Find the C.O.P of the refrigerator. **(07 Marks)**

OR

8 a. Define the following terms:
(i) Dry bulb temperature (DBT).
(ii) Wet bulb temperature (WBT)
(iii) Specific humidity.
(iv) Relative humidity. **(08 Marks)**

b. Atmospheric air at 101.325 KPa has 30°C DBT and 15°C DPT. Without using the psychromatic chart, using the property values from the tables. Calculate
(i) Partial pressure of air and water vapour.
(ii) Specific humidity
(iii) Relative humidity.
(iv) Vapour density and enthalpy of moist air. **(08 Marks)**

Module-5

9 a. Obtain expression for volumetric efficiency of a single stage air compressor in terms of pressure ratio, clearance and 'n' the polytropic index. **(06 Marks)**

b. What are disadvantages of a single stage air compressor? **(02 Marks)**

c. A two stage air compressor with perfect intercooling takes in air at 1 bar 27°C. The law of compression in both the stages is $PV^{1.3}$ = constant. The compressed air is delivered at 9 bar. Calculate for unit mass flow rate of air the minimum workdone and the heat rejected to the intercooler. Compare the values if the compression is carried out in single stage compressor with after cooler. **(08 Marks)**

OR

10 a. Mention the types of nozzles. Explain any one. **(04 Marks)**

b. Derive an expression for steam velocity coming out from a nozzle. **(04 Marks)**

c. Dry saturated steam at a pressure of 11 bar enters a convergent-divergent nozzle and leaves at a pressure of 2 bar. If the flow is adiabatic and frictionless, determine
(i) The exit velocity of steam.
(ii) Ratio of cross section at exit and that at throat. **(08 Marks)**
Assume the index of adiabatic expansion is 1.135.

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10CV52

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Design of RCC Structural Elements

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***IS: 456 -2000 and SP – 16 is permitted.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 Explain the following :
a. Partial safety factors for loads and materials. **(04 Marks)**
b. Explain the principles of limit state design. **(06 Marks)**
c. Show that x_u limt = 0.53d, for Fe250 grade of steel. **(04 Marks)**
d. Explain under reinforces section, over-reinforced section, balance section with a neat sketches. **(06 Marks)**

2 A R.C.C beam of rectangular section 300×600mm is reinforced with 4 bars of 20mm dia with an effective cover 50mm, effective span of the beam is 6m. Assuming M20 concrete and Fe250 steel. Determine the central concentrated P, that can be carried by the beam in addition to its self weight. **(20 Marks)**

3 a. Distinguish between short term and long term deflection in case of R.C structures. Mention the main factors affecting these deflections. **(06 Marks)**
b. A rectangular simply supported beam of span 5m is 300mm×650mm in cross section and is reinforced with 3 bars of 20mm on tension side at an effective cover of 50mm. Determine the shaft term defection due to an imposed working load of 20kN/m (excluding self wt). Assume grade of concrete M20 and grade of steel Fe415. **(14 Marks)**

4 A T-Beam slab floor has 125mm thick slab forming part of T – beam which are of 8m clear span. The end bearing are 450mm thick. Spacing of T-beams is 3.5m. The live load on the floor is 3kN/m^2. Design one of the intermediate beams. Use M20 concrete and Fe415 steel. **(20 Marks)**

PART – B

5 Design a slab for a room of clear dimensions 3m×5m supported on wall of 300mm thickness with corners held down. Two adjacent sides of the slab are continuous and other discontinuous. LL on slab is 3kN/m^2. Assume floor finish of 1kN/m^2. Use M20 concrete and Fe415 steel. Sketch the details of reinforcement. **(20 Marks)**

6 a. Design the reinforcement for a axially loaded square column of size 450mm × 450mm to support a load of 1500 kN. Use M20 concrete and Fe415 steel. **(10 Marks)**

b. A column size of 300×400mm has effective length of 3.6m and is subjected to P_u = 1100kN, and M_u = 150 kN-m, about the major axies. Assume the bars on two side, design the column using M25 concrete and Fe415 steel. **(10 Marks)**

7 Design on Isolated rectangular Footing of uniform depth for the column size of 230mm×300mm supporting an axial service load of 850kN. The safe bearing capacity of soil is 150kN/m^2. Adopt M20 grade concrete and Fe415 grade steel. Sketch the reinforcement details. **(20 Marks)**

8 Design a dog-legged stairs for an building in a room measuring 3.6×5.2m clear. The vertical distance between the Floors is 3.2m. Consider LL 3kN/m^2. Use M20 concrete and Fe415 grade of steel. Assume stairs are supported on 300mm wall at the outer edges of landing slabs. Consider Rise = 160mm, and Tread = 300mm. **(20 Marks)**

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10CV53

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Structural Analysis – II

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Missing data may be assumed suitably.***

PART – A

1 a. What is an influence line? Explain its importance in structural analysis. **(04 Marks)**

b. The load system shown in Fig. Q1 (b) move from left to right on a girder of span 10 m. Find the absolute maximum B.M. for the girder. Also find the maximum +ve and –ve S.F. anywhere on the beam. **(16 Marks)**

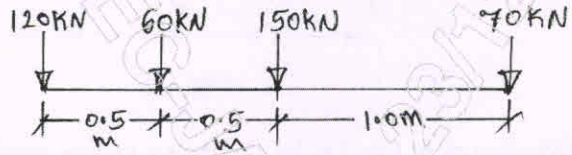

Fig. Q1 (b)

2 Analyse the continuous beam shown in Fig. Q2 by slope deflection method and draw B.M. diagram. Support B sinks by 1.0 mm and C rises up by 0.5 mm relative to support A. Take EI = 30000 kN-m^2. **(20 Marks)**

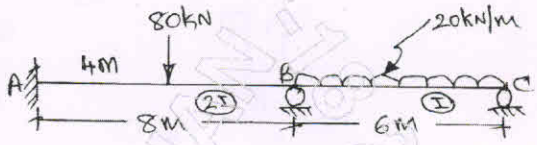

Fig. Q2

3 Analyse the given frame shown in Fig. Q3 by moment distribution method and draw BMD and SFD. **(20 Marks)**

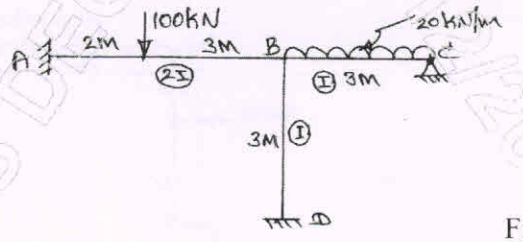

Fig. Q3

4 Find the total force P to be applied at C to prevent sway shown in Fig. Q4. Use slope deflection method. **(20 Marks)**

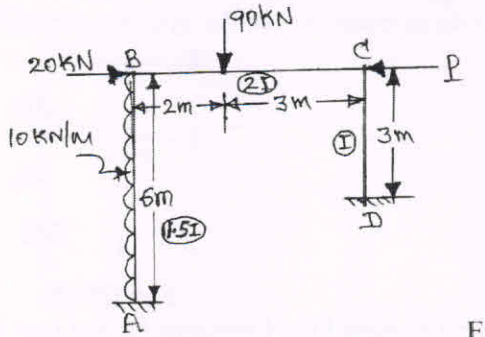

Fig. Q4

PART – B

5 Analyse the multistorey building frame shown in Fig. Q5 by Kani's method and draw BMD. Use principle of symmetry only. **(20 Marks)**

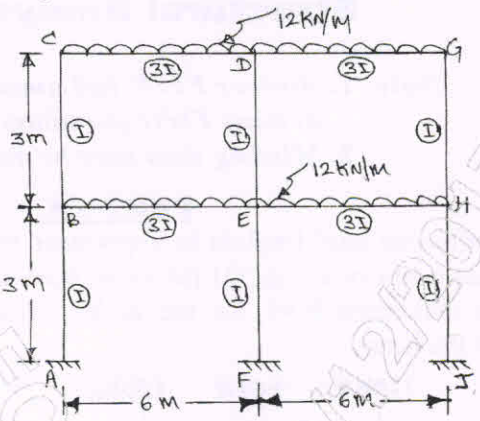

Fig. Q5

6 Analyse the frame shown in Fig. Q6 by flexibility matrix method. Draw BMD. **(20 Marks)**

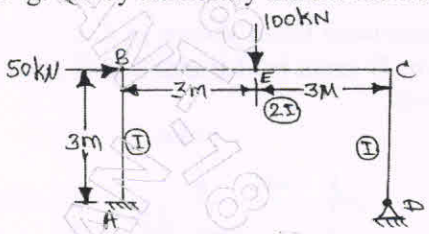

Fig. Q6

7 Analyse the portal frame shown in Fig. Q7 by stiffness matrix method. Draw BMD EI constant. **(20 Marks)**

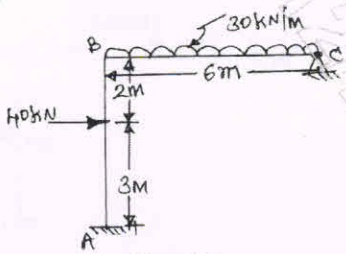

Fig. Q7

8 a. Define natural frequency and period of vibration. **(04 Marks)**

b. Determine the natural frequency of the systems shown in Fig. Q8 (b). **(10 Marks)**

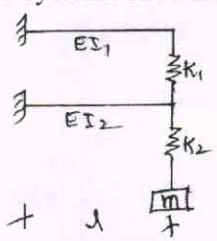

Fig. Q8 (b)

c. Set up the differential equation of motions for the free vibration of a spring mass system. **(06 Marks)**

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10CV54

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Geotechnical Engineering - I

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain three phase system of soil, with a sketch. Differentiate between void ratio and percentage voids. **(06 Marks)**

b. With usual notation show that

$$e = \frac{Gw}{Sr}.$$ **(06 Marks)**

c. Soil sample in its natural state is fully saturated with a water content of 30%. Determine the void ratio, dry unit weight and wet unit weight. Also calculate total weight of water required to fully saturate a soil mass of volume $50m^3$. Take G = 2.60. **(08 Marks)**

2 a. Determine the moisture content of soil sample by Pycnometer method. At what situation this method is preferred? **(07 Marks)**

b. Discuss advantages and limitations of sedimentation analysis. Explain the corrections to be applied to Hydrometer readings. **(07 Marks)**

c. A dry sample of weight 50gms is mixed with distilled water to prepare a suspension of 1000 mℓ for hydrometer analysis. The reading of the hydrometer taken after 5 minutes is 25 and the depth of the centre of the bulb below the water surface when the hydrometer was in the jar was 150mm. The volume of the hydrometer 62mℓ and cross section area of Jar 55 cm^2. Assuming G = 2.68 and $\eta = 1.0 \times 10^{-5}$ g-sec/cm^2. Determine the co-ordinates of the point corresponding to above observation. **(06 Marks)**

3 a. With a neat sketch, explain plasticity chart and describe its use in classifying fine grained soil. **(06 Marks)**

b. Explain with neat sketches, the structure of the following minerals :
i) Kaolinite ii) Montmorillonite. **(06 Marks)**

c. Following are the results obtained from the tests conducted on two soils A and B. Classify them as per IS classification system. Show the salient steps involved. **(08 Marks)**

Soil	LL	PL	% Retained on IS 75 μm Sieve	% Retained on IS 4.75 mm Sieve	Cu	Cc
A	110	50	40	Zero	-	-
B	-	-	97	05	7	2

4 a. State Darcy's Law. With a neat sketch, derive an expression for the co-efficient of permeability of a soil in a falling head permeability test. **(08 Marks)**

b. Explain the factors affecting the permeability of soil. **(06 Marks)**

c. A sample of soil for constant head permeability test yielded the following data :
i) Diameter of sample = 7.6cm.
ii) Length of sample = 20cm.
iii) Head causing the flow = 15cm.
iv) Quantity of water collected in 10min = 150 CC.

Assume G = 2.65 , γ_d = 18kN/m^3.
Determine : i) Co-efficient of Permeability ii) Discharge velocity iii) Seepage Velocity. **(06 Marks)**

PART – B

5 a. Explain Mohr – Coulomb failure theory of soils. Sketch Coulomb failure envelope for pure sand and pure clay. **(06 Marks)**

b. Explain the following terms : i) Sensitivity and Thixotropy of clay.
ii) Total, neutral and effective stresses in soils. **(06 Marks)**

c. Two identical specimens 4cm diameter and 8cm height of partly saturated compacted soil are tested in a triaxial cell under undrained conditions. The first specimen failed at deviator load of 720N under a cell pressure of 100kN/m^2. Second specimen failed at deviator load of 915N under a cell pressure of 200kN/m^2. The increase in the volume of first specimen at failure is 1.2mℓ and shortens by 0.6cm. The increase in the volume of second specimen at failure is 1.6mℓ and shortens by 0.8cm. Determine apparent cohesion and angle of shearing resistance by analytical method. **(08 Marks)**

6 a. Obtain the value of compactive energy imported to the soil during Light compaction and Heavy compaction test. **(04 Marks)**

b. What are the objectives of Compaction? Discuss the factors affecting compaction. **(06 Marks)**

c. Following are the results obtained from a standard compaction test :

Water content, W(%)	13.5	20.2	25	35	45
Bulk unit weight , γ_b kN/m^3	16.3	19.4	18.8	18	17.2

Plot compaction curve and obtain maximum dry unit weight and OMC. Also plot 100% saturation line. Show specimen calculation. G = 2.65. **(10 Marks)**

7 a. Define the following terms : i) Compression index ii) Co-efficient of compressibility iii) Co-efficient of volume compressibility. **(06 Marks)**

b. Explain with a neat sketch, Casagrande's method of obtaining Pre – consolidation pressure. **(06 Marks)**

c. A saturated soil stratum 5m thick lies above an impervious stratum. It has a compression index of 0.25 and co-efficient of Permeability 3.2 × 10^{-3}mm/sec. If void ratio is 1.90 at a normal stress of 0.15N/mm^2. Compute i) void ratio due to increase in stress to 0.2N/mm^2 ii) settlement of soil stratum due to above increase in stress. **(08 Marks)**

8 a. List the merits and demerits of Triaxial shear test over Direct shear test. **(06 Marks)**

b. Explain the determination of co-efficient of consolidation by square root of time fitting method. **(06 Marks)**

c. In a direct shear test on a specimen of clean dry sand a normal stress of 200kN/m^2 was applied and failure occurred at a shear stress of 140kN/m^2. Determine i) Angle of shearing resistance ii) Principal stresses during failure iii) Direction of principal planes with respect to plane to shearing.
Draw a neat sketch of Mohr circle showing the directions of Major and Minor principal planes with reference to shearing. **(08 Marks)**

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10CV56

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Transportation Engineering – I

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Use of IRC : 37 – 2001 is permitted.

PART – A

1 a. Discuss briefly the role of transportation in the economic social activities of the country. **(06 Marks)**

b. Explain the following :
i) Jayakar committee's recommendations
ii) IRC
iii) CRF. **(06 Marks)**

c. The area of state is 3,08,000 sq. km. The number of towns as per 1981 census was 276. The number of villages were 41,833. Calculate the length of various categories of roads as per 3rd 20 year road plan formulae. **(08 Marks)**

2 a. Briefly describe highway planning surveys. **(06 Marks)**

b. List the salient features of : i) PMGSY ii) KSHIP projects. **(06 Marks)**

c. Four new roads A, B, C and D are to be constructed in a district during a five year plan period. Suggest the order of priority for phasing the development programme based on maximum utility approach. Assume utility units of 0.5, 1, 2 and 4 for population ranges and 1 and 10 for 1000 t of agricultural and industrial products.

Road	Length km	Number of villages with population range				Productivity, t	
		<500	500 - 1000	1000-2000	>2000	Agricultural	Industrial
A	65	40	12	14	8	5000	1000
B	55	22	9	6	4	8000	1200
C	45	32	8	9	6	6000	800
D	72	36	6	3	3	9000	2000

(08 Marks)

3 a. Briefly explain the factors controlling highway alignment. **(06 Marks)**

b. Explain with neat sketch the width of carriage way and mention the IRC standards. **(06 Marks)**

c. Two vehicles A and B are moving in the same direction with speeds of 100 kmph and breaking efficiency of 70% and 50% respectively. An object is seen by both the drivers on the road approximately at a distance of 250m. Find :
i) Which vehicle will meet with an accident
ii) If the accident is to be avoided, what is the breaking efficiency required? **(08 Marks)**

4 a. Explain briefly the attainment of designed super elevation in practice. **(06 Marks)**

b. A NH passing through a plain terrain has a horizontal curve of radius equal to the ruling minimum radius. If the design speed is 100 kmph. Calculate the : i) design super elevation ii) Extra widening iii) Length of transition curve. Make suitable assumptions. **(08 Marks)**

c. An ascending gradient of 1 in 50 meets with a descending gradient of 1 in 80. Calculate the length of the summit curve for SSD of 120m and OSD of 470m. **(06 Marks)**

PART – B

5 a. Briefly explain the desirable properties of sub grade soil. **(06 Marks)**

b. Explain the desirable properties of road aggregates. Indicate the test conducted to determine these properties. **(06 Marks)**

c. The following test data pertains to a soil sub-grade specimen. Plot the data and determine the CBR value :

Penetration (mm)	0	0.5	1.0	1.50	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5
Load (kg)	0	5	16.2	28.1	40	48.5	56.5	67.5	75.2	89.0	99.5	106.5

(08 Marks)

6 a. Briefly explain the design factors to be considered in pavement design. **(06 Marks)**

b. Explain the following terms :

i) Modulus of subgrade reaction

ii) Radius of relative stiffness

iii) Equivalent radius of resisting section. **(06 Marks)**

c. Design the flexible pavement for construction of a new highway (NH/ Two lane /Single carriageway) with the following data as per IRC : 37–2001 :

i) Number of commercial vehicles as per last count = 1000 CVPD

ii) Period of construction = 3 years

iii) Design life = 15 years

Annual growth rate = 8% . Design CBR of sub-grade soil = 6% **(08 Marks)**

7 a. Explain the construction step for cement concrete roads. **(10 Marks)**

b. Explain the methods of sub-surface drainage to control the seepage flow, capillary rise and water table. **(10 Marks)**

8 a. Explain the various benefits that a road user gets by the improvement of road. **(06 Marks)**

b. Briefly explain the factors to be considered for evaluating the motor vehicle operating cost. **(06 Marks)**

c. Determine the relative economics of two type of flexible pavements by annual cost method from the following data :

Details	Pavement type A	Pavement type B
Total cost per km, Rs. lakhs	3.30	6.20
Design life, years	5.00	12.00
Annual rate of interest, %	10.00	9.00
Salvage value after design life, Rs. Lakhs	2.10	3.00
Average annual maintenance cost per km, Rs. lakhs	0.40	0.20

(08 Marks)

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CBCS Scheme

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15CV53

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Applied Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Describe with neat sketch wash boring technique to explore soil. **(08 Marks)**

b. The following sizes of sampling tubes are available in market.

Sample No.	I	II	III
Outer Diameter (mm)	75	110	50
Inner Diameter	72	107	35
Length (mm)	600	600	600

Out of these which one would you select for obtaining undistributed Soil sample from a bore hole, Apply appropriate technique to get best undisturbed sample. **(08 Marks)**

OR

2 a. Explain with neat sketch, electrical resistivity method of soil exploration. **(06 Marks)**

b. Predict the Ground water table given the following data: Depth upto which water is boiled out 18 m, Water rise in I day = 0.95 m, II day = 0.86 m and III day = 0.78 m, use the Hvorslev's method for predicting ground water table. **(10 Marks)**

Module-2

3 a. Compare Boussinesq's theory with Westergaard's theory with a logical graph analysis. **(08 Marks)**

b. Find intensity of vertical pressure at a point 3 m directly below 25 kN point load acting on a horizontal ground surface. What will be the vertical pressure at a point 2 m horizontally away from the axis of loading and at same depth of 3 m? Use Boussinesq's equation. **(08 Marks)**

OR

4 a. Explain components of settlements. **(12 Marks)**

b. A reinforced concrete foundation of dimensions 1.8m × 3.6m exerts a uniform pressure of 180 kN/m^2 on a soil mass, with E-value 45MN/m^2. Determine the value of Immediate settlement under the foundation. Take $\mu = 0.3$ and $I_f = 1.0$ **(04 Marks)**

Module-3

5 a. Compare Coulomb's Earth pressure theory over Rankin's Earth pressure theory. **(06 Marks)**

b. Determine the active earth pressure using Rebhann's graphical method. **(10 Marks)**

OR

6 a. Explain the procedure for determination of factor of safety using method of slices for C-ϕ-soil. **(12 Marks)**

b. An Embankment is inclined at an angle 35° and its height is 15 m. The angle of shearing resistance is 15° and the cohesion intercept is 40 kN/m^2. The unit weight of soil is 18 kN/m^3. Examine the factor of safety with respect to cohesion. Consider Taylor's stability number = 0.06. **(04 Marks)**

Module-4

7 a. Determine the bearing capacity of the soil by using plate load test as per IS : 1888 guidelines. **(08 Marks)**

b. A square footing located at a depth of 1.3 m below ground has to carry a safe load of 800 kN. Predict the size of footing which is safe against applied load. If the desired factor of safety is 3.0. Assume e = 0.55, Degree of Saturatm = 50%m G = 2.67, C = 8 kN/m^2. Use Terzagh's analysis for general shear failure. Assume $\phi = 30^\circ$, N_C = 37.2, N_q = 22.5 and N_r = 19.7 **(08 Marks)**

OR

8 a. Generalize the assumptions made by Terzagh's bearing capacity theory for development of bearing capacity equation. **(08 Marks)**

b. Determine the bearing capacity of the soil by using standard penetration test as per IS : 2131 guidelines. **(08 Marks)**

Module-5

9 a. Classify the various type of Piles based on material and function. **(10 Marks)**

b. Explain negative skin friction in pile foundation. **(06 Marks)**

OR

10 a. Explain with a neat sketch the construction and working of under remmed pile. **(10 Marks)**

b. Justify with a neat sketch, how static formula summarize the load transfer mechanism in pile foundations. **(06 Marks)**

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CBCS Scheme

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15CV52

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Analysis of Indeterminate Structures

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 Analyze the continuous beam shown in Fig.Q1 by slope deflection method. Draw BMD and EC.

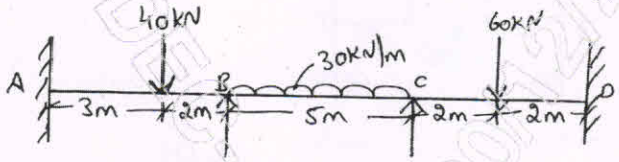

Fig.Q1 **(16 Marks)**

OR

2 Analyze the portal frame shown in Fig.Q2 by slope deflection method. Draw BMD.

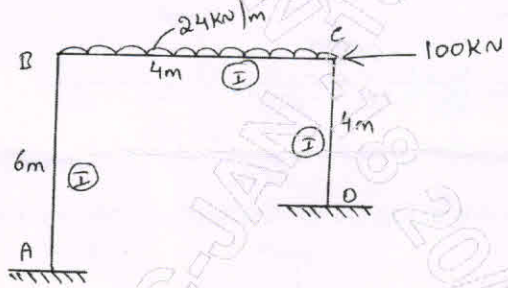

Fig.Q2 **(16 Marks)**

Module-2

3 Analyze the continuous beam by moment distribution method shown in Fig.Q3. The support 'B' sinks by 10 mm. Take EI = 4000 kN-m^2. Draw BMD and EC.

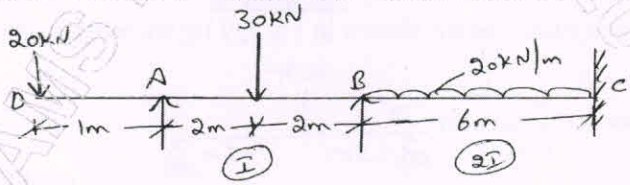

Fig.Q3 **(16 Marks)**

OR

4 Analyze the frame shown in Fig.Q4 by moment distribution method. Draw BMD.

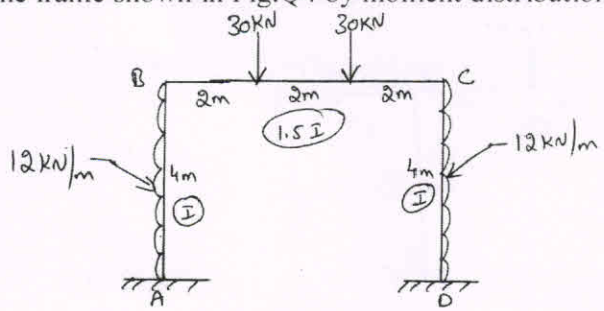

Fig.Q4 **(16 Marks)**

Module-3

5 Analyze the continuous beam by Kani's method. Shown in Fig.Q5. Draw BMD.

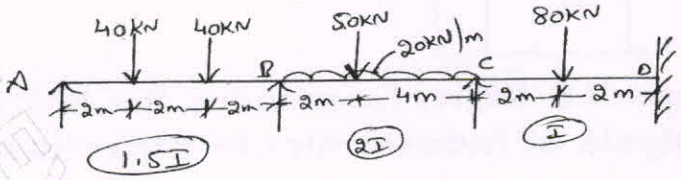

Fig.Q5 **(16 Marks)**

OR

6 Analyze the frame shown in Fig.Q6 by Kani's method. Draw BMD.

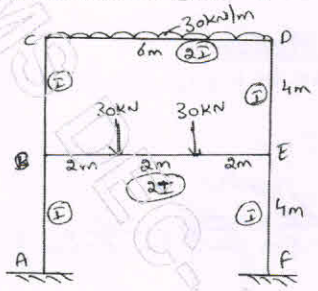

Fig.Q6 **(16 Marks)**

Module-4

7 Analyze the beam shown by flexibility matrix method. Draw BMD.

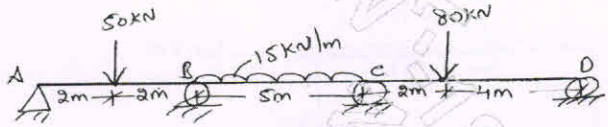

Fig.Q7 **(16 Marks)**

OR

8 Analyze the beam shown in Fig.Q8 by flexibility matrix method. Draw BMD.

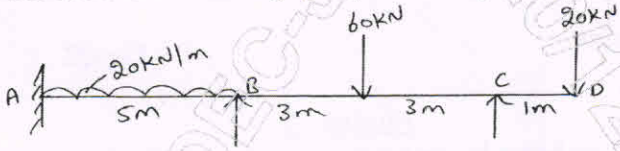

Fig.Q8 **(16 Marks)**

Module-5

9 Analyze the continuous beam shown in Fig.Q9 by stiffness matrix method. Draw BMD.

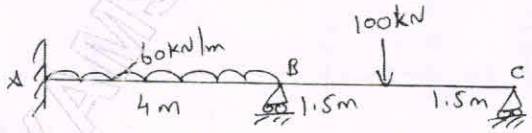

Fig.Q9 **(16 Marks)**

OR

10 Analyze the portal frame shown in Fig.Q10 by stiffness matrix method. Draw BMD.

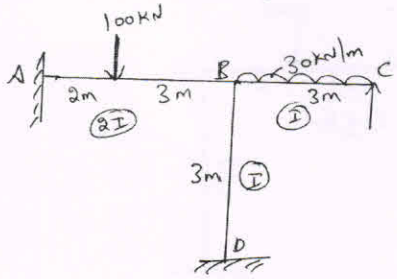

Fig.Q10 **(16 Marks)**

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CBCS Scheme

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15CV563

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Remote Sensing & GIS

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define Remote Sensing, with a neat sketch and explain the process of remote sensing system. **(08 Marks)**

b. With a neat sketch and explain the electromagnetic spectrum. **(08 Marks)**

OR

2 a. Explain the energy interactions in the atmosphere. **(08 Marks)**

b. Explain the elements of visual interpretation techniques. **(08 Marks)**

Module-2

3 a. Explain the different types of platforms used in remote sensing. **(06 Marks)**

b. What is resolution of a sensor? Describe all sensor resolutions. **(10 Marks)**

OR

4 a. Explain digital image processing. **(06 Marks)**

b. Write a note on IRS, Landsat, IKonos and Cartosat. **(10 Marks)**

Module-3

5 a. Define GIS. Describe the key components of GIS. **(08 Marks)**

b. Explain the different steps involved in GIS operations. **(08 Marks)**

OR

6 a. What is a map projections? Explain the types of map projections. **(08 Marks)**

b. Write a note on Geospatial data and projected coordinate system. **(08 Marks)**

Module-4

7 a. What is vector data model? How to represent the simple spatial features in vector data model. **(08 Marks)**

b. Write a note on topology and coverage. Mention their importance. **(08 Marks)**

OR

8 a. Explain the different raster data structures. **(08 Marks)**

b. What is raster data model? Explain the different types of raster data used in GIS. **(08 Marks)**

Module-5

9 a. What is land use land cover? Explain the applications of remote sensing in land use land cover analysis. **(08 Marks)**

b. How remote sensing and GIS are used in change detection study? **(08 Marks)**

OR

10 a. Explain the applications of RS and GIS in natural resource management. **(08 Marks)**

b. Explain the following: Urban palnning, Traffic management **(08 Marks)**

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CBCS Scheme

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15CV/CT51

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Design of RC Structural Elements

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Use of code IS456:2000 and SP-16 is permitted.

Module-1

1 a. Explain: (i) Characteristic load; (ii) Characteristic strength; (iii) Partial safety factor. **(06 Marks)**

b. What is stress block? Derive from the fundamentals the expressions for the area of stress block $0.36\ f_{ck} b x_u$ and depth of centre of compressive force from the extreme fibre in compression $0.42\ x_u$. **(10 Marks)**

OR

2 a. Explain: (i) Developmental length of bars; (ii) Short term deflection; (iii) Long term deflection **(06 Marks)**

b. A rectangular simply supported beam of span 5 m is 300 × 650 mm in cross section and is reinforced with 3 bars of 20 mm on tension side at an effective cover of 50 mm. Determine the short deflection due to an imposed working load of 20 kN/m excluding self weight. Assume grade of concrete M20 and steel as Fe415. **(10 Marks)**

Module-2

3 a. Differentiate between under reinforced, over reinforced and balanced section. **(06 Marks)**

b. A RCC beam of section 300 mm × 500 mm is reinforced with 4 bars of 16 mm diameter with an effective cover of 50 mm. The beam is simply supported over a span of 5 m. Find the maximum permissible udl on the beam. Use M20 grade concrete and Fe 500 steel. **(10 Marks)**

OR

4 a. A RCC beam 250 mm wide and 450 mm deep is reinforced with 3 numbers of 20 mm dia bars of grade Fe415, on the tension side with an effective cover of 50 mm. If the shear reinforcement of 2 legged-8 mm dia stirrups at a spacing of 160 mm c/c is provided at a section, determine the design ultimate strength of the section. Assume M20 concrete. **(07 Marks)**

b. A T-beam RC floor system consists of 120 mm thick slab supported by beams at 3m c/c. The effective width and depth of web is 300*580 mm as shown in Fig.Q4(b). Main reinforcement consists of 8 bars of 20 mm dia. The grade of concrete and steel used are M20 and Fe415 respectively. Determine the moment of resistance of T-beam, if it is used as simply supported beam of span 3.6 m.

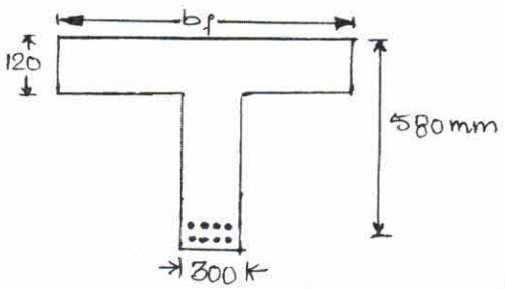

Fig.Q4(b) **(09 Marks)**

Module-3

5 A rectangular beam is to be simply supported on supports of 230 mm width. The clear span of the beam is 6m. The beam is to have width of 300 mm. The super imposed load is 12 kN/m. Using M20 concrete and Fe415 steel. Design the beam. Apply check for deflection. **(16 Marks)**

OR

6 Design a rectangular beam of section 230 mm × 600 mm of effective span 6m. Effective cover of reinforcement should be kept as 50 mm. Imposed load on the beam is 40 kN/m. Use M20 concrete and Fe 415 steel. **(16 Marks)**

Module-4

7 Design a continuous RC slab for a class room 7m wide and 14 m long. The roof is to be supported on RCC beams spaced at 3.5 m intervals. The width of beam should be kept 230 mm. The super imposed load is 3 kN/m^2 and furnishing load expected is 1 kN/m^2. Use M20 concrete and Fe415 steel. **(16 Marks)**

OR

8 Design a dog legged stairs for an office building in a room measuring 2.8m * 5.8 m clear. Vertical distance between the floor is 3.6m. Width of flight is to be 1.25 m. Allow a live load of 3 kN/m^2. Sketch the details of reinforcement. Use M20 concrete and Fe 415 steel. Assume the stairs are supported on 230 mm walls at the end of outer edges of landing slabs. **(16 Marks)**

Module-5

9 A corner column 400 * 400 mm, is subjected to the factored loads P_u = 1300 kN, M_{ux} = 190 kN-m and M_{uy} = 110 kN-m. Design the reinforcement in the column, assuming M25 concrete and Fe 415 steel and effective cover of 60 mm. Assume it as short column. **(16 Marks)**

OR

10 Design a square footing for a short axially loaded column of size 300 mm * 300 mm carrying 600 kN load. Use M20 concrete and Fe415 steel. SBC of soil is 180 kN/m^2. Sketch the details of reinforcement. **(16 Marks)**

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CBCS Scheme

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15CV/CT551

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Air Pollution and Control

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define Air Pollution. Explain Primary and Secondary air pollutants. **(08 Marks)**

b. With respect to Air pollution, explain air borne contaminants. **(08 Marks)**

OR

2 a. Enumerate the effects of Air pollution on Human Health and Vegetation. **(08 Marks)**

b. Define Inversion. Briefly explain the different types of inversion with the aid of neat sketches. **(08 Marks)**

Module-2

3 a. Explain the structure and the companion of atmosphere. **(08 Marks)**

b. Define Lapse rate. Explain the different types of lapse rate. **(08 Marks)**

OR

4 a. What are the assumptions and limitations of the Gaussian Plume dispersion model? **(08 Marks)**

b. A Thermal power plant releases SO_2 at a rate of 138.8 g/s. The stack height is 120m. While the temperature of the stack gas is 150^0C and the ambient air temperature is 35^0C. The wind velocity at the stack height is 8.5m/s. While the stack gas velocity is 10m/s. The stack diameter is 3.5m. The atmospheric pressure is 1.005 bar. Estimate the effective stack height. **(08 Marks)**

Module-3

5 a. What is meant by Air sampling? Explain briefly sampling train. **(08 Marks)**

b. With eh help of the neat sketch, explain the measurement of SPM in ambient air. **(08 Marks)**

OR

6 a. With the help of neat sketch, explain high volume air sampler for measurement of particulate matter. **(08 Marks)**

b. Briefly explain any one method of measuring SO_2 in the stack. **(08 Marks)**

Module-4

7 a. Explain the factors affecting the selection of the particulate air control devices. **(08 Marks)**

b. Briefly explain the particulate matter removal by gravity Sattler, with the help of neat sketch. **(08 Marks)**

OR

8 a. With the help of neat sketch, explain the working principle of Electro Static Precipitation. **(08 Marks)**

b. A cement plant was emitting flue gas at the rate of 20,000 m^3/h. Assuming inlet gas velocities of 2m/s. Design a tubular ESP with 0.20m diameter with 7 cylinders to achieve the efficiency of 90% and 95%. **(08 Marks)**

Module-5

9 a. Explain briefly the emission of the gasoline driven vehicles and diesel driven vehicles. **(08 Marks)**

b. Define Noise Pollution. Explain the sources and control methods of Noise - Pollution. **(08 Marks)**

OR

10 Write short notes on any Four of the following :

a. Acid rain and its effects.
b. Bhopal gas tragedy.
c. Air quality standards.
d. Noise Pollution standards.
e. Environmental policy.
f. Kyoto protocol. **(16 Marks)**

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10CV61

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018

Environmental Engineering – I

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain in detail the various types of water demands. **(06 Marks)**

b. With the help of a diagram, describe the hourly variation of water demand. **(06 Marks)**

c. The following data have been collected from the census department for a city. Calculate the probable population of the city in the year 2020 by using geometrical increase method:

Year	Population
1960	35,00,000
1970	46,60,000
1980	99,50,000
1990	1,56,00,000
2000	1,63,00,000
2010	1,84,00,000

(08 Marks)

2 a. What are intake structures? Describe with neat sketch a intake structure. **(08 Marks)**

b. Describe the working of a simple hand operated reciprocated pump. **(06 Marks)**

c. Estimate the size of supply conduct for a city with population of 5,00,000. Assume water consumption as 270 ℓ/c/d and flow velocity through the pipe as 1.2 m/sec. **(06 Marks)**

3 a. What is meant by turbidity of water? Explain how to determine the optimum coagulant dosage in the laboratory using Jar Test apparatus. **(10 Marks)**

b. Explain the significance of the following parameters of water, with their standards:
i) Hardness of water
ii) Chlorides
iii) Fluoride
iv) Turbidity
v) Nitrates **(10 Marks)**

4 a. Draw the water treatment flow chart indicating the impurities removed at each unit and discuss briefly of them. **(10 Marks)**

b. Design a sedimentation tank for a water works which supplies 1.5×10^6 liters/day. Velocity of flow is 15 cm/min and depth of water in tank is 3.5 m. Sedimentation period is 5 hours. Assume an allowance for sludge as 50 cm. **(10 Marks)**

PART – B

5 a. Explain the theory of filtration process for the treatment of water. **(10 Marks)**

b. Design a set of 8 rapid gravity filters for treating water at water works, which has to supply water to a town of population 3,00,000. Per capital demand if the town is 270 liters/day. The rate of filtration of the rapid gravity filter may be taken as 4500 litres/hour/sq.m. **(10 Marks)**

6 a. Explain lime soda process for removal of hardness. **(08 Marks)**

b. Discuss briefly on:

i) Pre and Post chlorination

ii) Super chlorination

iii) Dechlorination **(06 Marks)**

c. Write the requirements of a good disinfectants. **(06 Marks)**

7 a. Explain methods for removing fluoride from water. **(10 Marks)**

b. List the different layout of distribution system of water. Explain any two methods. **(10 Marks)**

8 a. Differentiate between port fire hydrant and flush fire hydrant. **(10 Marks)**

b. Write short notes on:

i) Back wash of RSF

ii) Break point chlorination **(10 Marks)**

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10CV62

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018

Design and Drawing of RC Structures

Time: 4 hrs. Max. Marks:100

Note: 1. ***Answer any TWO full questions from PART-A and any ONE question PART-B.***
2. Use of IS-456(2000) and SP-16 is permitted.

PART – A

1 A simply supported two way slab with clear dimensions 5.0m × 6.0m is supported on all sides by 230 mm thick wall. Following are the reinforcement details:
Short span : Positive steel = #12 mm @ 125 mm c/c
Negative steel = #12 mm @ 125 mm c/c
for a length of 1.5 m.
Longer span : Positive steel = #12 mm @ 140 mm c/c
Negative steel = #12 mm @ 140 mm c/c
for a length of 1.5 m.
Torsional reinforcements in the form of corner mat # 10 mm at 150 mm c/c is provided at top and bottom in all corners.
Edge strip reinforcement #8 @ 230 mm c/c
Thickness of slab 150 mm.

Draw to a suitable scale.

a. Plan showing reinforcement details. **(10 Marks)**
b. C/S at midspan along shorter span. **(05 Marks)**
c. C/S at midspan along longer span. **(05 Marks)**

2 A dog legged staircase is to be detailed with the following details:
Size of staircase room 2100 mm × 4500 mm
Width of flight = 1000 mm
Width of landing = 1000 mm
Number of treads in each flight = 10
Tread = 250 rise = 150 mm
Wall thickness = 230 mm
Waist slab thickness = 160 mm
Main steel 12 mm HYSD bars at 100 mm c/c and distribution steel for each flight = 8 mm @ 200 c/c. First flight starts from ground floor level and foundation 750 mm below GFL and second flight rests on wall.

Draw to a suitable scale:

a. Plan **(06 Marks)**
b. Sectional details of 1st and 2nd flight. **(14 Marks)**

3 A rectangular column of size 300 mm × 450 mm is provided with square isolated footing of size 2.60 m × 2.60 m. Height of column above GL = 3.6 m. Depth of foundation = 1.2 m below GL.

Details of Column:
Longitudinal steel = 10 numbers of 16 mm dia HYSD bars
Transverse steel = 8 mm dia ties at 200 mm c/c.
Details of footing:
Depth of footing at column face 600 mm and is tapered to 300 mm at the edge of footing.
Reinforcements = #12 mm HYSD bars at 150 mm c/c.

Draw to a suitable scale:

a. Plan of column and footing showing reinforcement. **(06 Marks)**
b. Sectional elevation. **(10 Marks)**
c. Bar bending schedule. **(04 Marks)**

PART – B

4 Two reinforce columns A = 350 mm × 350 mm and B = 400 mm × 400 mm in size carry axial service loads of 600 kN and 850 kN respectively. The columns are spaced at 3.6 m c/c. SBC of soil is 150 kN/m^2. The property line is 0.9 m from the centre of column A. Design the beam and slab type combined footing. **(40 Marks)**

Draw longitudinal section, plan and typical cross sections to a suitable scale. Use M20 grade of concrete and Fe 415 steel. **(20 Marks)**

5 Design a counter fort retaining wall with the following details.
Height of wall above GL = 6.0 m
Depth of hard soil level = 1.2 m
Angle of repose of the soil = 30°
SBC of the soil = 180 kN/m^2
Density of soil = 18 kN/m^3
Spacing between counterforts = 3.0 m c/c
Length of base slab = 4.5 m
Length of toe = 1.1 m
Coefficient of friction, $\mu = 0.55$
Materials: concrete M20 grade, Steel Fe415. **(40 Marks)**

Draw to a suitable scale:

a. Cross section through counterfort. **(10 Marks)**
b. Cross section mid way between counterforts. **(05 Marks)**
c. Sectional plan. **(05 Marks)**

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10CV63

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Transportation Engineering – II

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What are the factors considered for laying new railway line? **(06 Marks)**

b. With the aid of sketches briefly explain the types of rails. **(06 Marks)**

c. Define permanent way. What are the ideal requirements of permanent way? **(08 Marks)**

2 a. What are the advantages of welding of rails? **(06 Marks)**

b. With a neat sketch, explain
(i) Dog spike (ii) Screw spike **(06 Marks)**

c. Define sleeper density. For a rail of 12.80 metre length, calculate the quantity of materials required per km length of track. Assume sleeper density as $n+3$. **(08 Marks)**

3 a. Determine the maximum train load that can be handled by a locomotive having four pairs of driving wheels of an axle load of 28 tonnes each. On a straight track the train runs at a speed of 90 kmph. Also determine the reduction in speed of train when it is moving on upward gradient of 1 in 200. If the train moves on upward gradient with 4°curve, what would be the reduction of speed? **(08 Marks)**

b. What are the objects of providing transition curve? Explain briefly the essential requirement of ideal transition curve. **(06 Marks)**

c. A 6° curve branches off from 3° main curve in an opposite direction in the layout of B.G. yard. If the speed on the branch line is restricted to 35 kmph, determine the speed restricted on main line. Assume permissible deficiency in cant as 7.6 cm **(06 Marks)**

4 a. Draw a neat sketch of "Right hand turnout" and show the various parts on it. **(06 Marks)**

b. Find the lead and radius of curve for a B.G. turnout having d = 136 mm, $\theta = 1°34'27''$ and number of crossing as 1 in $8\frac{1}{2}$. **(04 Marks)**

c. Write a note on:
(i) Marshalling yards (ii) Locomotive yards. **(10 Marks)**

PART – B

5 a. List and explain the aircraft characteristics which affect planning and design of airports. **(10 Marks)**

b. What is wind rose diagram? Explain any one method of constructing wind rose diagram. **(10 Marks)**

6 a. With the aid of sketch explain the procedure of instrument landing system. **(06 Marks)**

b. Explain the various factors affecting on locations of exit taxiway. **(06 Marks)**

c. Determine the corrected length of runway for an airport site using the following data:
(i) Basic runway length = 2600 metres.
(ii) Airport elevation = 500 meters.
(iii) Airport reference temperature = 21°C
(iv) Runway effective gradient = 0.2% **(08 Marks)**

7 a. Explain the method of transfer of centre line into tunnel and providing grade. **(10 Marks)**
b. With the aid of sketch, explain he needle beam method of tunneling. **(06 Marks)**
c. What are the advantages of cement concrete lining? **(04 Marks)**

8 a. What are the factors to be considered for selection of harbor site? **(06 Marks)**
b. What is dry dock? Explain the construction and uses of dry dock. **(08 Marks)**
c. Compare with sketches, the wall type break water and mound type break water. **(06 Marks)**

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10CV65

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Hydraulic Structures and Irrigation Design Drawing

Time: 4 hrs. Max. Marks:100

Note: 1. ***Answer any TWO full questions form PART A and ONE question from PART B***
2. ***Draw neat diagram wherever necessary***
3. ***Missing data may suitably be assumed.***

PART – A

1 a. Define: i) Yield, ii) Trap efficiency iii) Density currents. **(03 Marks)**

b. The construction cost for certain possible heights of dam at a given site have been estimated and are given in table, along with storage capacity at these heights. Determine the most economical height of dam :

Height (m)	10	20	30	40	50	60	65
Construction cost (million Rs.)	4	8	12	18	27	39	50
Storage (million cum)	50	110	180	250	350	500	600

(05 Marks)

c. Explain briefly environmental effects of construction of a reservoir. **(07 Marks)**

2 a. What are the modes of failure of gravity dam? Explain. **(07 Marks)**

b. Design the practical profile of a gravity dam of stone masonry, given the following data :

RL of base of dam = 1250.00m
RL of FRL = 1280.00m
Height of wave = 1.5m
Safe compressive strength = 1200kN/m^2
Specific gravity = 2.4

Sketch the profile. **(08 Marks)**

3 a. List the design criteria for earth dams. **(07 Marks)**

b. Explain the steps in fixing the preliminary dimensions of an earth dam. **(08 Marks)**

PART – B

4 Design a surplus weir with stepped apron of a tank with the following details :

Catchment area = 20km^2
Maximum water level = 124.000m
Full tank level = 123.000m
Ground level at weir site = 122.000m
GL below proposed weir upto a reach of 5m = 121.000m
Tank bund level = 125.500m
Top width of tank bund = 2.0m
Side slopes of bund on either side = 2H:1V
Hard foundation available at 120.000m
Ryve's coefficient = 9
Hydraulic gradient = 1:5

(25 Marks)

Draw to a suitable scale :

a. Half plan at top and half plan at foundation. **(20 Marks)**

b. Half elevation and half sectional elevation. **(15 Marks)**

c. Cross section across the weir. **(10 Marks)**

5 Design details of a canal regulator is as follows :

Particulars	u/s	d/s
Full supply discharge	$16m^3/s$	$13m^3/s$
Bed width	10m	10m
Full supply level	12.000m	11.500m
Top level of Bank	13.000m	12.500m
Canal bed level	10.000m	10.000m
Top width of bank	2m	2m
Canal side slopes	2H:1V	2H:1V

Bligh's coefficient = 10

General GL at the site = 12.00m

Good soil for foundation is at 9.000m

Design Ventway, Gates, Apron, and Protection works. **(25 Marks)**

Draw to a suitable scale:

a. Half plan at top and half plan at foundation. **(20 Marks)**

b. Half elevation and half sectional elevation. **(15 Marks)**

c. Sectional elevation through regulator vent. **(10 Marks)**

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10CV666

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Rural Water Supply and Sanitation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What is the need for protected water and supply? What are the points to be considered while selecting the source of water for rural water supply? **(08 Marks)**

b. List the water borne diseases. Explain their controlling measures. **(06 Marks)**

c. Mention the BIS drinking water quality standards for the following water quality parameters i) p^H ii) Total hardness iii) Chlorides iv) Nitrates v) Fluorides vi) Sulphates. **(06 Marks)**

2 a. What are the factors to be considered while selection of a particular type of pump for rural water supply. **(06 Marks)**

b. Define : i) Disinfection ii) Defluoridation iii) Hardness iv) Chlorination. **(04 Marks)**

c. Explain the following : i) Nalgonda technique ii) Lime – Soda process. **(10 Marks)**

3 a. Explain the concept of Eco - Sanitation. **(04 Marks)**

b. Write a neat sketch of : i) Aqua privy ii) Soak pit. **(08 Marks)**

c. With a neat sketch, explain the working of a Septic tank. **(08 Marks)**

4 a. Differentiate between : i) Conservancy system and Water carriage system ii) Separate system and Combined system. **(10 Marks)**

b. What is Rain water Harvesting? Discuss the methods of Rain water harvesting. **(10 Marks)**

PART – B

5 a. Explain : i) Classification of communicable diseases ii) Mode of transmission. **(14 Marks)**

b. Explain general methods of Control of Communicable disease. **(06 Marks)**

6 a. List and explain Refuse disposal methods. **(10 Marks)**

b. Draw a typical sketch of Biogas plant and explain its working. **(10 Marks)**

7 a. Discuss the different objectives of milk sanitation. **(05 Marks)**

b. Explain tests for milk quality determination. **(05 Marks)**

c. Explain the following : i) Cattle borne diseases ii) Planning for a cow shed. **(10 Marks)**

8 a. Explain the life cycle of housefly and mosquito. **(12 Marks)**

b. Discuss the diseases transmitted by house fly and mosquito and their control measures. **(08 Marks)**

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10CV64

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018

Geotechnical Engineering – II

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What are the objectives of soil exploration? With a neat sketch, explain any one method. **(06 Marks)**

b. What are the objectives of dewatering? With a neat sketch, explain any one method. **(06 Marks)**

c. A sampling tube has inner diameter of 70 mm and cutting edge diameter of 68 mm. Their outside diameters are 72 mm and 74 mm respectively. Determine the area ratio, inside clearance and outside clearance of the samples. This tube is pushed to the bottom of the bore hole to a distance of 550 mm with a length of sample recorded being 530 mm. Find the recovery ratio. **(08 Marks)**

2 a. Distinguish between Boussinesq's and Westergaard's theory of stress distribution. **(06 Marks)**

b. Explain construction and uses of Newmark's chart. **(08 Marks)**

c. A water tank is supported by a ring foundation having outer diameter of 10 m and inner diameter of 7.5 m. The ring foundation transmits a load intensity of 160 kN/m^2. Compute the vertical stress induces at a depth of 4 m below the centre of ring foundation using Boussinesq's analysis. **(06 Marks)**

3 a. List the characteristics and uses of flow net. **(06 Marks)**

b. Explain the graphical method of determining phreatic line in homogenous earth dam with horizontal filter. **(08 Marks)**

c. For an earth dam of homogenous section with horizontal filter. The coefficients of permeability in x and y directions are 8×10^{-7} cm/s and 3.6×10^{-7} cm/s respectively. The flow nets constructed include 4 flow channels and 18 potential drops. Determine the discharge through the dam in m^3/day if the treat during seepage was 14 m. **(06 Marks)**

4 a. Distinguish between the active and passive earth pressure. **(04 Marks)**

b. With a neat sketch explain the procedure to determine the lateral earth pressure by Culmann's graphical method. **(08 Marks)**

c. A retaining wall of 8 m height retains sandy material. The properties of sand are e = 0.6, $\phi = 30^\circ$ and G = 2.65. The water table is at a depth of 2.5 m from the ground surface. Draw the earth pressure diagram and determine the magnitude of total active earth pressure. **(08 Marks)**

PART – B

5 a. With neat sketch, explain different types of slope failures. **(06 Marks)**

b. Explain Swedish slip circle method for cohesive soils. **(06 Marks)**

c. A 5m deep canal has side slopes of 1:1. The properties of soil are C_u = 20 kN/m^2, $\phi_u = 10^\circ$, e = 0.8 and G = 2.8. If Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion when canal runs full. Also find the same in case of draw down if Taylor's stability number for this condition is 0.137. **(08 Marks)**

6 a. Define ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. **(06 Marks)**

b. With a neat sketch, explain plate load test. **(06 Marks)**

c. Determine the safe bearing capacity of a square footing with 2.1 m width placed at a depth of 1.5 m in a soil with moist unit weight of 17 kN/m^3, C = 15 kN/m^2 and $\phi = 20^\circ$. Take $N_C = 11.8$, $N_q = 3.9$ and $N_r = 1.7$, what is the change in bearing capacity if the water table raises to 0.5 m above the base of footing? Assume factor of safety as 3. **(08 Marks)**

7 a. Explain the terms:
i) Immediate settlement
ii) Primary consolidation settlement
iii) Secondary consolidation settlement
iv) Differential settlement **(08 Marks)**

b. Estimate the immediate settlement of a footing size (2 × 3) m resting at a depth of 2m in a sandy soil. The compression modulus of soil is 10 N/mm^2. The footing is expected to transmit a unit pressure of 160 kN/m^2. Assume $\mu = 0.28$ and $I_f = 1.06$. **(06 Marks)**

c. A square footing of width 1.2 m rests on a saturated clay layer of 4 m deep liquid limit of clay is 30%, unit weight is 17.8 kN/m^2, moisture content is 28% and specific gravity is 2.68. Determine the settlement if the footing carries a load of 300 kN. **(06 Marks)**

8 a. Explain the factors influencing the selection of depth of foundation. **(06 Marks)**

b. Discuss the proportioning of combined footings. **(06 Marks)**

c. Design a friction pile group to carry a load of 3000 kN including the weight of pile cap at a site where the soil is uniform clay to a depth of 20 m underlain by rock. Average unconfined compressive strength of clay is 70 kN/m^2. With liquid limit 60%. A factor of safety of 3 is required against shear failure. **(08 Marks)**

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10CV74

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Design of Presstrssed Concrete Structures

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Use of IS : 1343 – 1980 is permitted.***

PART – A

1 a. Explain the necessity of using high strength concrete and high tensile steel in prestressed concrete structures. **(08 Marks)**

b. Distinguish between pretensioing and port tensioning. **(06 Marks)**

c. Explain with neat sketches, Freyssinet system of pre-stressing. **(06 Marks)**

2 a. Explain the concept of load balancing with different cable profiles. **(06 Marks)**

b. A rectangular concrete beam, 100mm wide by 250mm deep spanning over 8m is prestressed by a straight cable carrying an effective pre-stressing force of 250kN located at an eccentricity of 40mm. The beam supports a live load 1.2kN/m.

i) Calculate the resultant stress distribution for the central cross section of the beam. The density of concrete is $24kN/m^3$.

ii) Find the magnitude of prestressing force with an eccentricity of 40mm which can balance the stresses due to dead and live loads at the bottom fibre of the central section of the beam. **(14 Marks)**

3 a. List the various types of losses in PSC beams and write the equations used to determine them. **(06 Marks)**

b. A pretensioned beam, 200mm wide and 300mm deep is prestresses by 10 wires of 7mm diameter, initially stressed to $1200N/mm^2$, with their centroids located 100mm from the soffit. Find the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete.

If the concrete undergoes a further shortening due to creep and shrinkage, while there is a relaxation of five percent of steel stress, estimate the final percentage loss of stress in the wires using IS:1343 regulations. Use following data : $E_s = 210kN/mm^2$; $E_c = 5700\sqrt{f_{ck}}$, $f_{ck} = 42N/mm^2$, Creep coefficient is 1.6 and total residual shrinkage strain is 3×10^4. **(14 Marks)**

4 a. List the factors influencing deflections. **(04 Marks)**

b. Obtain an expression for computing deflection at midspan in a PSC beam with trapezoidal tendons with eccentricity 'e' at mid third points, with linear variation towards support. The Mohr's theorem. **(04 Marks)**

c. A concrete beam having rectangular section 100mm wide and 300mm deep is prestressed bya parabolic cable carrying an initial force of 240kN. The cable has an eccentricity of 50mm at the centre of span and is concentric at the supports. If the span of the beam is 10m and live load is 2kN/m. estimate short term deflection at the centre of span. Assuming $E = 38kN/mm^2$ and creep coefficient $\phi = 2.0$, loss of prestress is 20 percent of the initial stress after 6 months. Estimate the long terms defection at the centre of span at this stage, assuming that the dead and live loads are simultaneously applied after the release of pre-stress. **(12 Marks)**

PART – B

5 a. Explain with sketches, the different types of flexural failures in PSC beam. **(06 Marks)**

b. A post tensioned beam with unbounded tendons is of rectangular section 400mm wide with an effective depth of 800mm. The cross sectional area of the pre-stressing steel is 2840mm^2. The effective pre-stress in steel after all losses is 900N/mm^2. The effective span of the beam is 16m. If f_{ck} = 40N/mm^2, estimate the ultimate moment of resistance of the section using IS : 1343. **(07 Marks)**

c. A post tensioned pre-stressed concrete T-beam with unbounded tendons is made up of a flange 300mm wide and 150m thick and the width of the rib is 150mm. The effective depth of the section is 320mm. The beam is pre-stressed by 24wires of 5mm diameter having a characteristic strength of 1650N/mm^2. The effective stress after all losses is 900N/mm^2. If the cube strength of concrete is 56N/mm^2. Estimate the flexural strength of the section using IS:1343 – 1980. Assume $\left(\frac{L}{\delta}\right)$ ratio as 20. **(07 Marks)**

6 a. Explain the types of shear cracks in structural concrete. **(06 Marks)**

b. A concrete beam of rectangular section 200mm wide and 650mm deep is prestressed by a parabolic cable located at an eccentricity of 120mm at midspan and zero at the supports. If the beam has a span of 12m and carries a uniformly distributed live load of 4.5kN/m, find the effective force necessary in the cable for zero shear stress at the support section. For this condition, calculate the principal stresses. The density of concrete is 25kN/m^3. **(14 Marks)**

7 a. Explain the concept of stress distribution in End block. **(08 Marks)**

b. The end block of a post tensioned beam is 300mm wide and 400mm deep. Ten cables each made up of 12 wires of 5mm diameter strands are stressed to 1200N/mm^2. The wires are located at constant eccentricity of 100mm below the centroidal axis. Design the end block and detail the reinforcement. If the anchorage plate is 200mm×200mm and diameter of the duct is 100mm, permissible stress in concrete at transfer is 20N/mm^2, permissible shear stress in steel is 94.5N/mm^2. Determine the thickness of anchorage pate. **(12 Marks)**

8 A prestressed beam has an unsymmetrical I-section with an overall depth of 1840mm. The top and bottom flange withs are 1800 and 820mm respectively. The thickness of the top flange varies from 180mm at the ends to 430mm at the junction of web, which is 1800mm thick. The thickness of the bottom flange varies from 150mm at the ends to 450mm at the junction of the web. The beam is designed for a simply supported span of 40m. the permissible compressive stress at the transfer and working load is limited to 16N/mm^2, while the tensile stress at the transfer and working load is limited to zero and 1.4N/mm^2, respectively. The loss ratio is 0.80 calculate :

a. The permissible uniformly distributed imposed load

b. The magnitude of the prestressed face if at the mid-span section if is located 130mm from the soffit and

c. The vertical limits within which the cable must is at midspan and support sections.

(20 Marks)

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10CV755

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Highway Geometric Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Briefly discuss the various design factors to be considered for geometric design of highways. **(10 Marks)**

b. Enumerate the concept of PCU in geometric design of Highways. List out the factors governing PCU. Give same typical values as recommended by IRC. **(10 Marks)**

2 a. What is camber? List the functions of camber. Discuss the factors governing the camber. Discuss shapes of camber with the help of neat sketch. **(10 Marks)**

b. Write a note on following and mention the IRC standards :
i) Carriage way ii) Right of way. **(10 Marks)**

3 a. With sketches indicate the circumstances in which sight distance is affected, describe how the sight distance required at as uncontrolled intersection is estimated. **(10 Marks)**

b. The speed of overtaking and overtakes vehicles are 70kmph and 40kmph, respectively on a two way traffic road. If the acceleration of overtaking vehicles is 0.99 m/sec^2.
i) Calculate safe overtaking sight distance.
ii) Mention the minimum length of overtaking zone
iii) Draw a neat sketch of overtaking zone and shown the position of the sign posts. **(10 Marks)**

4 a. Write note on mechanical widening and psychological widening. **(06 Marks)**

b. What is transition curve? Explain types of transition curve. **(06 Marks)**

c. Calculate the length of transition curve and the shift using the following data. Design speed of 65 kmph, radius of circular curve = 220m. Allowable rate of introduction of super elevation 1 in 150, pavement is rotated about the centre line and pavement width including extra widening is = 7.5m. **(08 Marks)**

PART – B

5 a. What are the circumstances in which a valley curve is famed? Indicate with sketches. **(06 Marks)**

b. Derive the expression for calculating length of valley curve of parabolic shape for comfort condition. **(06 Marks)**

c. A vertical summit curve is formed at the intersection of two gradients, +3.0 and -5.0 percent. Design the length of summit curve to provide stopping sight distance for a design speed of 80kmph. Assume data as per IRC. **(08 Marks)**

6 a. Explain the need of grade separated intersection and give advantages and disadvantages of grade separated intersection. **(10 Marks)**

b. With a neat sketch, explain channelized intersection also discuss advantages of channelized intersection. **(10 Marks)**

7 a. Draw a neat diagram of rotary intersection (roundabout) and show the different elements? **(10 Marks)**

b. Draw a neat sketch of
   i) Diamond interchange
   ii) Half clover leaf and explain any two advantages of each. **(10 Marks)**

8 a. With sketches explain the methods of sub surface drainage with respect to
   i) Lowering of water table
   ii) Control of seepage flow. **(10 Marks)**

b. A longitudinal channel with a trapezoidal cross section if to be constructed in a cut section. The longitudinal slope is 1 in 2500, soil is clay with Manning's coefficient as 0.024. take discharge of $3m^3$/sec and velocity of flow as 0.6m/s. **(10 Marks)**

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10CV761

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Numerical Methods in Civil Engineering

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Solve the following system of simultaneous equation by gauss elimination method.

$x_2 + 3x_3 = 9$

$2x_1 + 2x_2 - x_3 = 8$

$-x_1 + 5x_3 = 8.$ **(10 Marks)**

b. Solve the following system of simultaneous equation by factorization method.

$5x - 2y + z = 4$

$7x + y - 5z = 8$

$3x + 7y + 4z = 10.$ **(10 Marks)**

2 a. A contractor is planning a job that requires large quantity of gravel and sand. There are three pit x, y, z from which materials can be obtained. The composition is shown for each pit along with requirement. Formulate simultaneous equation and find quality to be extracted from each pit. Solve the equation Gauss by elimination method. **(10 Marks)**

Sl.No	Materials	Pit-x	Pit-y	Pit-z	Requirement (m^3)
1	Gravels	70%	40%	30%	40
2	Sand	30%	60%	60%	30
3	other	0%	0%	10%	0

b. Solve the following system of simultaneous equation by Gauss-Jordan method.

$2x - 6y + 8z = 24$

$5x + 4y - 3z = 2$

$3x + y + 2z = 16.$ **(10 Marks)**

3 a. Find the root of following equation $X = (5 - x)^{1/2}$ by Newton Raphson method up to four decimal accuracy. Given $1.5 < x < 2.0$. **(10 Marks)**

b. Find the root of the function by using Bisection method. Correct to 2 decimals.

$f(x) = 3x^3 + 5x - 40 = 0.$ **(10 Marks)**

4 a. A simply supported beam 4B of span 6m supports a load of 10kN/m at A linearly varying to 20kN/m at B. Find area of bending moment diagram by trapezoidal rule. Take 1m interval. **(10 Marks)**

b. Compute the area of bending moment diagram for beam shown Fig.Q4(b) by Simpson's rule using six equal segments i.e h = L/6. **(10 Marks)**

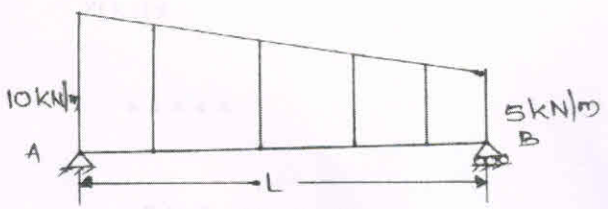

Fig.Q4(b)

PART – B

5 A cantilever with varying moment of inertia and of span L supports a uniformly distributed load of W kN/m as shown in Fig.Q5. Assuming six segments points estimate the maximum deflection and slope in cantilever by New mark's method. **(20 Marks)**

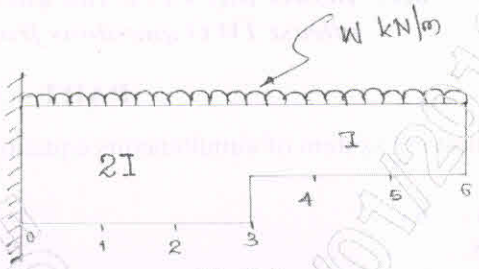

Fig.Q5

6 a. Solve $f(x) = \frac{(y-x)}{(y+x)}$ with y = 1 at x = 0. Find the values of y at x = 0.1 by Euler's method in five steps. **(08 Marks)**

b. RK method $\frac{dy}{dx} = \sqrt{x^2 + y^2}$ y(0) = 0.8, find y(0.2) y(0.4) at x = 0, y = 0.8 h = 0.2. **(12 Marks)**

7 Determine the bending moments and deflections at the interval of 2.5m by finite difference for beam shown Fig.Q7. **(20 Marks)**

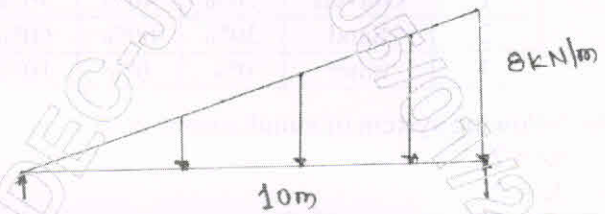

Fig.Q7

8 A concrete foundation strip 40m long has c/s of 1m × 1m is resting o the soil and supports a. Concentrated load of 1000kN each at 10m interval as shown. If $E = 2 \times 10^7$ kN/m^2, $k = 10^5$ kN/m. Find the deflection and ending moment at load points. **(20 Marks)**

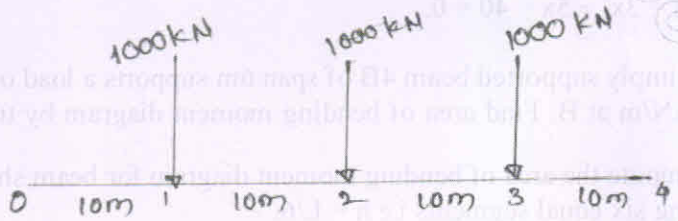

Fig.Q8

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10CV/CT73

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Estimation and Valuation

Time: 3 hrs. Max. Marks:100

Note: 1. ***Part – A Q.No. 1 which is compulsory, Answer any FOUR questions by Selecting any TWO from part B and TWO from part C each.***

2. ***Missing data, if any, may be suitably assumed.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 The plan and cross section of walls of residential building are as shown in Fig. Q1. Work out the quantities and prepare the cost abstract of the following items of work by centre line method.

a. Earth work excavation for foundation in ordinary soil @ Rs 115/m^3.

b. Cement concrete Bed 1:4:8 @ Rs 2850/-M^3

c. Size stone masonry in foundation and basement with CM1:6 @ Rs 2800/-m^3 and Rs 3450/-m^3 (Basement)

d. First class brick masonry for super structure is CM 1:6 @3800/-m^3 (only for main wall)

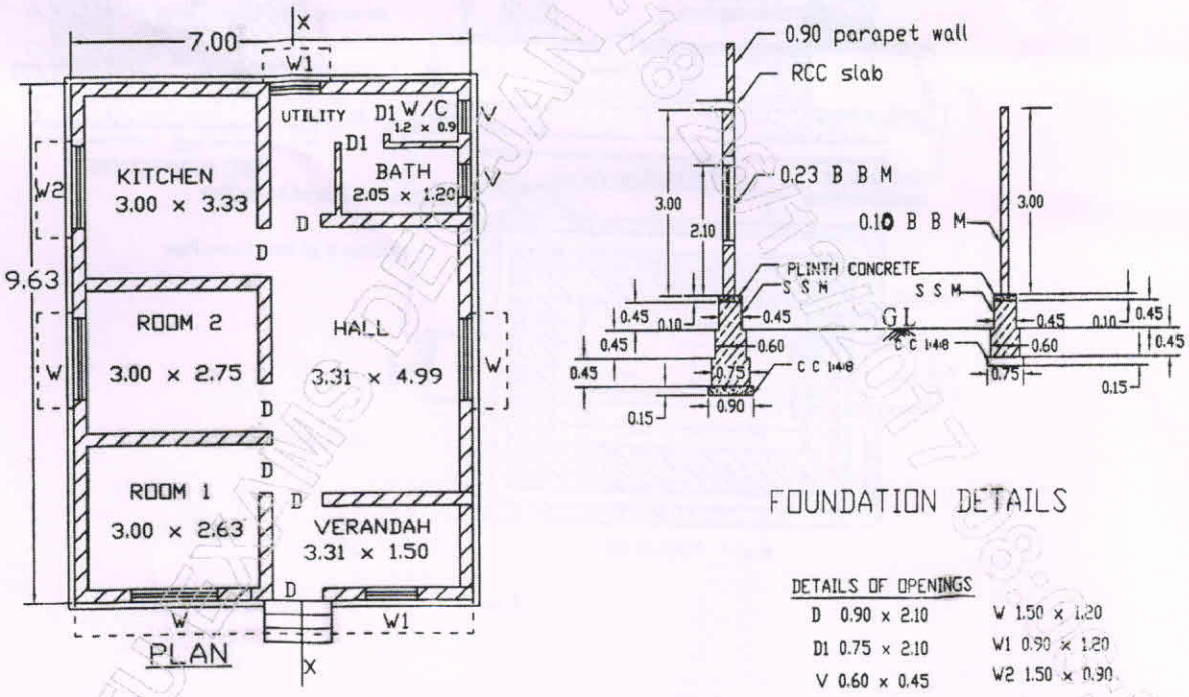

Fig Q1 **(40 Marks)**

PART – B

2 a. List and explain briefly various types of estimate. **(11 Marks)**

b. Write a note on cost of materials. **(04 Marks)**

3 The details of man hole is as shown in Fig. Q3. Estimate the quantities for the following item of work

a. Earth work excavation in foundation
b. Cement concrete 1:3:6 floor and foundation
c. First class Brick work with C.M.1:4
d. 20mm thick cement plaster 1:3 in floor and channel. **(15 Marks)**

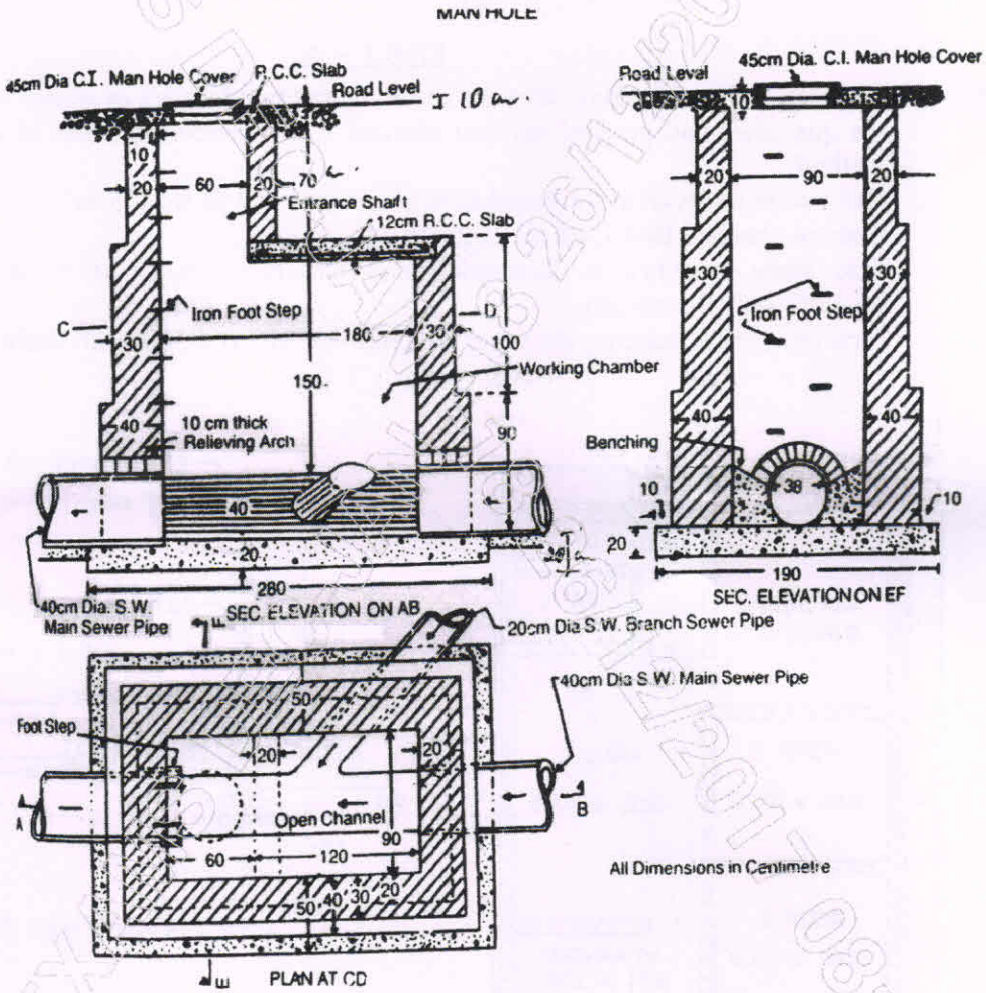

Fig Q3

4 Write specifications for any three of the following :

a. Burnt Brick masonry in CM 1:6
b. Mosaic or Terrazzo Floor
c. Painting work
d. Earth work excavation. **(15 Marks)**

PART – C

5 Carry out rate analysis for any three of the following :

a. PCC (1:3:6) for foundations using 20mm and down size aggregates.
b. First class brick masonry for super structure is CM1:4
c. 12mm thick plastering for walls with CM1:6
d. 20mm thick DPC with CM1:5. **(15 Marks)**

6 Estimate the quantity of earth work for a portion of road work from the following data, using mid sectional area method : Formation width = 4m ; side slope 2:1 is filling ; side slope 1.5:1 is cutting

Chainage m	0	40	80	120	160	200	240	280
RL of ground m	100.6	100.2	99.8	100.2	100.8	101.9	102.4	102.5
RL of formation level	101.00	Raising gradient 1 to 400 ----------→						

(15 Marks)

7 Write a note on any three of the following :

a. EMD and security deposit
b. Technical sanction
c. Measurement books
d. Method of valuation. **(15 Marks)**

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10CV82

Eighth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Design and Drawing of Steel Structures

Time: 4 hrs. Max. Marks:100

Note : 1. ***Answer any ONE full questions from Part – A and ONE full question from Part - B.***
2. Use of IS 800 – 2007 , SP(6) (1) – 1984 or Steel Tables permitted.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. An un – stiffened seated connection for beam ISLB 500 @ 75kg/m to the flange of a column ISHB400 @ 82.2 kg/m is done using 2 rows of 2 – 16 mm diameter bolts with an angle ISA 110×110×10 mm. Top cleat angle is ISA 100×100×8 mm with 2 – 16 mm diameter bolts on each leg. Draw to a suitable scale i) Front view ii) Side view. **(14 Marks)**

b. A cross beam ISLB 350 @ 0.495kN/m is connected to main beam ISMB 500 @ 0.869kN/m, such that top of flanges are at same level. The framed connection has the following details : i) Connecting cleat angle - 2 ISA 150 × 115 × 10.
ii) The connection between cleat angle of length 115m and web of the cross beam is connected by 5mm fillet weld. Depth of the weld is 180mm.
iii) The connection between the cleat angle of length 150mm and web of the main beam is connected by 8mm fillet weld. Depth of the weld is 250mm.
iv) Clearance between cross beam and web of main beam is 12mm.
Draw to a suitable scale i) Front view ii) Side view. **(16 Marks)**

2 a. Draw to a suitable scale the front and side elevations of a welded bracket from the following data :
* Column → ISHB 350 @ 710.2N/m
* Bracket → ISLB 350 @ 485.6N/m
* Projection of bracket from flange of the column → 350mm
* Depth of bracket at free end → 150mm
* Size of weld → 8mm
* Bracket is welded to the flange of column. **(10 Marks)**

b. A column ISHB 450@ 0.925kN/m is supported by Gusseted base. Dimension of the base plate is 1200 × 800 × 22mm with 1200mm edge placed parallel to column flange. Gusset plate is 16mm thick. Gusset angles are of ISA 150 × 115 × 15 m two in number with 150mm leg connected to Gusset plate. Connection between column flange and Gusset plate has 18 numbers of 18mm bolts in two rows and same number of bolts for connection between Gusset plate and Gusset angle. Provide 6 numbers of 18mm diameter bolts to connect Gusset angle to base plate. Provide two web cleat angles of ISA 100 × 100 × 8mm connected by 3 numbers of 18mm bolts for each leg. Also, 4 numbers of 25mm anchor bolts are provided. Draw to a suitable scale i) Top view ii) Side view iii) Sectional elevation. **(20 Marks)**

PART – B

3 Draw a simply supported crane Gantry Girder for the following data :

i) Span of crane Girder = 18m.
ii) Span of Gantry Girder = 7m.
iii) Capacity of the crane = 230 kN.
iv) Self wt. of crane excluding the crab = 200kN.
v) Weight of crab = 60kN.
vi) Wheel base distance = 3.2m.
vii) Self weight of Rail = 0.25 kN/mm.
viii) Height of Rail = 80mm.
ix) Minimum Hook approach = 1.00 mt. **(40 Marks)**

Draw to a suitable scale :

a. Plan details.
b. Side elevation.
c. Section through Gantry. **(30 Marks)**

4 Design a welded plate girder of span 24 mt, carrying super imposed load of 50kN/m and two concentrated loads of 150 kN each at one third points of the span. Assume the girder as laterally supported throughout and yield strength = 250 MPa. Provide two curtailments. **(40 Marks)**

Draw to a suitable scale :

i) Plan for full span (sectional)
ii) Front Elevation.
iii) Cross section at support and mid span. **(30 Marks)**

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10CV834

Eighth Semester B.E. Degree Examination, Dec.2017/Jan.2018

Earthquake Resistant Design of Structures

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. ***Use of IS 1893:2002 code is permitted.***

PART – A

1 a. Explain the concept of Elastic Rebound Theory with a neat sketch. **(05 Marks)**

b. With a neat figure, explain the terms epicenter and hypocenter and the interiors of earth. **(05 Marks)**

c. Explain seismic zoning map of India with reference to :
i) Background and bases on which the seismic zone is done.
ii) Use of seismic zoning in computation of seismic forces, zone factors of prominent areas. **(10 Marks)**

2 a. Explain different ground motion characteristics in short. **(05 Marks)**

b. Differentiate between S waves and P waves. **(05 Marks)**

c. Explain response spectrum in detail with a neat sketch and explain the various regions in response spectrum. **(10 Marks)**

3 a. Write a note on response control concepts and write a note on base isolation. **(08 Marks)**

b. Write a note on seismic evaluation. **(06 Marks)**

c. What is seismic retrofitting? Explain in detail retrofitting techniques. **(06 Marks)**

4 a. Write a note on structural irregularity. Explain soft storey concept in detail. **(10 Marks)**

b. Explain different types of lateral load resistant systems. **(05 Marks)**

c. A building having a non uniform distribution of mass in shown in Fig.Q4(c). [Plan of a building] Locate its centre of mass.

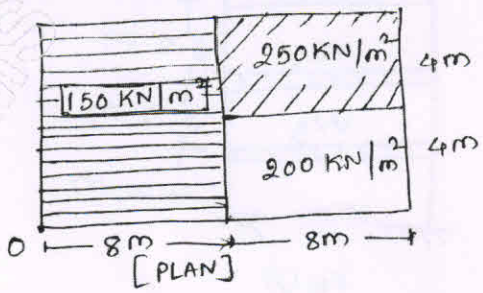

Fig.Q4(c) **(05 Marks)**

PART – B

5 a. What are the different methods of seismic analysis of structures? **(06 Marks)**

b. Summarize the philosophy of seismic design. **(06 Marks)**

c. Provide stepwise procedure of computation of earthquake forces using:
i) Equivalent static force procedure
ii) The dynamic analysis procedure. **(08 Marks)**

6 For a four storeyed RCC office building located in zone 'V' and resting on hard rock, compute the seismic forces on the structure as per IS 1893-2002 equivalent static procedure. Height of first storey is 4.2 m and the remaining three stories are of height 3.2 m each plan dimensions (length and width) of the structure are 15m × 20m. The RCC frames are in filled with masonry. Refer Fig.Q6.
Dead load on floor is 12 kN/m^2 on floors and 10 kN/m^2 on roof.
Live load = 4 kN/m^2 on floors and 1.5 kN/m^2 on roof.
Compute the base shear and compare the results with base shear after neglecting the stiffness of infill walls.

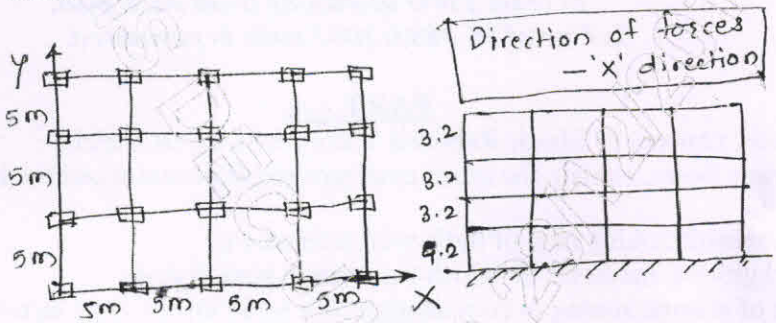

Fig.Q6 **(20 Marks)**

7 For the residential RCC (SMRF) building founded on soft soil and situated in zone V shown in Fig.Q7. Compute the seismic forces for each storey using dynamic analysis procedure.
Given: The free vibration analysis results.
Frequency : $\{\omega\} = \{47.832 \quad 120.155 \quad 167.0\}$

Modes $\{\phi\}_1 = \begin{Bmatrix} 1.00 \\ 0.759 \\ 0.336 \end{Bmatrix}$ $\{\phi\}_2 = \begin{Bmatrix} 1.00 \\ -0.805 \\ -1.157 \end{Bmatrix}$ $\{\phi\}_3 = \begin{Bmatrix} 1.00 \\ -2.427 \\ 0.075 \end{Bmatrix}$

Seismic weights: $W_1 = W_2 = W_3 = 1962$ kN
Stiffness : $K_1 = K_2 = 160 \times 10^3$ kN/m
$K_3 = 240 \times 10^3$ kN/m

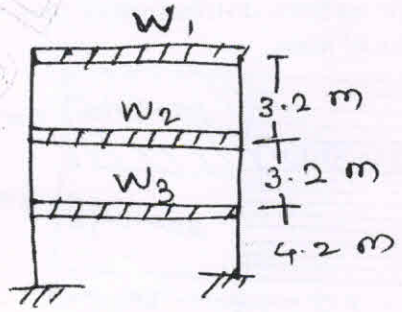

Fig.Q7 **(20 Marks)**

8 a. Explain the different elastic properties of masonry structures. **(06 Marks)**
b. Write a note on recommendation of improvement of seismic resistance of masonry structures. **(06 Marks)**
c. Explain various modes of failure for masonry buildings with neat sketches. **(08 Marks)**

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10CV843

Eighth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Urban Transport Planning

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain interdependence of land use and traffic. **(10 Marks)**

b. With flow diagram explain system approach to urban transport planning. **(10 Marks)**

2 In detail explain the following surveys

i) Home interview survey

ii) Road side interview survey. **(20 Marks)**

3 a. Define zone. What are the factors considered for dividing area into zones? **(10 Marks)**

b. List and briefly explain the types of inventory of transport facilities. **(10 Marks)**

4 a. List and explain the factors affecting on trip generation rates. **(10 Marks)**

b. With assumptions, explain the concept of category analysis. **(10 Marks)**

PART – B

5 a. With example, explain Furness method. **(10 Marks)**

b. List and briefly explain the types of synthetic methods. **(10 Marks)**

6 a. With line diagram, explain

i) Pre distribution modal split

ii) Post distribution modal split **(12 Marks)**

b. Explain Moore's algorithm. **(08 Marks)**

7 a. List the types of assignment techniques. Explain all or nothing assignment. **(10 Marks)**

b. With structural diagram, explain the Lowry model. **(10 Marks)**

8 Write a note on :

a. Gravity model

b. Recent development in modal split analysis.

c. Selection of land use transport model

d. Difficulties in transport planning for small and medium cities. **(20 Marks)**

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