CBCS Scheme

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15MAT31

Third Semester B.E. Degree Examination, June/July 2017
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. Obtain the Fourier series expansion of

$$f(x) = \begin{cases} \pi x & 0 \le x \le 1 \\ \pi(2-x) & 1 \le x \le 2 \end{cases}$$ **(08 Marks)**

and deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots=\frac{\pi^2}{8}$.

b. Obtain the constant term and first sine and cosine terms in the Fourier expansion of y from the following table. **(08 Marks)**

x	0	1	2	3	4	5
y	9	18	24	28	26	20

OR

2 a. Expand $f(x) = |x|$ as a Fourier series in $-\pi \le x \le \pi$ and deduce that **(06 Marks)**

$$\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots=\frac{\pi^2}{8}.$$

b. Obtain the half range cosine series for the function $f(x) = x \sin x$ in $0 < x < \pi$. **(05 Marks)**

c. The following table gives variations of periodic current over a period T. Show that there is a direct current part of 0.75 amp in the variable current and obtain the amplitude of first harmonic. **(05 Marks)**

t(sec)	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$
A (amp)	1.98	1.3	1.05	1.3	-0.88	-0.25

Module-2

3 a. Find the Fourier Transform of

$$f(x) = \begin{cases} 1-x^2 & |x| \le 1 \\ 0 & |x| > 1 \end{cases}$$ **(06 Marks)**

Hence evaluate $\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos \frac{x}{2}\, dx$.

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. Find the inverse Z – transform of

$$\frac{3z^2+2z}{(5z-1)(5z+2)}.$$ **(05 Marks)**

OR

4 a. Find the Fourier sine transform of $\frac{e^{-ax}}{x}$, $a > 0$. **(06 Marks)**

b. Find the Z – transform of i) $\cosh n\theta$ ii) n^2. **(05 Marks)**

c. Solve the difference equation $y_{n+2} + 4y_{n+1} + 3y_n = 3^n$ with $y_0 = 0$, $y_1 = 1$. **(05 Marks)**

Module-3

5 a. Find the coefficient of correlation and two regression lines for the following data : **(06 Marks)**

x	1	2	3	4	5	6	7	8	9	10
y	10	12	16	28	25	36	41	49	40	50

b. Fit a curve of the form $y = ae^{bx}$ for the following data : **(05 Marks)**

x	5	6	7	8	9	10
y	133	55	23	7	2	2

c. Use Newton – Raphson method to find a real root of the equation $x \sin x + \cos x = 0$ near $x = \pi$. **(05 Marks)**

OR

6 a. In a partially destroyed lab 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 coefficient of correlation between x and y. **(06 Marks)**

b. Fit a second degree parabola to the following data : **(05 Marks)**

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

c. Use the regula – falsi method to obtain a root of the equation $2x - \log_{10}x = 7$ which lies between 3.5 and 4. Carryout 2 iterations. **(05 Marks)**

Module-4

7 a. The population of a town is given by the table **(06 Marks)**

Year	1951	1961	1971	1981	1991
Population in thousands	19.96	39.65	58.81	77.21	94.61

Using Newton's forward and backward interpolation formula, calculate the increase in the population from the year 1955 to 1985.

b. Use Lagrange's interpolation formula to find y at x = 10, given **(05 Marks)**

x	5	6	9	11
y	12	13	14	16

c. Given the values

x	2	4	5	6	8	10
y	10	96	196	350	868	1746

Construct the interpolating polynomial using Newton's divided difference interpolation formula. **(05 Marks)**

OR

8 a. From the following table, estimate the number of students who obtained marks between 40 and 45. **(06 Marks)**

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

b. Apply Lagrange's formula inversely to obtain the root of the equation f(x) = 0, given f(30) = -30 , f(34) = -13 , f(38) = 3 , f(42) = 18. **(05 Marks)**

c. Use Simpson's $\frac{1}{3}$ rule to find $\int_0^{0.6} e^{-x^2} dy$ by taking 7 ordinates. **(05 Marks)**

Module-5

9 a. Find the work done in moving a particle in the force field $\vec{F} = 3x^2 i + (2xz - y)j + z k$ along the curve defined by $x^2 = 4y$, $3x^3 = 8z$ from x = 0 to x = 2. **(06 Marks)**

b. Verify Stoke's theorem for $\vec{F} = (x^2 + y^2)i - 2xy j$ around the rectangle $x = \pm a$, $y = 0$, $y = b$. **(05 Marks)**

c. Solve the Euler's equation for the functional $\int_{x_0}^{x_1} (1 + x^2 y^1) y^1 dx$. **(05 Marks)**

OR

10 a. Verify Green's theorem for $\int_c (xy + y^2)dx + x^2 dy$, where e is bounded by y = x and $y = x^2$. **(06 Marks)**

b. Evaluate the surface integral $\iint_s \vec{F}$. Nds where $\vec{F} = 4xi - 2y^2 j + z^2 k$ and s is the surface bounding the region $x^2 + y^2 = 4$, z = 0 and z = 3. **(05 Marks)**

c. Show that the shortest distance between any two points in a plane is a straight line. **(05 Marks)**

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CBCS Scheme

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15CV/CT32

Third Semester B.E. Degree Examination, June/July 2017
Strength of Materials

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define : (i) Poisson's ratio (ii) Volumetric strain (iii) Temperature stresses **(06 Marks)**

b. A steel bar of 20 mm diameter is subjected to tensile load test. Determine stress, strain, Young's modulus, % elongation from the following data:
Gauge length – 200 mm, Extension at a load of 100 kN – 0.147 mm, Total elongation 50 mm. Also determine the % decrease in cross sectional area of the specimen if the diameter of the rod at failure is 16 mm. **(10 Marks)**

OR

2 a. Derive the relationship between Young's modulus and shear modulus with usual notation. **(06 Marks)**

b. A steel tube 45 mm external diameter and 3 mm thick encloses centrally a solid copper bar 30 mm diameter. The bar and the tube are rigidly connected together at their ends at a temperature of 30°C. Find the stresses developed in each material when heated to 180°C. Take $E_S = 200\,GPa$, $\alpha_S = 10.8\times10^{-6}/°C$; $E_C = 110\,GPa$, $\alpha_C = 17\times10^{-6}/°C$ **(10 Marks)**

Module-2

3 a. Derive Lami's equation for thick cylinders. **(06 Marks)**

b. The state of stress at a point in a strained material is as shown in the Fig. Q3 (b)
Determine (i) Principal stresses and principal planes (ii) Max shear stress and its plane
(iii) Sketch the stress diagram showing stresses and planes. **(10 Marks)**

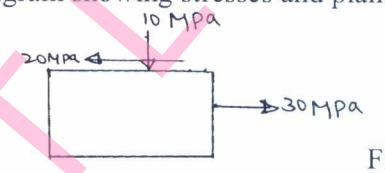

Fig. Q3(b)

OR

4 a. Derive expressions for normal stress and tangential stress for a member subject to uniaxial loading. **(06 Marks)**

b. A shell 3.25 m long, 1 m diameter is subjected to internal fluid pressure of 1 MPa. If the thickness of the shell is 10 mm. Find Hoop stress, longitudinal stress, max shear stress and change in diameter and length. Take $E = 2\times10^5$ MPa, $\frac{1}{m} = 0.3$. **(10 Marks)**

Module-3

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

b. A simply supported beam is subject to a point load of 15 kN together with udl of 15 kN/m applied as shown in Fig. Q5 (b). Draw SFD and BMD. Find also point of zero shear and its corresponding BM. **(10 Marks)**

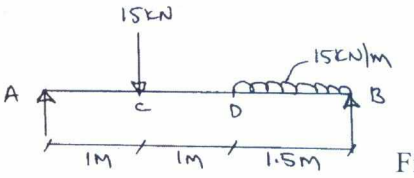

Fig. Q5 (b)

OR

6 a. Show that max BM for a simply supported beam of length l carrying udl of intensity W/unit length is $\frac{Wl^2}{8}$. **(06 Marks)**

b. Draw SFD and BMD for the load diagram, shown in Fig. Q6 (b). Mark the values at salient points. **(10 Marks)**

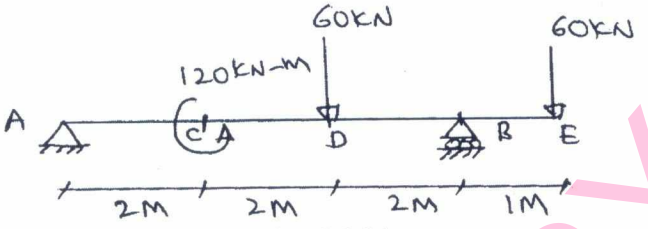

Fig. Q6 (b)

Module-4

7 a. Derive the bending equation, $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$ with usual notation. **(06 Marks)**

b. A hallow tube of 6 m length with external diameter 60 mm and thickness 10 mm is subject to minimum crippling load. Find Euler's critical load for this column : (i) When both ends are fixed. (ii) When one end fixed other end hinged. Assume E = 200 GPa. **(10 Marks)**

OR

8 a. Derive expression for crippling load for a long column when both ends are hinged. **(06 Marks)**

b. A circular pipe of external diameter 70 mm and thickness 8 mm is used as a simply supported beam over an effective span of 2.5 m. Find the max concentrated load that can be applied at the centre of the span if permissible stress in the tube is 150 N/mm^2. **(10 Marks)**

Module-5

9 a. Derive the torque equation $\frac{T}{I_p} = \frac{f_s}{R} = \frac{C_\theta}{l}$ with usual notation. **(06 Marks)**

b. State the theories of failures. Explain briefly any two of the theories. **(10 Marks)**

OR

10 a. State the assumption made in the theory of pure torsion. **(06 Marks)**

b. A hallow shaft has to transmit 600 kW power at 80 rpm. The maximum torque developed may exceed the mean torque by 40%. Design a suitable section if the working stress is 90 MPa. Take diameter ratio as 0.8. What will be the angular twist measured over a length of 2 m if C = 84 GPa? **(10 Marks)**

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CBCS Scheme

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15CV33

Third Semester B.E. Degree Examination, June/July 2017
Fluid Mechanics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define the following with symbols and units:
i) Mass density ii) Specific weight **(04 Marks)**

b. Derive expression for Newton's law of viscosity and state. **(06 Marks)**

c. A cylindrical shaft of 90 mm dia rotates about a vertical axis inside a fixed cylindrical tube of length 50 cm and 95 mm internal dia. If the space between the tube and the shaft is filled by a lubricant of dynamic viscosity 8.0 poise. Determine the power required to overcome viscous resistance, when the shaft is rotated at a speed of 240 rpm. **(06 Marks)**

OR

2 a. Explain the working of a Bourdan's pressure gauge with a diagram. **(04 Marks)**

b. State and prove Pascal's law. **(06 Marks)**

c. Fig.Q2(c) shows a differential manometer connecting two points A and B. Pipe A contains carbon tetrachloride of specific gravity 1.594 under a pressure of 1.05 kgf/cm^2 and pipe B contains oil of specific gravity 0.8 under a pressure of 1.75 kgf/cm^2. If the manometer liquid is mercury, find the difference 'x' between the mercury levels.

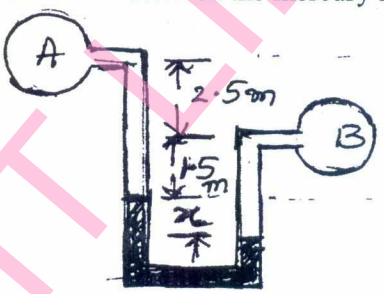

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. Define: i) Total pressure, ii) Centre of pressure. **(04 Marks)**

b. Derive an expression for the depth of centre of pressure from the free surface of liquid of an inclined plane surface submerged in the liquid. **(06 Marks)**

c. A rectangular plane surface 1 m wide and 3 m deep lies in water in such a way that its plane makes an angle of 30° with the free surface of water. Determine the total pressure and the depth of centre of pressure when the upper edge of the plate is 2 m below the free surface. **(06 Marks)**

OR

4 a. Define: i) Uniform and non-uniform flow, ii) steady and unsteady flow. **(04 Marks)**

b. Derive the three dimensional continuity equation in the Cartesian coordinates. **(06 Marks)**

c. The stream function for a two dimensional flow is $\Psi = 2x^2 - 2y^2$. Find:
i) Resultant velocity at point (1, 3).
ii) Velocity potential function. **(06 Marks)**

Module-3

5 a. Define momentum equation and give its applications. **(03 Marks)**

b. State the Bernoulli's theorem. Derive the Bernoulli's equation starting from Euler's equation of motion along a stream line. **(06 Marks)**

c. A 45° reducing bend is connected in a pipeline, the diameters at the inlet and outlet are 600 mm and 300 mm respectively. Find the force exerted by the water on the bend if the intensity of pressure at inlet to bend is 88.29 kN/m^2 and rate of flow of water is 0.6 m^3/sec. **(07 Marks)**

OR

6 a. Define: i) Forced vortex, ii) Free vortex. Give one example each. **(04 Marks)**

b. Derive an expression for the discharge through a venturimeter. **(06 Marks)**

c. The water is flowing through a tapering pipe of length 50 cm, having dia 40 cm at the upper end and 20 cm at the lower end at the rate of 60 ℓps. The pipe has a slope of 1 in 40. Find the pressure at the lower end, if the pressure at the higher end is 24.525 N/cm^2. **(06 Marks)**

Module-4

7 a. Define the hydraulic coefficients (C_c, C_d, C_v) of an orifice and obtain the relation between them. **(05 Marks)**

b. Derive the expression for discharge through a small orifice of area 'a' under a head 'h' measured above the centre of the orifice. **(05 Marks)**

c. Water discharges freely at a rate of 98 ℓps through a 120 mm dia vertical sharp edged orifice under a constant head of 10 m of water. A point on the jet measured from the venacontracta has coordinates (+4.5m, –0.54m). Find hydraulic coefficients. **(06 Marks)**

OR

8 a. Explain ventilation of weirs. **(04 Marks)**

b. Derive the expression for discharge through a triangular notch. **(06 Marks)**

c. Find the discharge through a trapezoidal notch which is 1m wide at the top and 0.40 m at the bottom and is 30 cm in height. The head of water on the notch is 20 cm. given C_d for rectangular portion = 0.62 and C_d for triangular portion = 0.60. **(06 Marks)**

Module-5

9 a. Explain: i) Pipes in parallel, ii) Pipes in series. **(04 Marks)**

b. Derive Darcy Weisbach expression for the loss of head due to friction in pipes. **(06 Marks)**

c. A pipe 50 mm diameter is 6 m long and the velocity of flow of water in the pipe is 2.4 m/sec. What loss of head and the corresponding power would be saved if the central 2 m length of pipe was replaced by 75 mm diameter pipe, the change of section being sudden? Take 4f = 0.04 for pipes of both diameters. **(06 Marks)**

OR

10 a. Explain the terms hydraulic gradient and total energy lines. **(04 Marks)**

b. Derive the expression for pressure rise due to sudden closure of valve when the pipe material is elastic. **(05 Marks)**

c. For a pipe network shown in Fig.Q10(c), determine the flow in each pipe. The value of n may be assumed as 2.0.

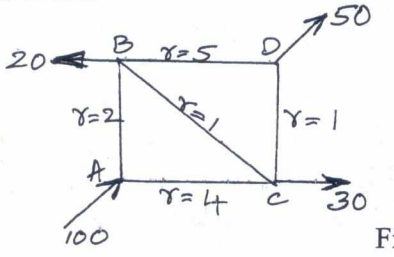

Fig.Q10(c) **(07 Marks)**

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15CV34

Third Semester B.E. Degree Examination, June/July 2017
Basic Surveying

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Compare Plane Surveying and Geodetic Surveying (any two points). **(04 Marks)**

b. Explain Indirect method of ranging, with a sketch. **(06 Marks)**

c. Explain the basic principles of Surveying with sketches. **(06 Marks)**

OR

2 a. Discuss the classification of surveying. **(08 Marks)**

b. A big pond obstructs the chain line AB. A line AL was measured on the left of the line AB for circumventing the obstacle. The length of AL was 901m. Similarly, the line AM was measured on the right of the line AB whose length was 1100m. Points M, B, L are in the same straight line. Lengths of the links BL and BM are 502m and 548m, respectively. Find the distance AB. **(08 Marks)**

Module-2

3 a. Compare the following : i) Fore bearing and Back bearing ii) Whole circle bearing and Quandrantal bearing iii) Meridian and Bearing. **(06 Marks)**

b. List the fundamental lines of a theodolite. Summarize the desired relationship between them. **(06 Marks)**

c. The magnetic bearing of a line was found to be N 60^0 30' W in 2002, when the declination was 5^0 10' E. Find its present magnetic bearing, if declination is 3^0 W. **(04 Marks)**

OR

4 a. Explain the following terms with reference to a theodolite :
i) Transiting ii) Swinging iii) Trunnion axis. **(03 Marks)**

b. Explain the measurement of a horizontal angle by repetition method. Draw a typical tabular column. List the errors eliminated by this method. **(08 Marks)**

c. The following bearings were observed in a closed compass traverse :

Line	FB	BB
AB	S 45^0 30' E	N 45^0 30' W
BC	S 60^0 00' E	N 60^0 40' W
CD	S 5^0 30' E	N 3^0 20' W
DA	N 54^0 30' W	S 56^0 00' E

Determine the stations affected by local attraction, apply the corrections and find the corrected bearings. **(05 Marks)**

Module-3

5 a. Compare the following : i) Latitude and Departure ii) Dependent coordinates and independent coordinates. **(04 Marks)**

b. Describe the closing error in a compass traverse. Explain how the closing error is adjusted by transit rule. **(05 Marks)**

c. A tachometer, fitted with an analectic lens and having the multiplying constant 100, was set up at station C to determine the gradient between two points A and B and the following observations were taken, keeping the staff vertical.

Staff at	Vertical angle	Stadia readings
A	$+4^0\ 20'\ 0''$	1.300, 1.610, 1.920
B	$+0^0\ 10'\ 40''$	1.100, 1.410, 1.720

If the horizontal angle ACB is $35^0\ 20'$, determine the gradient between A and B. **(07 Marks)**

OR

6 a. Summarize the different systems of tachometric measurements. **(03 Marks)**

b. Find the expressions for distance and elevation when the staff is held vertical and line of sight is inclined. **(08 Marks)**

c. The bearings of PQ and QR are $18^0\ 36'$ and $60^0\ 24'$ respectively. The coordinates of the ends P and R are :

Point	North co-ordinates	East co-ordinates
P	300.0	400.0
R	1432.8	1257.2

Find the lengths of PQ and QR. **(05 Marks)**

Module-4

7 a. Compare the following terms used in leveling :
i) Back sight and Fore sight ii) Bench mark and Reduced level. **(04 Marks)**

b. Explain the effects of curvature and refraction in levelling. **(04 Marks)**

c. The following observations were made on a hilltop to ascertain its elevation. The height of the target F was 5m.

Instrument station	Staff reading on BM	Vertical angle	Remarks
O_1	2.550	$18^0\ 6'$	RL of BM
O_2	1.670	$28^0\ 42'$	= 345.580

The instrument stations were 100m apart and were in line with F. **(08 Marks)**

OR

8 a. Derive the expressions for the horizontal distance, vertical distance and the elevation of an elevated object, when the base is inaccessible and instrument stations are not in the same vertical plane with the object. **(08 Marks)**

b. The following consecutive readings were taken along AB with a 4m levelling staff on a continuously sloping ground at intervals of 20 meters.
0.345 on A , 1.450 , 2.630 , 3.875 , 0.655 , 1.745 , 2.965 , 3.945 , 1.125 , 2.475 , 3.865 on B.
The elevation of A was 60.350. Enter the above readings in a level – book form and work out the RL's by rise and fall method. Also find the gradient of line AB. **(08 Marks)**

Module-5

9 a. List the various methods to calculate the area with their formula. **(06 Marks)**

b. Explain the following terms : i) Contour interval ii) Horizontal equivalent. **(04 Marks)**

c. The following offsets were taken from a chain line to an irregular boundary line at an interval of 10m. Compute the area by trapezoidal and Simpson's rule.
Offsets : 0 , 2.5 , 3.5 , 5.0 , 4.6 , 3.2 and 0 m. **(06 Marks)**

OR

10 a. Explain the characteristics of contours, with sketches (any five). **(05 Marks)**

b. Explain the interpolation of contours. List the methods of contouring. **(05 Marks)**

c. A road embankment is 30m wide at the top with side slopes of 2:1. The ground levels at 100m intervals along a line AB are as under :
A 170.30 , 169.10 , 168.50 , 168.10 , 166.50 B. The formation level at 'A' is 178.70m with uniform falling ground of 1 in 50 from 'A' to 'B'. Determine the volume of earthwork by Prismoidal formula. Assume the ground to be in cross – section. **(06 Marks)**

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CBCS Scheme

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15CV/CT35

Third Semester B.E. Degree Examination, June/July 2017
Engineering Geology

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer FIVE full questions, choosing one full question from each module.***
2. ***Write neat figures wherever necessary.***

Module-1

1 a. Enumerate importance and applications of Geology in Civil Engineering practices. **(06 Marks)**
b. Write a note on cleavage and fracture properties in minerals. **(05 Marks)**
c. Write the physical properties, composition and uses of Quartz and Calcite. **(05 Marks)**

OR

2 a. Describe the Internal structure and Composition of the Earth. **(06 Marks)**
b. Define a Mineral. Describe hardness property in minerals. **(05 Marks)**
c. Distinguish between Rock forming and Ore forming minerals with examples. **(05 Marks)**

Module-2

3 a. What are Igneous rocks? Describe different types of igneous rocks. **(06 Marks)**
b. Explain Rock as a construction material. **(05 Marks)**
c. Define a Fault. Describe different parts of fault, with neat figure. **(05 Marks)**

OR

4 a. What is Metamorphism? Give a note on types of metamorphism. **(06 Marks)**
b. Write a short note on Granite and Sandstone, giving their mineralogical composition and uses. **(05 Marks)**
c. What are Joints? Comment on their Engineering Importance. **(05 Marks)**

Module-3

5 a. Explain Rock Weathering and its types with examples. **(06 Marks)**
b. What is an Earthquake? Give its causes and effects. **(06 Marks)**
c. Write a note on Floods and their control. **(04 Marks)**

OR

6 a. Comment on Geomorphological aspects in selection of sites for dams and reservoirs. **(06 Marks)**
b. What are Landslides? Give a note on their control. **(05 Marks)**
c. Describe different drainage patterns. **(05 Marks)**

Module-4

7 a. What is an Aquifer? Give a note on its types with examples. **(06 Marks)**
b. Explain Electrical Resistivity method for Ground water Exploration. **(06 Marks)**
c. Write a note on Hydrological cycle. **(04 Marks)**

OR

8	a.	Write a note on occurrence of Ground water in different terrains.	**(06 Marks)**
	b.	Describe artificial recharge of Ground water.	**(05 Marks)**
	c.	Explain Sea water intrusion and its remedies.	**(05 Marks)**

Module-5

9	a.	What are Topographic and Contour maps?	**(06 Marks)**
	b.	Explain concept and applications of Remote sensing.	**(05 Marks)**
	c.	Comment on Impact of mining and quarrying on environment.	**(05 Marks)**

OR

10	a.	Write a note on Global Positioning System (GPS).	**(06 Marks)**
	b.	What is LANDSAT Imagery? Write its uses.	**(05 Marks)**
	c.	Write a note on the Impact of reservoirs on Environment.	**(05 Marks)**

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CBCS Scheme

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15CV36

Third Semester B.E. Degree Examination, June/July 2017
Building Materials and Construction

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. What are the requirements for a good quality building stone? Hence define : backing, corbel and coping of stones. **(06 Marks)**

b. Briefly explain the advantages of cement concrete blocks. **(04 Marks)**

c. List the different tests conducted on bricks. Explain briefly any two of them. **(06 Marks)**

OR

2 a. What are the requirements of good mortar? List the typical proportions used for cement mortar in construction industry. **(04 Marks)**

b. Briefly explain the following tests on fine aggregates :
i) bulking ii) specific gravity test. **(06 Marks)**

c. Differentiate natural and manufactured coarse aggregate. Briefly explain use and procedure of impact and abrasion test on coarse aggregates. **(06 Marks)**

Module-2

3 a. What do you understand by "bearing capacity" of soil. Define : ultimate bearing capacity and safe bearing capacity of soil. **(04 Marks)**

b. Sketch and explain following types of foundations :
i)Isolated footing ii) combined footing iii) strap beam footing. **(06 Marks)**

c. With a neat sketch, explain the features of English bond and Flemish bond with respect to brick masonry. List their merits and demerits. **(06 Marks)**

OR

4 a. Define : i) Bevelled closer ii) Mitred closer iii) King closer and iv) Queen closer. **(04 Marks)**

b. Explain different classification of stone masonry with neat sketches, wherever necessary. **(06 Marks)**

c. Compare and contrast brick work to stone work. **(06 Marks)**

Module-3

5 a. Define lintel. What are the different types of lintels used? **(04 Marks)**

b. With a neat sketch, explain the components of a segmental arch. **(06 Marks)**

c. Write short notes on : Cement flooring and Mosaic flooring. **(06 Marks)**

OR

6 a. What are the factors to be considered while selecting a roof covering? **(04 Marks)**

b. Enumerate the advantages and disadvantages of flat roofs over a pitched roof. **(06 Marks)**

c. With neat sketches, write an explanatory note on different types of roof trusses. **(06 Marks)**

Module-4

7 a. List the guide lines to be followed while locating doors and windows. **(04 Marks)**

b. Draw a neat sketch showing all the components of following types of door :
i) Fully paneled door ii) revolving door. **(06 Marks)**

c. With neat sketches, differentiate :
i) fixed window and pivoted window
ii) corner window and bay window. **(06 Marks)**

OR

8 a. Define a stair. With a neat sketch explain the following terms : i) Thread and Riser ii) Flight and landing. **(04 Marks)**

b. Plan a doglegged stair for a building in which vertical distance between the floors is 3.6m. The stair hall measures 3m × 5m (internal dimensions). **(06 Marks)**

c. Write explanatory note on : shoring and underpinning formwork. **(06 Marks)**

Module-5

9 a. What are the objectives of plastering? Explain the requirement of a good plaster. **(04 Marks)**

b. Explain the method of applying : Stucco plastering and Lathe plastering. **(06 Marks)**

c. Discuss the defects in plastering. **(06 Marks)**

OR

10 a. What are the causes of dampness in building? Hence what do you understand by damp proof course. **(06 Marks)**

b. Mention the objectives of painting and point out the characteristics of an ideal paint. **(06 Marks)**

c. Explain the method of varnishing wood works. **(04 Marks)**

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CBCS Scheme

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15MATDIP31

Third Semester B.E. Degree Examination, June/July 2017
Additional Mathematics - I

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Express $\frac{3+4i}{3-4i}$ in the form x + iy. **(06 Marks)**

b. Express $\sqrt{3}+i$ in the polar form and hence find their modulus and amplitudes. **(05 Marks)**

c. Find the sine of the angle between $\vec{a} = 2i - 2j + k$ and $\vec{b} = i - 2j + 2k$. **(05 Marks)**

OR

2 a. Simplify **(06 Marks)**

$$\frac{(\cos 3\theta + i\sin 3\theta)^4(\cos 4\theta + i\sin 4\theta)^5}{(\cos 4\theta + i\sin 4\theta)^3 + (\cos 5\theta + i\sin 5\theta)^{-4}}$$

b. If $\vec{a} = i + 2j - 3k$ and $\vec{b} = 3i - j + 2k$, then show that $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$ are orthogonal. **(05 Marks)**

c. Find the value of λ, so that the vectors $\vec{a} = 2i - 3j + k$, $\vec{b} = i + 2j - 3k$ and $\vec{c} = j + \lambda k$ are co-planar. **(05 Marks)**

Module-2

3 a. If $y = \cos(m \log x)$ then prove that $x^2y_{n+2} + (2n+1)xy_{n+1} + (m^2 + n^2)y_n = 0$. **(06 Marks)**

b. With usual notation prove that

$$\tan\phi = \frac{rd\theta}{dr}.$$ **(05 Marks)**

c. If $u = \log_e\left(\frac{x^4 + y^4}{x + y}\right)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3$. **(05 Marks)**

OR

4 a. Find the Pedal equation of $r = a[1-\cos\theta]$. **(06 Marks)**

b. Expand $\log_e(1+x)$ in ascending powers of x as far as the term containing x^4. **(05 Marks)**

c. Find the total derivative of $Z = xy^2 + x^2y$, where $x = at^2$ $y = 2at$. **(05 Marks)**

Module-3

5 a. Evaluate $\int_0^{\pi/6} \sin^6 3x\,dx$ using Reduction formula. **(06 Marks)**

b. Evaluate $\int_0^1 x^6\sqrt{1-x^2}\,dx$ – using Reduction formula. **(05 Marks)**

c. Evaluate $\int_1^2\int_0^{2-y} xydxdy$. **(05 Marks)**

OR

6 a. Evaluate $\int_0^{\pi/2} \sin^3 x \cos^7 x \, dx$. **(06 Marks)**

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

c. Evaluate $\int_0^3 \int_0^2 \int_0^1 (x + y + z) \, dz \, dx \, dy$. **(05 Marks)**

Module-4

7 a. A particle moves along the curve $\vec{r} = (1-t^3)\hat{i} + (1+t^2)\hat{j} + (2t - 5)\hat{k}$. Determine the velocity and acceleration. **(06 Marks)**

b. Find the directional derivative of $\phi = xy^2 + yz^3$ at the point (2,-1, 1) in the direction of the vector $i + 2j + 2k$. **(05 Marks)**

c. Find the constant a, b, c. Such that the vector $\vec{F} = (x + y + az)\,\hat{i} + (x + cy + 2z)\,\hat{k} + (bx + 2y - z)\,\hat{j}$ is irrotational. **(05 Marks)**

OR

8 a. Find the angle between the tangents to the curve $\vec{r} = t^2\,\hat{i} + 2t\,\hat{j} - t^3\,\hat{k}$ at the points $t = \pm 1$. **(06 Marks)**

b. Find the divergence and curl of the vector $\vec{F} = (xyz + y^2z)\,\hat{i} + (3x^2 + y^2z)\,\hat{j} + (xz^2 - y^2z)\,\hat{k}$. **(05 Marks)**

c. If $\vec{F} = (ax + 3y + 4z)\,\hat{i} + (x - 2y + 3z)\,\hat{j} + (3x + 2y - z)\,\hat{k}$ is solenoidal, find a. **(05 Marks)**

Module-5

9 a. Solve $\frac{dy}{dx} = \frac{y}{x - \sqrt{xy}}$. **(06 Marks)**

b. Solve $\frac{dy}{dx} + y \cot x = \sin x$. **(05 Marks)**

c. Solve $\frac{dy}{dx} = \frac{x + 2y - 1}{x + 2y + 1}$. **(05 Marks)**

OR

10 a. Solve $(x^2 - y^2)\,dx = 2xy\,dy$. **(06 Marks)**

b. Solve $x\frac{dy}{dx} + y = x^3 y^6$. **(05 Marks)**

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

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