CBCS SCHEME

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15MAT31

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. An alternating current after passing through a rectifier has the form, $I = \begin{cases} I_0 \sin x & \text{for } 0 < x < \pi \\ 0 & \text{for } \pi < x < 2\pi \end{cases}$

where I_0 is the maximum current and the period is 2π. Express I as a Fourier series. **(08 Marks)**

b. Determine the constant term and the first cosine and sine terms of the Fourier series expansion of y from the following data: **(08 Marks)**

x^0	0	45	90	135	180	225	270	315
y	2	1.5	1	0.5	0	0.5	1	1.5

OR

2 a. Obtain the Fourier series expansion of the function, $f(x) = |x|$ in $(-\pi, \pi)$ and hence deduce that,

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots = \frac{\pi^2}{8}$$ **(06 Marks)**

b. Find the Fourier series expansion of the function,

$$f(x) = \begin{cases} \pi x & \text{in } 0 \le x \le 1, \\ \pi(2-x) & \text{in } 1 \le x \le 2 \end{cases}$$ **(05 Marks)**

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

t(sec)	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$	T
A(amplitude)	1.98	1.30	1.05	1.3	−0.88	−0.25	1.98

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

Module-2

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

b. Find the Fourier sine transform of $\frac{e^{-ax}}{x}$. **(05 Marks)**

c. Compute the inverse z-transforms of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$. **(05 Marks)**

OR

4 a. Find the z-transform of $e^{-an}n + \sin n\frac{\pi}{4}$. **(06 Marks)**

b. Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = y_1 = 0$ using z-transform. **(05 Marks)**

c. Find the Fourier cosine transform of, $f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4 - x & 1 < x < 4 \\ 0 & x > 4 \end{cases}$. **(05 Marks)**

Module-3

5 a. Find the Correlation coefficient and equations of regression lines for the following data:

x	1	2	3	4	5
y	2	5	3	8	7

(06 Marks)

b. Fit a straight line to the following data:

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

(05 Marks)

c. Find a real root of the equation $xe^x = \cos x$ correct to three decimal places that lies between 0.5 and 0.6 using Regula-falsi method. **(05 Marks)**

OR

6 a. The following regression equations were obtained from a correlation table.
$y = 0.516x + 33.73$
$x = 0.516y + 32.52$
Find the value of (i) Correlation coefficient (ii) Mean of x's (iii) Mean of y's. **(06 Marks)**

b. Fit a second degree parabola to the following data:

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

(05 Marks)

c. Use Newton-Raphson's method to find a real root of $x \sin x + \cos x = 0$ near $x = \pi$, carry out three iterations. **(05 Marks)**

Module-4

7 a. The following data gives the melting point of an alloy of lead and zinc, where t is the temperature in °C and P is the percentage of lead in the alloy:

P%	60	70	80	90
t	226	250	276	304

Find the melting point of the alloy containing 84% of lead, using Newton's interpolation formula. **(06 Marks)**

b. Apply Lagrange's interpolation formula to find a polynomial which passes through the points $(0, -20)$, $(1, -12)$, $(3, -20)$ and $(4, -24)$ **(05 Marks)**

c. Find the approximate value of $\int_0^{\pi/2} \sqrt{\cos\theta}\, d\theta$ by Simpson's $\frac{3}{8}^{th}$ rule by dividing it into 6 equal parts. **(05 Marks)**

OR

8 a. From the following table :

x°	10	20	30	40	50	60
cos x	0.9848	0.9397	0.8660	0.7660	0.6428	0.5

Calculate $\cos 25^\circ$ using Newton's forward interpolation formula. **(06 Marks)**

b. Use Newton's divided difference formula and find f(6) from the following data:

x :	5	7	11	13	17
f(x) :	150	392	1452	2366	5202

(05 Marks)

c. Evaluate $\int_0^1 \frac{dx}{1+x}$ using Weddle's rule by taking equidistant ordinates. **(05 Marks)**

Module-5

9 a. Find the area between the parabolas $y^2 = 4x$ and $x^2 = 4y$ with the help of Green's theorem in a plane. **(06 Marks)**

b. Solve the variational problem $\delta\int_0^1 (12xy + y'^2)dx = 0$ under the conditions $y(0) = 3$, $y(1) = 6$. **(05 Marks)**

c. Prove that the shortest distance between two points in a plane is along the straight line joining them. **(05 Marks)**

OR

10 a. A cable hangs freely under gravity from the fixed points. Show that the shape of the curve is a catenary. **(06 Marks)**

b. Use Stoke's theorem to evaluate for $\vec{F} = (x^2 + y^2)i - 2xyj$ taken around the rectangle bounded by the lines $x = \pm a$, $y = 0$, $y = b$. **(05 Marks)**

c. Evaluate $\iint_S (yzi + zxj + xyk).\hat{n}ds$ where S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$ in the first octant. **(05 Marks)**

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15CV/CT32

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Derive an expression for the elongation of a rectangular tapering bar subjected to an axial pull P. **(08 Marks)**

b. A stepped bar is subjected to external loading as shown in Fig. Q1 (b). Determine the magnitude of axial force P such that net deformation in the bar does not exceed 02 mm. E for steel is 200 GPa and that for copper is 100 GPa. Larger diameter and smaller diameters are 40 mm and 15 mm respectively. **(08 Marks)**

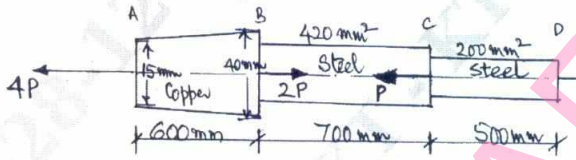

Fig. Q1 (b)

OR

2 a. Derive the relationship between modulus of elasticity (E), modulus of rigidity (C) and bulk modulus (K). **(08 Marks)**

b. Two parallel walls 6 m apart are stayed together by a steel rod 25 mm diameter at a temperature of 80°C. Calculate the pull exerted by the steel rod when it is cooled to 20°C if, (i) the walls do not yield (ii) the walls yield together at two ends by 1.5 mm totally. Given: $E = 2\times10^5$ N/mm^2 coefficient of thermal expansion = $\alpha = 11\times10^{-6}$ /°C. **(08 Marks)**

Module-2

3 a. Derive expression for principal stresses and their planes for a two dimensional stress system. **(08 Marks)**

b. The state of stress in a two dimensionally stressed body is as shown in Fig. Q3 (b). Determine the principal planes, principal stresses, maximum shear stress and their planes. Schematically represent these planes on x-y coordinates: **(08 Marks)**

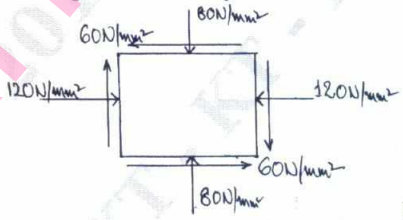

Fig. Q3 (b)

OR

4 a. Show that in the case of a thin cylindrical shell subjected to internal fluid pressure, the volumetric strain is equal to the sum of twice the hoop strain and longitudinal strain and also obtain expression for $e_V = \frac{P.d}{2tE}\left[\frac{5}{2} - \frac{2}{m}\right]$ with usual notations. **(08 Marks)**

b. A thick cylinder of 250 mm internal diameter and 350 mm outer diameter contains a fluid at a pressure of 12 N/mm^2. Determine the hoop stresses and radial stresses and draw a neat sketch showing the stress distribution across wall thickness. **(08 Marks)**

Module-3

5 a. Explain the different types of supports in beams with neat sketches. **(06 Marks)**

b. A overhanging beam with roller and hinged supports is as shown in Fig. Q5 (b). Draw bending moment and shear force diagrams for given loadings. **(10 Marks)**

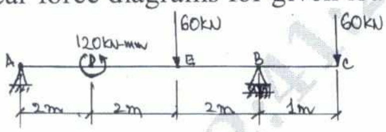

Fig. Q5 (b)

OR

6 a. Derive the relationship between intensity of loading, shear force and bending moment. **(08 Marks)**

b. Draw shear force and bending moment diagrams for a beam loaded as shown in Fig. Q6 (b). Indicate the point of inflexion and locate the points of contraflexure and also maximum bending moment. **(08 Marks)**

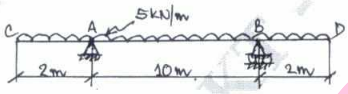

Fig. Q6 (b)

Module-4

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

b. A beam is of square cross section of sides 100 mm. If the permissible stress is 70 N/mm^2, find the moment of resistance of the beam section. Find whether there is any improvement in moment of resistance if the section is placed with one of the diagonals vertical. **(10 Marks)**

OR

8 a. Write a note on: (i) Effective length of columns (ii) Limitations of Euler's theory on columns. **(08 Marks)**

b. A hollow column of cast iron whose outside diameter is 200 mm has thickness of 20 mm. It is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 4. Calculate slenderness ratio and compare Euler's and Rankine's critical loads.

Take critical stress = σ_C = 550 N/mm^2

Rankine's constant = $\alpha = \frac{1}{1600}$

Elastic modulus = $E = 8 \times 10^4\ N/mm^2$ **(08 Marks)**

Module-5

9 a. Derive the expression for torsion in circular shafts and state the assumptions. **(08 Marks)**

b. A solid shaft rotating at 500 rpm transmits 30 kW. Maximum torque is 20% more than mean torque. Allowable shear stress is 65 MPa, modulus of rigidity is 81 GPa and angle of twist in the shaft should not exceed 1° in 1 mt length. Determine the suitable diameter. **(08 Marks)**

OR

10 a. Determine the ratio of power transmitted by a hollow shaft and a solid shaft when both have same weight length, material and speed. The diameter of solid shaft is 150 mm and external diameter of hollow shaft is 250 mm. **(08 Marks)**

b. (i) What is the significance and importance of theories of failure?
(ii) Explain the maximum principal stress theory (Rankine's) **(08 Marks)**

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15CV33

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Fluid Mechanics

Time: 3 hrs. Max. Marks: 80

Note: **1.** ***Answer any FIVE full questions, choosing one full question from each module.***
2. ***Missing data may be assumed suitably.***

Module-1

1 a. Calculate the capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in (i) water and (ii) mercury. Take surface tension $\sigma = 0.0725$ N/m for water and $\sigma = 0.50$ N/m for mercury in contact with air. Take specific gravity of mercury as 13.6 and angle of contact = 128°. **(06 Marks)**

b. Prove that the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure is given by $p = 4\sigma/d$. **(04 Marks)**

c. A rectangular plate 0.50m × 0.50m dimensions having a weight 500N slides down an inclined plane [Fig.Q1(c)] making 30° angle with the horizontal at a velocity of 1.75 m/sec. If the 2 mm gap between the plate and inclined surface is filled with a lubricating oil, find its viscosity.

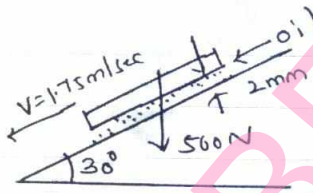

Fig.Q1(c) **(06 Marks)**

OR

2 a. State and prove Pascal's law. **(08 Marks)**

b. Explain with neat sketch: (i) Absolute pressure (ii) Vacuum pressure (iii) Gauge pressure **(05 Marks)**

c. The right limb of a simple U tube manometer containing mercury is open to the atmospheric while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm. **(03 Marks)**

Module-2

3 a. Show that centre of pressure lies below the centre of gravity in vertical plane surface submerged in liquid. **(08 Marks)**

b. A gate closing an opening is triangular in section as shown in Fig.Q3(b). The gate is 1m long (in the direction perpendicular to the plane of the paper) and it is made up of concrete weighing 24 kN/m^3. If the gate is hinged at the top and freely supported at one of the bottom ends, find the height of water h on the upstream side when the gate will just be lifted.

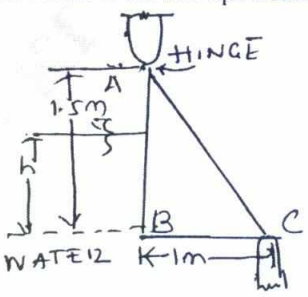

Fig.Q3(b) **(08 Marks)**

OR

4 a. Derive continuity equation in 3 dimensional flow in Cartesian coordinates. **(08 Marks)**

b. The velocity components in a two dimensional flow field for an incompressible fluid are expressed as $U = y^3/3 + 2x - x^2y$, $V = xy^2 - 2y - x^3/3$.

i) Show that these functions represent a possible case of fluid flow.

ii) Obtain an expression for stream functions τ. **(08 Marks)**

Module-3

5 a. State and derive modified Bernoulli's equation. **(08 Marks)**

b. A venture meter is to be fitted in a pipe 0.25 m diameter where the pressure head is 7.6 m of flowing liquid and the maximum flow is 8.1 m^3 per minute. Find the least diameter of the throat to ensure that the pressure head does not become negative. Take $C_d = 0.96$. **(08 Marks)**

OR

6 a. The water is flowing through a pipe having diameter of 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through the pipe is 30 litres/sec. The section 1 is 3m above datum and section 2 is 2m above datum. If the pressure at section 1 is 25 N/cm^2, find the intensity of pressure at section 2. **(08 Marks)**

b. A 45° reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 600 mm and 300 mm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet to bend is 8.829 N/cm^2 and rate of flow of water is 600 lit/sec. **(08 Marks)**

Module-4

7 a. What are hydraulic coefficients of an orifice? Derive necessary expressions. **(08 Marks)**

b. For a Borda's mouthpiece (running free), show that the coefficient of contraction is 0.5. **(08 Marks)**

OR

8 a. Derive the expression for discharge over a triangular notch. **(08 Marks)**

b. A Cipo letti weir of crest length 60 cm discharge water. The head of water over the weir is 360 mm. Find the discharge over the weir if the channel is 80 cm wide and 50 cm deep. Take $C_d = 0.60$. **(08 Marks)**

Module-5

9 a. Derive Darcy-Weisbach equation for head loss due to friction in a pipe. **(08 Marks)**

b. Three pipes of lengths 800 m, 500 m and 400 m and of diameters 500 mm, 400 mm and 300 mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700 m. Find the diameter of the single pipe. **(05 Marks)**

c. Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. the rate of flow of water through the pipe is 250 liters/s. **(03 Marks)**

OR

10 a. Explain water hammer. Derive the expression for water hammer due to sudden closure of valve and pipe is rigid. **(08 Marks)**

b. A main pipe divides into two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 2000 m and 1.0 m respectively, while the length and diameter of 2nd parallel pipe are 2000 m and 0.8 m. Find the rate of flow in each parallel pipe, if total flow in the main is 3.0 m^3/s. The coefficient of friction for each parallel pipe is same and equal to 0.005. **(08 Marks)**

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CBCS SCHEME

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15CV34

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Basic Surveying

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain the classification of survey. **(08 Marks)**

b. The distance between two points A and B measured along slope is 504m. Find the horizontal distance between A and B when
i) The angle of slope is 12° ii) The slope is 1 in 4.5 and iii) The difference in elevation of A and B is 65m. **(08 Marks)**

OR

2 a. With neat sketches, explain obstacles in chaining. **(08 Marks)**

b. A and B area two points 200m apart along one bank of a river flowing east to west. The bearings of a tower on the other bank are observed from A and B are 40° and 310° respectively. Find the width of river. **(08 Marks)**

Module-2

3 a. Distinguish between: i) Whole circle bearing and quadrantal bearing ii) Closed traverse and open traverse iii) Dip and Declination. **(08 Marks)**

b. Following are bearing observed in closed traverse. Identify the stations affected by local attraction and determine corrected bearings. **(08 Marks)**

Line	AB	BC	CD	DE	EA
FB	S10°W	S77°E	N5°E	N54°W	S88°W
BB	N10°E	N75°W	S2°W	S50°E	N85°E

OR

4 a. Explain the adjustment of horizontal axis of a transit theodolite by the "Spire Test'. **(08 Marks)**

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

Module-3

5 a. Explain the Bowditch's and Transit methods of adjusting closed traverse. **(08 Marks)**

b. In order to determine the constants of Tacheometer two distances 201m and 400m were accurately measured from the instrument and readings on a stadia rod on the upper and lower wires were taken as follows:

Sl. No.	Distance (m)	Reading (m) @	
		Lower stadia	Upper stadia
1	201	2.00	4.00
2	400	0.50	4.50

Determine values of the constants and find the distance, when the readings of the wires were 1.5m and 4.5m. The line of sight being horizontal in all cases. **(08 Marks)**

OR

6 a. The following observations are lengths and bearings of the lines of traverse ABCDE, the length and bearing of EA have been omitted. Calculate the length and bearing of the line EA. **(08 Marks)**

Line	AB	BC	CD	DE	EA
Length (m)	204	226	187	192	?
Bearing	87°30′	28°20′	280°0′	210°3′	?

b. Determine the gradient from a point A to a points B from the following observations made with a tachometer fitted with an anallactic lens. The constant of instrument was 100 and staff held vertically. **(08 Marks)**

Instrument st^n	Staff point	Bearing	Vertical angle	Staff reading
P	A	134°	+10° 32′	1.360, 1.915, 2.470
	B	224°	+5° 6′	1.065, 1.885, 2.705

Module-4

7 a. Define the following terms:
i) Back sight ii) Fore sight iii) Bench mark iv) Reduced level. **(08 Marks)**

b. The following consecutive readings were taken with the help of a dumpy level 1.904, 2.653, 3.906, 4.026, 1.964, 1.702, 1.592, 1.261, 2.542, 2.006 and 3.145. The instrument was shifted after fourth and seventh readings. The first reading was taken on the staff held on BM of RL100m. Determine the R.L. of various points by rise and fall method. **(08 Marks)**

OR

8 a. How would you determine the difference in elevation of the instrument station and top of Chimney by single plane method if the base of Chimney is inaccessible, when the instrument axis are at the different level. (any one method). **(08 Marks)**

b. To measure the elevation of a Chimney by double plane method was used. The following observations are mentioned below. Determine the elevation of top of chimney. **(08 Marks)**

Top of Chimney	Station points	Horizontal Angles	Vertical Angles	Staff Readings	Remarks
P	A	$\theta_1 = 62°18'$ (LBAP)	20°12′	2.240m	RL of BM = 400m
	B	$\theta_2 = 72°42'$ (LABP)	21°6′	3.260m	Dist. Between A & B, d = 75m

Module-5

9 a. Explain cross-staff method for calculation of area. **(08 Marks)**

b. A series of offsets were taken from a chain line to a curved boundary line at 15m intervals in the following order. 0.265, 3.80, 3.75, 4.65, 3.60, 4.95, 5.85m. Compute area between a chain line, the curved boundary and end offsets by i) Average ordinate rule ii) Trapezoidal rule iii) Simpson's rule. **(08 Marks)**

OR

10 a. A railway embankment 400m long is 12m wide at formation level and has side slope 2 to 1. The ground level at every 100m along the center line are as under:

Distance (m)	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 center line. Calculate volume of earthwork. **(08 Marks)**

b. Define a contour. List the uses of contour maps. **(08 Marks)**

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CBCS SCHEME

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15CT/CV35

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Describe the internal structure of the Earth based on the seismological evidences, with a neat sketch. **(08 Marks)**

b. Describe any two minerals with respect to their physical properties and their engineering uses : i) Orthoclase ii) Calcite iii) Gypsum iv) Asbestos. **(08 Marks)**

OR

2 a. Define Mineral. Name the physical properties to identify the mineral with suitable examples. **(08 Marks)**

b. Define Engineering geology. Write a brief note on importance of Geology in the field of Civil Engineering. **(08 Marks)**

Module-2

3 a. Describe the geological aspects in the investigations of a good Dam site. **(08 Marks)**

b. Describe the characters of good building stones. **(08 Marks)**

OR

4 a. Define Outcrop. Describe the terms Strike and Dip, with a neat sketch. **(08 Marks)**

b. Define Fault. How are they formed and their effects in Civil Engineering? **(08 Marks)**

Module-3

5 a. Define Weathering. Describe the different types of chemical weathering and its importance. **(08 Marks)**

b. What is an Epicenter? Explain the causes and effects of an Earthquake. **(08 Marks)**

OR

6 a. Write a note on Tsunami. Describe briefly the causes and effects. **(08 Marks)**

b. Define Watershed management. Explain briefly Floods and their control. **(08 Marks)**

Module-4

7 a. Write a note on Ground water pollution and Sea water intrusion. **(08 Marks)**

b. Define Aquifer. Write a note on confined and unconfined aquifer, with a neat sketch. **(08 Marks)**

OR

8 a. Explain Ground water investigation by Electrical Resistivity method. **(08 Marks)**

b. Write a note on Rain water harvesting and discuss the various types of artificial recharge. **(08 Marks)**

Module-5

9 a. Describe Remote Sensing. Discuss its application in Civil Engineering. **(08 Marks)**

b. Write a note on impact of mining on Reservoirs and Environment. **(08 Marks)**

OR

10 a. Write a note on uses of topographic and geological maps. **(08 Marks)**

b. Describe the application of Geographic Information System (GIS) and Global Positioning System (GPS). **(08 Marks)**

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CBCS SCHEME

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15CV36

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 qualities a good building stone should posses when it is used for construction purpose. **(04 Marks)**

b. Describe the construction and working of Bull's trench kiln. **(06 Marks)**

c. What is bulking of sand? Mention its practical importance. Explain the size of sand grain on bulking of sand. **(06 Marks)**

OR

2 a. Describe the constituents of good brick earth along with their importance. **(04 Marks)**

b. Explain the factors causing deterioration of stone work and preservation of stone work. **(06 Marks)**

c. Briefly explain the importance of shape, size and texture of coarse aggregates in concrete work. **(06 Marks)**

Module-2

3 a. What is foundation and what are its functions? **(04 Marks)**

b. Differentiate between strip footing and strap footing with sketches. **(06 Marks)**

c. Describe salient features of English bond with an elevation sketch of burnt brick masonry wall. **(06 Marks)**

OR

4 a. Explain the importance of load bearing wall and partition wall in construction of buildings. **(04 Marks)**

b. Describe the types of Ashlar type of stone masonry with sketches. **(06 Marks)**

c. Explain the construction and importance of Grillage foundation with its plan view. **(06 Marks)**

Module-3

5 a. Differentiate between stone lintel and RCC lintel with sketches. **(04 Marks)**

b. Explain the construction of marble flooring in ground floor of building with sketch. **(06 Marks)**

c. Differentiate between lean-to-roof and couple roof with sketches. **(06 Marks)**

OR

6 a. Sketch king post roof truss label its parts (half portion). **(04 Marks)**

b. Mention the requirements of good floor. What are the factors affecting selection of flooring material. **(06 Marks)**

c. Explain the factors affecting stability of arches. **(06 Marks)**

Module-4

7	a.	Mention the requirements of good stair.	(04 Marks)
	b.	Explain raking shore with a neat sketch.	(06 Marks)
	c.	Differentiate between flush door and louvered door with sketches.	(06 Marks)

OR

8	a.	Briefly explain types of stairs.	(04 Marks)
	b.	Explain with neat sketches : (i) Bay window (ii) Corner window	(06 Marks)
	c.	Differentiate between brick layers scaffolding and Mason's scaffolding.	(06 Marks)

Module-5

9	a.	Explain the procedure of painting of newly plastered wall surface.	(04 Marks)
	b.	Write the objectives of plastering and requirements of good plaster.	(06 Marks)
	c.	Briefly explain the methods of damp proofing.	(06 Marks)

OR

10	a.	Explain the procedure adopted in stucco plastering.	(04 Marks)
	b.	Explain the importance of constituents of a paint.	(06 Marks)
	c.	Describe the defects in plastering.	(06 Marks)

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CBCS SCHEME

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15MATDIP31

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Find the modulus and amplitude of $\frac{(3-\sqrt{2}i)^2}{1+2i}$. **(06 Marks)**

b. Find the cube root of $(1-i)$. **(05 Marks)**

c. Prove that $\left(\frac{1+\sin\theta+i\cos\theta}{1+\sin\theta-i\cos\theta}\right)^n = \cos\left(n\frac{\pi}{2}-n\theta\right)+i\sin\left(n\frac{\pi}{2}-n\theta\right)$. **(05 Marks)**

OR

2 a. For any three vector a, b, c show that $\left[\vec{a}+\vec{b}, \vec{b}+\vec{c}, \vec{c}+\vec{a}\right] = 2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ **(06 Marks)**

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

c. Find the angle between the vectors $\vec{a}=5\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=2\hat{i}-3\hat{j}+6\hat{k}$ **(05 Marks)**

Module-2

3 a. Find the n^{th} derivative of $\cos x\cos 2x\cos 3x$. **(06 Marks)**

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

c. Find the angle between the radius vector and tangents for the curve $r^2\cos 2\theta = a^2$ **(05 Marks)**

OR

4 a. If $u = e^{ax+by}+(ax-by)$ prove that $b\frac{\partial u}{\partial x}+a\frac{\partial u}{\partial y} = 2abu$. **(06 Marks)**

b. 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)**

c. If $x = u(1-v)$, $y = uv$. Find $\frac{\partial(x,y)}{\partial(u,v)}$. **(05 Marks)**

Module-3

5 a. Obtain the reduction formula for $\int_0^{\frac{\pi}{2}}\cos^n x\,dx$ $(n>0)$. **(06 Marks)**

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

c. Evaluate $\int_0^1\int_0^1\int_0^y xyz\,dx\,dy\,dz$. **(05 Marks)**

OR

6 a. Obtain the reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$, $n > 0$. **(06 Marks)**

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

c. Evaluate $\int_0^1 \int_0^{\sqrt{x}} xy dy dx$. **(05 Marks)**

Module-4

7 a. A particle moves along a curve $x = e^{-t}$, $y = 2\cos 3t$, $z = 2\sin 3t$ where t is the time. Determine the component of velocity and acceleration vector at t = 0 in the direction of $\hat{i} + \hat{j} + \hat{k}$. **(08 Marks)**

b. Find the value of the constant a, b, such that $\vec{F} = (axy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (bxz^2 - y)\hat{k}$ is irrotational. **(08 Marks)**

OR

8 a. If $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$ show that $\vec{F} \cdot \text{curl}\vec{F} = 0$. **(06 Marks)**

b. If $\phi(x, y, z) = x^3 + y^3 + z^3 - 3xyz$ find $\nabla\phi$ at (1, −1, 2). **(05 Marks)**

c. Find the directional derivative $\phi(x, y, z) = x^2yz + 4xz^2$ at (1,–2,–1) in the direction of $2\hat{i} - \hat{j} - 2\hat{k}$. **(05 Marks)**

Module-5

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

b. Solve $ye^{xy}dx + (xe^{xy} + 2y)dy = 0$ **(05 Marks)**

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

OR

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

b. Solve $(y^3 - 3x^2y)dx - (x^3 - 3xyz)dy = 0$ **(05 Marks)**

c. Solve $(1 + y^2)dx + (x - \tan^{-1} y)dy = 0$ **(05 Marks)**

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