CBCS SCHEME

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15MAT31

Third Semester B.E. Degree Examination, June/July 2019
Engineering Mathematics – III

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Obtain the Fourier series for the function :

$$f(x)=\begin{cases}-\pi & \text{in } -\pi<x<0\\ x & \text{in } 0<x<\pi\end{cases}$$

Hence deduce that $\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2}=\frac{\pi^2}{8}$. **(08 Marks)**

b. Express y as a Fourier series up to the second harmonics, given :

x	0	$\pi/3$	$2\pi/3$	π	$4\pi/3$	$5\pi/3$	2π
y	1.98	1.30	1.05	1.30	–0.88	–0.25	1.98

(08 Marks)

OR

2 a. Obtain the Fourier series for the function $f(x)=2x-x^2$ in $0\le x\le 2$. **(08 Marks)**

b. Obtain the constant term and the first two coefficients in the only Fourier cosine series for given data :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

(08 Marks)

Module-2

3 a. Find the Fourier transform of $xe^{-|x|}$. **(06 Marks)**

b. Find the Fourier sine transform of $\frac{e^{-ax}}{x}$, $a>0$. **(05 Marks)**

c. Obtain the z – transform of $\sin n\theta$ and $\cos n\theta$. **(05 Marks)**

OR

4 a. Find the inverse cosine transform of $F(\alpha)=\begin{cases}1-\alpha, & 0\le\alpha\le 1\\ 0, & \alpha>1\end{cases}$.

Hence evaluate $\int_0^{\infty}\frac{\sin^2 t}{t^2}dt$. **(06 Marks)**

b. Find inverse Z – transform of $\frac{3z^2+2z}{(5z-1)(5z+2)}$ **(05 Marks)**

c. Solve the difference equation $y_{n+2}+6y_{n+1}+9y_1=2^n$ with $y_0=0, y_1=0$, using z – transforms. **(05 Marks)**

Module-3

5 a. Find the lines of regression and the coefficient of correlation for the data :

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

(06 Marks)

b. Fit a second degree polynomial to the data :

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(05 Marks)

c. Find the real root of the equation $x \sin x + \cos x = 0$ near $x = \pi$, by using Newton – Raphson method upto four decimal places. **(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. Fit a curve of the type $y = ae^{bx}$ to the data :

x	5	15	20	30	35	40
y	10	14	25	40	50	62

(05 Marks)

c. Solve $\cos x = 3x - 1$ by using Regula – Falsi method correct upto three decimal places, (Carryout two approximations). **(05 Marks)**

Module-4

7 a. Give f(40) = 184, f(50) = 204, f(60) = 226, f(70) = 250, f(80) = 276, f(90) = 304. Find f(38) using Newton's forward interpolation formula. **(06 Marks)**

b. Find the interpolating polynomial for the data :

x	0	1	2	5
y	2	3	12	147

By using Lagrange's interpolating formula. **(05 Marks)**

c. Use Simpson's $\frac{3}{8}$th rule to evaluate $\int_0^{0.3} (1-8x^3)^{1/2} dx$ considering 3 equal intervals.

(05 Marks)

OR

8 a. The area of a circle (A) corresponding to diameter (D) is given below :

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

Find the area corresponding to diameter 105, using an appropriate interpolation formula. **(06 Marks)**

b. Given the values :

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

Evaluate f(9) using Newton's divided difference formula. **(05 Marks)**

c. Evaluate $\int_0^1 \frac{x}{1+x^2} dx$ by Weddle's rule taking seven ordinates. **(05 Marks)**

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15CV/CT32

Third Semester B.E. Degree Examination, June/July 2019
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. Define : (i) Modulus of Rigidity (ii) Poisson's ratio **(04 Marks)**

b. Prove that the total extension of a uniformly tapering rod of diameter D_1 and D_2 , when the rod is subjected to an axial load 'P' is given by $dl = \frac{4PL}{\pi E D_1 D_2}$. **(06 Marks)**

c. An axial pull of 40,000 N is acting on a bar consisting of three sections of length 300mm, 250mm and 200mm and of diameters 20mm, 40mm and 50mm respectively. If the Young's modulus = 2×10^5 N/mm^2, determine (i) Stress in each section (ii) total extension of the bar. **(06 Marks)**

OR

2 a. Explain elasticity and elastic limit. **(04 Marks)**

b. A steel bar 300mm long, 50mm wide and 40mm thick is subjected to a pull of 300 kN in the direction of its length. Determine the change in volume. Take E = 2×10^5 N/mm^2 and Poisson's ratio = 0.25. **(06 Marks)**

c. A reinforced short concrete column 250mm × 250mm in section is reinforced with 8 steel bars. The total area of steel bars is 2500 mm^2. The column carries a load of 390 kN. If the modulus of elasticity for steel is 15 times that of concrete. Find the stresses in concrete and steel. **(06 Marks)**

Module-2

3 a. Differentiate between thin cylinder and a thick cylinder. Find an expression for the radial pressure and hoop stress at any point in case of a thick cylinder. **(10 Marks)**

b. A rectangular bar of cross section area of 11,000 mm^2 is subjected to a tensile load 'P' as shown in Fig.Q3(b). The permissible normal and shear stresses on the oblique plane BC are given as 7 N/mm^2 and 3.5 N/mm^2 respectively. Determine the safe value of 'P'. **(06 Marks)**

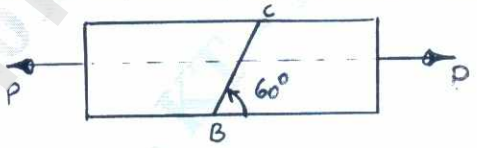

Fig.Q3(b)

OR

4 a. Determine the maximum and minimum hoop stress across the section of a pipe 400mm internal diameter and 100mm thick, when the pipe contains a fluid at a pressure of 8 N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution across the section. **(08 Marks)**

b. At a point in a strained material the principal tensile stresses across two perpendicular planes are 80 N/mm^2 and 40 N/mm^2. Determine normal stress, shear stress and the resultant stress on a plane inclined at 20° with the major principal plane. Determine also the obliquity. **(08 Marks)**

Module-3

5 a. Define (i) Shear force (ii) Bending moment. **(02 Marks)**

b. Draw the SF and BM diagrams for a cantilever of length 'L' carrying a point load 'W' at the free end. **(04 Marks)**

c. Draw the SF and BM diagrams of a simply supported beam of length 7 mt carrying uniformly distributed loads as shown in Fig.Q5(c). **(10 Marks)**

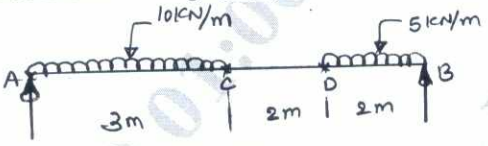

Fig.Q5(c)

OR

6 A horizontal beam 10mt long is carrying a uniformly distributed load of 1 kN/m. The beam is supported on two supports 6 mt apart. Find the position of the supports, so that bending moment on the beam is as small as possible. Also draw the SF and BM diagram. **(16 Marks)**

Module-4

7 a. Define the terms : (i) Neutral axis (ii) Section modulus. **(04 Marks)**

b. A hollow mild steel tube 6m long 40mm internal diameter and 5mm thick is used as a strut with both ends hinged. Find the crippling load and safe load taking factor of safety as 3. Take $E = 2\times10^5$ N/mm^2. **(06 Marks)**

c. The external and internal diameter of a hollow cast iron column are 50mm and 40mm respectively. If the length of this column is 3m and both of its ends are fixed, determine the crippling load using Rankine's formula. Take the values of $\sigma_c = 550$ N/mm^2 and $\alpha = \frac{1}{1600}$ in Rankine's formula. **(06 Marks)**

OR

8 a. Define (i) Buckling load (ii) Slenderness ratio. **(04 Marks)**

b. A timber beam of rectangular section of length 8m is simply supported. The beam carries a U.D.L. of 12 kN/m ran over the entire length and a point load of 10 kN at 3m from the left support. If the depth is two times the width and the stress in the timber is not to exceed 8 N/mm^2, find the suitable dimensions of the section. **(12 Marks)**

Module-5

9 a. List the theories of failures. **(04 Marks)**

b. A hollow shaft of external diameter 120mm transmits 300 kW power at 200 r.p.m. Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed 60 N/mm^2. **(06 Marks)**

c. Determine the diameter of a solid steel shaft which will transmit 90 kW at 160 r.p.m. Also determine the length of the shaft if the twist must not exceed 1° over the entire length. The maximum shear stress is limited to 60 N/mm^2. Take the value of modulus of rigidity = 8×10^4 N/mm^2. **(06 Marks)**

OR

10 a. Derive the relation for a circular shaft when subjected to a torsion as given below:

$$\frac{T}{J} = \frac{\tau}{R} = \frac{C\theta}{L}$$ **(08 Marks)**

b. State and explain theory of maximum principal strain theory. **(08 Marks)**

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CBCS SCHEME

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15CV33

Third Semester B.E. Degree Examination, June/July 2019
Fluid Mechanics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define the terms:
- i) Mass density
- ii) Specific volume
- iii) Specific gravity
- iv) Compressible fluid
- v) Incompressible fluid. **(05 Marks)**

b. State Newton's law of viscosity. The velocity distribution over a plate is given by $V = \frac{y}{3} - y^2$, in which 'V' is the velocity in m/sec, at a distance 'y' m above the plate. Find the shear stress at y = 0 and y = 0.1m, $\mu = 0.835$ N-s/m^2. **(05 Marks)**

c. Explain the phenomenon of capillarity obtain an expression for capillary rise of a liquid. **(06 Marks)**

OR

2 a. What are the desirable characteristics of a manometric liquid? **(05 Marks)**

b. Differentiate between:
- i) Absolute and gauge pressure
- ii) Simple manometer and differential manometer
- iii) Piezometer and pressure gauges. **(06 Marks)**

c. Using an inverted U-Tube manometer, find the intensity of pressure at B for the given condition shown in Fig.Q.2(c). Carbon tetrachloride of relative density 1.6 is flowing through the pipe A and B. Water is used as monometer fluid. The pressure at A is 294.33 kN/m^2. **(05 Marks)**

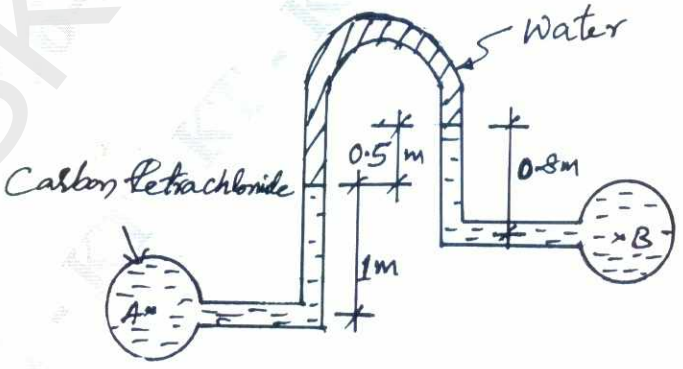

Fig.Q.2(c)

Module-2

3 a. Derive an expression for total pressure on a inclined submerged plane surface. **(04 Marks)**

b. A triangular plate of base width 2m and height 3m is immersed in water with its plane making an angle of 60° with the free surface of water. Determine the hydrostatic pressure force and the position of centre of pressure when the apex of the triangle lies 5m below the free water surface. **(06 Marks)**

c. A concrete dam of trapezoidal section having water on vertical face is 16m high. The base of the dam is 8m wide and top 3m wide. Find the resultant thrust on the base per metre length of the dam water is stored upto top of dam. Take density of masonry = 24 kN/m^3. **(06 Marks)**

OR

4 a. Explain the terms: i) Path line ii) Streak line iii) Stream line and iv) Streams tube. **(04 Marks)**

b. The velocity components in a two-dimensional incompressible flow field are expressed as $u = \frac{y^3}{3} + 2x - x^2y$; $V = xy^2 - 2y - \frac{x^3}{3}$. Determine the velocity and acceleration at point P(x = 1m, y = 3m). **(06 Marks)**

c. The velocity potential function for a two dimensional flow $\phi = x^2 (3y - 2)$. At a point P(2, 3) determine:

i) The velocity at that point.

ii) The value of stream function (ψ) at the point. **(06 Marks)**

Module-3

5 a. What are the different energies of moving fluid? Explain each one of them. **(04 Marks)**

b. Derive the Bernoulli's energy equation from the Euler's motion equation, mentioning clearly the assumption made in the derivation. **(06 Marks)**

c. The water is flowing through a pipe having diameter 20cm and 10cm at section 1-1 and 2-2 respectively. The rate of flow through a pipe is 35 lt/sec. The section 1-1 is 6m above datum and section 2-2 is 4m above datum. If the pressure at section 1-1 is 0.4 N/mm^2. Find the intensity of pressure at section 2-2. **(06 Marks)**

OR

6 a. A pipe of 200mm diameter conveying 0.18m^3/sec of water has a 90° bend in a horizontal plane. The pressure intensities at the inlet and outlet of the bend are 290 kPa and 280 kPa. Find the resultant force exerted by water on the bend. **(08 Marks)**

b. A horizontal venturimeter is provided in a pipe of 30cm diameter conveying water. The throat diameter is 15cm. If the pressure in the pipe is 160 kN/m^2 and the Vaccum pressure of the throat is 35cm of mercury. Find the rate of flow in the pipe. Assume $C_d = 0.98$. **(06 Marks)**

c. A pitot static tube is used to measure the velocity of water in a pipe. The stagnation pressure head is 6m and the static pressure head is 5m. Calculate the velocity of flow. Assume $C_v = 0.98$. **(02 Marks)**

Module-4

7 a. What is orifice? Discuss the classification of orifices. **(06 Marks)**

b. What is mouth piece? Discuss the classification of mouth piece with sketches. **(06 Marks)**

c. The head of water over an orifice of diameter 10cm is 10m. The water coming out from orifice is collected in a circular tank of diameter 1.5m. The rise of water level in this tank is 1m in 25 sec. The co-ordinates of a point on the jet, measured from Vena-contracta are 4.3m horizontal and 0.5m vertical. Find the coefficient of C_d, C_v, C_c? **(04 Marks)**

OR

8 a. Derive an expression for discharge over a rectangular notch in terms of head of water over the crest of the notch. **(06 Marks)**

b. Water flows over a rectangular weir 1m wide at depth of 15cm and afterwards passes through a triangular right angled weir. Taking C_d for the rectangular and triangular weir as 0.62 and 0.59 respectively, find the depth over the triangular weir. **(06 Marks)**

c. Describe a cippoletti weir. Water is flowing over a cippotte weir 4m long under a head of 1m. Compute the **(04 Marks)**

Module-5

9 a. What do you understand by the terms:
i) Major energy loss and minor energy loss.
ii) Total energy line and hydraulic gradient line. **(04 Marks)**

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

c. Water has to be supplied to a town of 4,25,000 in habitants. The reservoir is 6km from the town. The head lost in the pipe line due to friction is measured as 12.5m. Find the size of the supply main if each inhabitant consumes 180 lit of water per day and half the daily supply is pumped in 8 hours. Take f = 0.0075. **(06 Marks)**

OR

10 a. Three pipes of diameters 300mm, 200mm and 400mm and lengths 450m, 225m and 315m respectively are connected in series. The difference in water surface levels in two tanks is 18m. Determine the rate of flow of water if co-efficients of friction are 0.0075, 0.0078 and 0.0072 respectively considering minor losses. **(06 Marks)**

b. Derive an expression for pressure rise due to sudden closure of valve when the pipe material is elastic. **(08 Marks)**

c. Water is flowing in a pipe of 150mm diameter with a velocity of 3.5m/sec. When it is suddenly brought to rest by closing the valve find the pressure rise assuming the pipe is elastic. E = 206 GN/m^2, Poisson's ratio 0.25 and K for water = 2.0 GN/m^2, thickness of wall = 10mm. **(02 Marks)**

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15CV34

Third Semester B.E. Degree Examination, June/July 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. Define surveying. Explain the basic principles of surveying. **(08 Marks)**

b. A 30mt chain was tested, before commencement of the day's work and found to be correct. After measuring 3000mt, the chain was found to be 5cm too long. At the end of the days work, after measuring 5400mt, the chain was found to be 10cm too long, what was the true distance chained? **(08 Marks)**

OR

2 a. Define Ranging. Explain direct ranging by the use of line ranger. **(08 Marks)**

b. A chain line ABC crosses a river, B and C being on the near and distant banks respectively. The respective bearings of C and A taken at D, a point 45mt measured at right angles to AB from B are 300° and 210°. The length of AB is 24mt. Find the width of the river. **(08 Marks)**

Module-2

3 a. Distinguish between:
i) Fore bearing and back bearing
ii) Whole circle bearing and reduced bearing
iii) Dip and declination **(06 Marks)**

b. Following are the observed bearings of a closed traverse:

Line	PQ	QR	RS	SP
FB	124°30′	68°15′	310°30′	200°15′
BB	304°30′	246°0′	135°15′	17°45′

At what station local attraction was suspected. Determine the correct bearings of the lines. **(10 Marks)**

OR

4 a. Define the following terms with reference to theodolite:
i) The horizontal axis
ii) Transiting
iii) Line of collimations
iv) Face left observation. **(08 Marks)**

b. Explain repetition method of measurement of horizontal angle by transmit theodolite. List the errors, eliminated by this method. **(08 Marks)**

Module-3

5 a. What is meant by closing error? How it is adjusted by Bowditch method. **(08 Marks)**

b. The table below gives the lengths and bearings of the lines of a transverse ABCDE, the length and bearing at line EA having bean omitted. Calculate the length and bearing of line EA. **(08 Marks)**

Line	Length (M)	Bearing
AB	204.0	87°30′
BC	226.0	20°20′
CD	187.0	280°0′
DE	192.0	210°3′
EA	?	?

OR

6 a. Derive the distance and elevation formulae for staff vertical and the line of fight bearing inclined in Tachometry. **(08 Marks)**

b. A Tachometer was setup at a station 'A' and the readings on a vertically held staff at B were 2.255, 2.605 and 2.955, the line of sight being at an inclination of +8°24′. Another observation on the vertically held staff at BM gave the readings 1.640, 1.920 and 2.200, the inclination of the line of sight being +1°6′. Calculate the horizontal distance between A and B, and the elevation of 'B' if the RL of BM is 418.685 mt, the constants at the instruments were 100 and 0.3. **(08 Marks)**

Module-4

7 a. Explain the temporary adjustments of Dumpy level. **(08 Marks)**

b. The following staff readings were taken with a level, the instrument having been moved after third, sixth and eight readings.
2.225, 1.625, 0.985, 2.095, 2.795, 1.265, 0.605, 1.980, 1.045 and 2.685
Enter the above readings in a page level field book and calculate the R.L. of the points. The first reading was taken on a B.M. of elevation 100.000 mt. Use rise and fall method. **(08 Marks)**

OR

8 a. List the sources of Errors in leveling. **(08 Marks)**

b. The following notes refer to reciprocal levels taken with one level:

Instant @	Staff Reading on		
	P	Q	Remains
P	1.824	2.748	Distance between P and Q = 1010 mt
Q	0.928	1.606	RL of P = 126.386 m

Find the i) Time R.L. of Q ii) The combined correction for curvature and retraction. Determine the elevation at the foot of the signal if the height of the signal above its base is 3 mtrs. **(08 Marks)**

Module-5

9 a. Explain the characteristics of contours. **(08 Marks)**

b. The following perpendicular offsets were taken at 10 mt intervals from a survey line to an irregular boundary line.
3.25, 5.60, 4.20, 6.65, 8.75, 6.20, 3.25, 4.20, 5.65
Calculate the area enclosed between the survey line, the irregular boundary line, and the first and last offset by the application of : (i) Average ordinate rule (ii) Trapezoidal rule (iii) Simpson's rule **(08 Marks)**

OR

10 a. The following readings were obtained when an area was measured by a planimeter, the tracing arm was being set to natural scale. The initial and final readings were 2.268 and 4.582. The zero of the disc passed the index mark once in the clockwise direction. The anchor point was inside the figure with the value of constant C of the figure = 26.430.

i) Calculate the area of the figure.

ii) If the area of the figure drawn to a scale of 1 inch = 64 feet, find the area of the figure.

(08 Marks)

b. A railway embankment is 10 mt wide with side slopes 1½ to 1. Assuming the ground to be level in a direction transverse to the centre line, calculate the volume contained in a length of 120 mt. The centre height at 20 mt intervals being in meters 2.2, 3.7, 3.8, 4.0, 3.8, 2.8, 2.5.

(08 Marks)

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CBCS SCHEME

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15CV35

Third Semester B.E. Degree Examination, June/July 2019
Engineering Geology

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. What is Geology? Discuss its importance in Civil Engineering Project. **(08 Marks)**
b. With neat sketch, describe internal structure of the earth with its composition. **(08 Marks)**

OR

2 a. Define a Mineral. Explain Hardness , Streak and Cleavage with suitable examples. **(08 Marks)**
b. Write the physical properties , composition and uses of :
i) Biotitic ii) Asbestos iii) Calcite iv) Magnetite. **(08 Marks)**

Module-2

3 a. What is Petrology? Write the broad classification of rocks with examples and explain their formation. **(08 Marks)**
b. What are the essential characters of good building stones? And describe
i) Granite ii) Limestone iii) Marble. **(08 Marks)**

OR

4 a. What is Structural Geology? Define Fold , Fault and Joints and explain the mechanism of their formation. **(08 Marks)**
b. Define Dam and Tunnel. Write a note on Effect of Folds and Faults on dam and tunnel. **(08 Marks)**

Module-3

5 a. Briefly explain drainage system and its pattern. List major landforms formed by the action of river. **(08 Marks)**
b. What are epigene and hypogene geological agents? Explain briefly chemical weathering. **(08 Marks)**

OR

6 What is an Earthquake? Explain its causes and effects. Discuss in detail the precautionary measures followed in designing seismic resistant structures. **(16 Marks)**

Module-4

7 a. What are Aquifers? How are they classified? Briefly explain perched aquifer. **(08 Marks)**
b. Explain briefly Electrical Resistivity method in ground water exploration. **(08 Marks)**

OR

8 a. What is Artificial recharge for groundwater? Explain in brief the methods adopted. **(08 Marks)**
b. Write a note on sea water intrusion , causes and remedial measures. **(08 Marks)**

Module-5

9 a. What is Remote sensing? Explain its components and applications. (08 Marks)
  b. What is GIS and GPS? Explain their importance in civil engineering. (08 Marks)

OR

10 Write short notes on :
  a. Topographic and Geological maps.
  b. Satellite imageries.
  c. Impact of mining.
  d. Impact of quarrying. (16 Marks)

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CBCS SCHEME

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15CV36

Third Semester B.E. Degree Examination, June/July 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. Explain the factors causing deterioration of stonework. **(06 Marks)**

b. List the tests conducted on Fine aggregates. Explain any two tests in detail. **(10 Marks)**

OR

2 a. Write notes on :
(i) Stabilized Mud Blocks (ii) Grading of aggregates (iii) Timber as construction. **(06 Marks)**

b. List the tests on coarse Aggregates. Explain (i) Aggregate Impact test (ii) Aggregate Abrasion test. **(10 Marks)**

Module-2

3 a. What are the functions of good foundation? **(05 Marks)**

b. What are the requirements of good building stones? **(05 Marks)**

c. Briefly explain load bearing walls and cavity walls. **(06 Marks)**

OR

4 a. Define safe Bearing capacity. List the methods of improving bearing capacity of soil and explain any two methods. **(08 Marks)**

b. Find the dimensions of combined rectangular footing for two columns A and B carrying loads 1000 N and 1500kN respectively. Column A is 500mm × 500mm in size and column B is 600mm × 600mm in size. The centre to centre spacing of columns is 5.0m. The SBC of soil may be taken as 250 kN/m^2. The footing is not to project more than 250mm beyond the outer edge of smallest column. **(08 Marks)**

Module-3

5 a. Draw a neat sketch of an arch and explain various technical terms related to an arch. **(08 Marks)**

b. List the types of roofs and explain any two with neat sketches. **(08 Marks)**

OR

6 a. Define Lintel. Explain different types of lintels with neat sketches. **(10 Marks)**

b. Briefly explain the functions of Chejja, Canopy and Balcony. **(06 Marks)**

Module-4

7 a. What are the factors considered while locating Doors and windows? **(05 Marks)**

b. State briefly the requirements of a good stair. **(05 Marks)**

c. Explain with the help of sketches the following terms:
(i) Nosing (ii) Handrail (iii) Landing (iv) Newel post. **(06 Marks)**

OR

8 a. Explain in brief with neat sketches:
(i) Panelled door (ii) Revolving Door (iii) Corner window (iv) Louvered window **(10 Marks)**

b. Plan a dog-legged staircase for a building in which the vertical distance between the floors is 3.0m. The stair hall measures 2.8m × 5.8m. **(06 Marks)**

Module-5

9 a. Discuss the defects in plastering. **(06 Marks)**

b. Explain in brief the causes and effects of dampness. **(10 Marks)**

OR

10 a. List the methods of plastering and explain any two. **(08 Marks)**

b. List the types of paints. Describe the procedure of painting on steel surfaces. **(08 Marks)**

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CBCS SCHEME

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15MATDIP31

Third Semester B.E. Degree Examination, June/July 2019
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 the complex number $\frac{(1+i)(1+3i)}{1+5i}$ in the form a + ib. **(05 Marks)**

b. Find the modulus and amplitude of $1+\cos\theta+i\sin\theta$. **(05 Marks)**

c. Show that $(a+ib)^n+(a-ib)^n = 2(a^2+b^2)^{n/2}\cos\left(n\tan^{-1}\left(\frac{b}{a}\right)\right)$ **(06 Marks)**

OR

2 a. If $\vec{A} = i-2j+3k$ and $\vec{B} = 2i+j+k$, find the unit vector perpendicular to both $\vec{A}$ and $\vec{B}$. **(05 Marks)**

b. Show that the points $-6i+3j+2k$, $3i-2j+4k$, $5i+7j+3k$ and $-13i+17j-k$ are coplan. **(05 Marks)**

c. Prove that $\left[\vec{B}\times\vec{C},\ \vec{C}\times\vec{A},\ \vec{A}\times\vec{B}\right] = \left[\vec{A}\,\vec{B}\,\vec{C}\right]^2$ **(06 Marks)**

Module-2

3 a. Find the n^{th} derivative of $\frac{x}{(x-1)(2x+3)}$. **(05 Marks)**

b. Find the angle of intersection of the curves $r = a(1+\cos\theta)$ and $r = b(1-\cos\theta)$. **(05 Marks)**

c. Obtain the Maclourin series expansion of the function sin x upto the term containing x^4. **(06 Marks)**

OR

4 a. Show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y} = 2u\log u$ where $\log u = \frac{x^3+y^3}{3x+4y}$. **(05 Marks)**

b. If $u = f(x-y, y-z, z-x)$ prove that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z} = 0$. **(05 Marks)**

c. If $u = x+3y^2-z^3$, $v = 4x^2yz$, $w = 2z^2-xy$, evaluate $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ at (1, –1, 0). **(06 Marks)**

Module-3

5 a. Obtain the reduction formula for $\int\sin^n x\,dx$. Hence evaluate $\int_0^{\pi/2}\sin^n x\,dx$. **(05 Marks)**

b. Evaluate $\int_0^{\infty}\frac{x^6}{(1+x^2)^7}dx$. **(05 Marks)**

c. Evaluate $\int_{-1}^{1}\int_0^z\int_{x-z}^{x+z}(x+y+z)dx\,dy\,dz$. **(06 Marks)**

OR

6 a. Evaluate $\int_0^{2a}\int_0^{x^2/4a} xy\,dy\,dx$. **(05 Marks)**

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

c. Evaluate $\int_0^a \frac{x^7\,dx}{\sqrt{a^2-x^2}}$ by using reduction formula. **(06 Marks)**

Module-4

7 a. A particle moves along the curve $x = t^3+1$, $y = t^2$, $z = 2t+3$ where t is the time. Find the components of velocity and acceleration at $t = 1$ in the direction of $i+j+3k$. **(05 Marks)**

b. Find $\text{div}\vec{F}$ and $\text{curl}\vec{F}$ where $\vec{F} = \text{grad}(x^3+y^3+z^3-3xyz)$. **(05 Marks)**

c. Prove that $\text{div}(\text{curl}\vec{F}) = 0$. **(06 Marks)**

OR

8 a. Find the directional derivative of $f(x,y,z) = xy^3+yz^3$ at (2, −1, 1) in the direction of $i+2j+2k$. **(08 Marks)**

b. Prove that $\nabla^2\left(\frac{1}{r}\right) = 0$ where $r = \sqrt{x^2+y^2+z^2}$. **(08 Marks)**

Module-5

9 a. Solve $(x^2-y^2)dx - xy\,dy = 0$. **(05 Marks)**

b. Solve $\left[y\left(1+\frac{1}{x}\right)+\cos y\right]dx + (x+\log x - x\sin y)dy = 0$. **(05 Marks)**

c. Solve $\frac{dy}{dx} - \frac{y}{1+x} = e^{3x}(x+1)$. **(06 Marks)**

OR

10 a. Solve $(xy^3+y)dx + 2(x^2y^2+x+y^4)dy = 0$. **(08 Marks)**

b. Solve $(3y+2x+4)dx - (4x+6y+5)dy = 0$. **(08 Marks)**

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