CBCS SCHEME

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18MAT31

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs. Max. Marks: 100

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

Module-1

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

b. If $f(t) = \begin{cases} t, & 0 < t < a \\ 2a - t, & a < t < 2a \end{cases}$ and $f(t + 2a) = f(t)$, show that $L\{f(t)\} = \frac{1}{s^2} \tanh\left(\frac{as}{2}\right)$. **(07 Marks)**

c. Find the Inverse Laplace transforms of :

i) $\frac{2s+1}{s^2+6s+13}$ ii) $\frac{1}{3}\log\left(\frac{s^2+b^2}{s^2+a^2}\right)$. **(07 Marks)**

OR

2 a. Express the function f(t) in terms of unit step function and find its Laplace transform, where

$$f(t) = \begin{cases} 1, & 0 < t \le 1 \\ t, & 1 < t \le 2 \\ t^2, & t > 2 \end{cases}.$$ **(06 Marks)**

b. Find the Inverse Laplace transform of $\frac{s^2}{(s^2+a^2)^2}$ using Convolution theorem. **(07 Marks)**

c. Solve by the method of Laplace transforms, the equation $y'' + 4y' + 3y = e^{-t}$ given $y(0) = 0$, $y'(0) = 0$. **(07 Marks)**

Module-2

3 a. Obtain the Fourier series of the function $f(x) = x^2$ in $-\pi \le x \le \pi$. **(06 Marks)**

b. Obtain the Fourier series expansion of

$$f(x) = \begin{cases} x, & 0 < x < \pi \\ x - 2\pi, & \pi < x < 2\pi \end{cases}.$$ **(07 Marks)**

c. Find the Cosine half range series for $f(x) = x(\ell - x)$, $0 \le x \le \ell$. **(07 Marks)**

OR

4 a. Obtain the Fourier series of $f(x) = |x|$ in $(-\ell, \ell)$. **(06 Marks)**

b. Find the sine half range series for

$$f(x) = \begin{cases} x, & 0 < x < \pi/2 \\ \pi - \pi, & \pi/2 < x < \pi \end{cases}.$$ **(07 Marks)**

c. Obtain the constant term and the coefficients of the first cosine and sine terms in the Fourier expansion of y from the table. **(07 Marks)**

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

Module-3

5 a. If $f(x) = \begin{cases} 1-x^2 & , |x|<1 \\ 0 & , |x|\ge 1 \end{cases}$. Find the Fourier transform of f(x) and hence find value of $\int_0^\infty \frac{x\cos x - \sin x}{x^3}dx$. **(06 Marks)**

b. Find the Fourier Cosine transform of $f(x) = \begin{cases} 4x, & 0<x<1 \\ 4-x, & 1<x<4 \\ 0, & x>4 \end{cases}$. **(07 Marks)**

c. Find the Z – transform of $\cos\left(\frac{n\pi}{2}+\frac{\pi}{4}\right)$. **(07 Marks)**

OR

6 a. Solve the Integral equation $\int_0^\infty f(\theta)\cos\alpha\theta\, d\theta = \begin{cases} 1-\alpha & , 0\le\alpha\le 1 \\ 0 & , \alpha>1 \end{cases}$ hence evaluate $\int_0^\infty \frac{\sin^2 t}{t^2}dt$. **(06 Marks)**

b. Find the Inverse Z – transform of $\frac{2z^2+3z}{(z+2)(z-4)}$. **(07 Marks)**

c. Using the Z – transform, solve $Y_{n+2} - 4Y_n = 0$, given $Y_0 = 0$, $Y_1 = 2$. **(07 Marks)**

Module-4

7 a. Using Taylor's series method, solve the Initial value problem $\frac{dy}{dx} = x^2y - 1$, y(0) = 1 at the point x = 0.1. Consider upto 4th degree term. **(06 Marks)**

b. Use modified Euler's method to compute y(0.1), given that $\frac{dy}{dx} = x^2 + y$, y(0) = 1 by taking h = 0.05. Consider two approximations in each step. **(07 Marks)**

c. Given that $\frac{dy}{dx} = x - y^2$, find y at x = 0.8 with

x :	0	0.2	0.4	0.6
y :	0	0.02	0.0795	0.1762

By applying Milne's method. Apply corrector formula once. **(07 Marks)**

OR

8 a. Solve the following by Modified Euler's method $\frac{dy}{dx} = x + |\sqrt{y}|$, y(0) = 1 at x = 0.4 by taking h = 0.2. Consider two modifications in each step. **(06 Marks)**

b. Given $\frac{dy}{dx} = 3x + \frac{y}{2}$, y(0) = 1. Compute y(0.2) by taking h = 0.2 using Runge – Kutta method of order IV. **(07 Marks)**

c. Given $\frac{dy}{dx} = (1+y)x^2$ and y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979, determine y(1.4) by Adam's Bashforth method. Apply corrector formula once. **(07 Marks)**

Module-5

9 a. Given $y'' - xy' - y = 0$ with $y(0) = 1$, $y'(0) = 0$. Compute $y(0.2)$ using Runge – Kutta method. **(06 Marks)**

b. Derive Euler's equation in the form $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$. **(07 Marks)**

c. Prove that the geodesics on a plane are straight lines. **(07 Marks)**

OR

10 a. Find the curve on which functional $\int_0^1 [(y')^2 + 12xy]dx$ with $y(0) = 0$, $y(1) = 1$ can be extremized. **(06 Marks)**

b. Obtain the solution of the equation $\frac{2d^2y}{dx^2} = 4x + \frac{dy}{dx}$ by computing the value of dependent variable corresponding to the value 1.4 of the independent variable by applying Milne's method using the following data. Apply corrector formula once. **(07 Marks)**

x :	1	1.1	1.2	1.3
y :	2	2.2156	2.4649	2.7514
y' :	2	2.3178	2.6725	3.0657

c. A heavy cable hangs freely under gravity between two fixed points. Show that the shape of the cable is Catenary $y = c \cosh\left(\frac{x+a}{c}\right)$. **(07 Marks)**

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18CV32

Third Semester B.E. Degree Examination, July/August 2021
Strength of Materials

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions.***
2. ***Missing data, if any, may be suitably assumed.***

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

b. A steel bar of 20 mm diameter is subjected to tension test in lab. Determine stress, strain, Young's Modulus Percentage elongation from the following data:
Gauge length – 200 mm, extension at a load of 100 kN is 0.147 mm, total elongation 50 mm. also determine the percentage decrease in cross sectional area of the specimen. If the diameter of the rod at failure is 16 mm. **(10 Marks)**

c. Derive an expression for extension/shortening of bar of uniform cross sectional area. **(04 Marks)**

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

b. A bar of 20 mm diameter is tested in tension. It is observed that when a load of 37.7 kN is applied the extension measured over a gauge length of 200 mm is 0.12 mm and contraction in diameter is 0.0036 mm. Find the Poisson's ratio, Young's modulus, bulk modulus and modulus of rigidity. **(08 Marks)**

c. Show that volumetric strain is sum of strains in three mutually perpendicular directions. **(06 Marks)**

3 a. Derive an expression for change in volume of thin cylinders. **(10 Marks)**

b. For a state of stresses with σ_x = 85 MPa (tensile) σ_y = 60 MPa (compressive) with a shear stress of 45 MPa, determine the principal stresses and locate their planes. Also obtain maximum tangential stress and locate corresponding planes. [Refer Fig.Q3(b)]

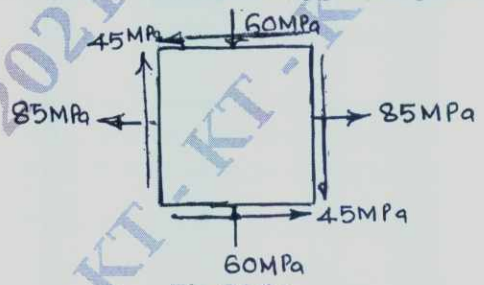

Fig.Q3(b) **(10 Marks)**

4 a. Derive an expression for normal and tangential stresses on a plane inclined at an angle θ with plane of σ_x for an element subjected to general two dimensional stress system and show that:
(i) Sum of normal stresses in any two mutually perpendicular directions is constant.
(ii) Principal planes are planes of maximum normal stresses also. **(10 Marks)**

b. Find the thickness of metal necessary for a steel cylindrical shell of internal diameter 150 mm to withstand an internal pressure of 50 N/mm^2. The maximum hoop stress in the section is not to exceed 150 N/mm^2. If the thickness of cylinder is found using thin cylinder analysis, what is the percentage error? **(10 Marks)**

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

b. Draw SFD and BMD for a simply supported beam subjected to a couple moment 'M' in clockwise direction acting at a distance of 'a' from left support and 'b' from right support. **(06 Marks)**

c. Draw SFD and BMD for a cantilever beam subjected to loads as shown in Fig.Q5(c).

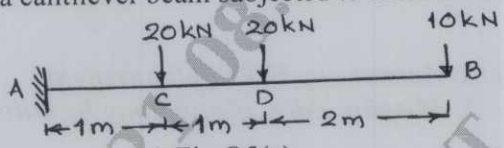

Fig.Q5(c) **(08 Marks)**

6 a. Define: (i) Shear force (ii) Bending moment (iii) Point of contraflexure **(06 Marks)**

b. Draw BMD and SFD for the overhanging beam shown in Fig.Q6(b). Clearly indicate the point contraflexure.

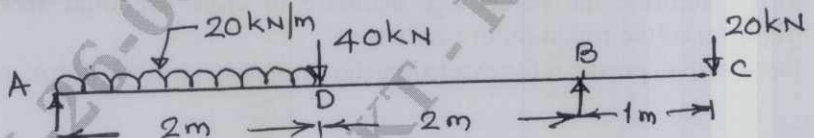

Fig.Q6(b) **(14 Marks)**

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

b. Derive the bending equation with usual notations. **(08 Marks)**

c. A solid shaft transmits 250 KW at 100 rpm. If the shear stress is not to exceed 75 MPa, what should be the diameter of the shaft? If this shaft is to be replaced by a hollow one whose diameter ratio is 0.6. Determine the size and percentage saving in weight. The maximum shear stress being the same. **(08 Marks)**

8 a. Derive the torsion equation for a circular shaft $\frac{T}{J}=\frac{\tau}{r}=\frac{G\theta}{L}$ with usual notations. **(10 Marks)**

b. A simply supported beam 100 mm × 200 mm in cross section carries a central concentrated load 'W'. The permissible stress in bending and shear are 15 MPa and 1.2 MPa respectively. Determine the safe load W, if the span of the beam is 3m. **(10 Marks)**

9 a. Derive the moment curvature equation of deflection. **(06 Marks)**

b. Find the Euler's crippling load for a hollow cylindrical steel column of 40 mm diameter and 4 mm thick. Take the length of column as 2.3 m and column is hinged at both the ends. Also determine the crippling load by Rankine's formula using constants as 335 MPa and $\frac{1}{75000}$.

Take $E = 205 \times 10^3$ N/mm^2. **(10 Marks)**

c. What are the limitations of Euler's theory of buckling? **(04 Marks)**

10 a. Derive an expression for a column when both the ends are pinned. **(06 Marks)**

b. Determine the slope and deflection at free end of a cantilever beam of span 'L' subjected to udl w/m over its full length by using Macaulay's method. **(06 Marks)**

c. Find the maximum value of slope and deflection for a simply supported beam subjected to point load at centre use Macaulay's method. **(08 Marks)**

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18CV33

Third Semester B.E. Degree Examination, July/August 2021
Fluid Mechanics

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. Differentiate between i) Liquids and gases ii) Real fluids and Ideal fluids iii) Specific weight and Specific volume of a fluid. **(06 Marks)**

b. One litre of crude oil weighs 9.6N. Calculate its specific weigh, density and specific gravity. **(06 Marks)**

c. Calculate the capillary rise in a glass tube of 3mm diameter when immersed vertically in i) Water and ii) Mercury. Take surface tensions for mercury and water as 0.0725N/m and 0.52 N/m respectively in contact with air , specific gravity of mercury taken as 13.6. **(08 Marks)**

2 a. Differentiate between i) Absolute and gauge pressure ii) Simple manometer and differential manometer iii) Peizometer and pressure gauges. **(06 Marks)**

b. An open tank contains water upto a depth of 1.5m and above it an oil of Sp.gr 0.8 for a depth of 2m. Find the pressure intensity i) at the interface of the two liquids ii) at the bottom of the tank. **(06 Marks)**

c. The water is flowing through two different pipe to which an inverted differential manometer having an oil Sp.gr 0.8 is connected. The pressure head in the pipe A is 2m of water. Find the pressure in the pipe B for the manometer readings as shown in Fig. Q2(c). **(08 Marks)**

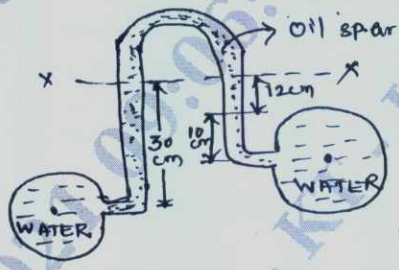

Fig. Q2(c)

3 a. What do you understand by 'Total Pressure' and 'Centre of Pressure'? **(06 Marks)**

b. A circular opening, 3m diameter in a vertical side of a tank is closed by a disc of 3m diameter which can rotate about a horizontal diameter. Calculate i) the force on the disc ii) the torque required to maintain the disc in equilibrium in the vertical position when the head of water above the horizontal diameter is 6m. **(06 Marks)**

c. Find the horizontal and vertical components of the total force acting on a curved surface AB, which is the form of a quadrant of a circle of radius 2m as shown in Fig. Q3(c). Take the width of the gate is 2m. **(08 Marks)**

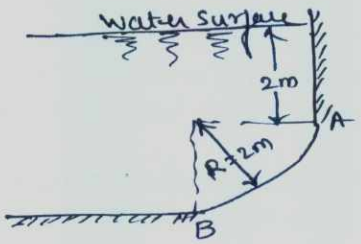

Fig. Q3(c)

4 a. Define the terms : i) Velocity potential function ii) Stream function. **(06 Marks)**

b. The velocity vector in a fluid flow is given by $V = 2x^3 i - 5x^2 yj + 4tK$. Find the velocity and acceleration of a fluid particle at (1, 2, 3) at time t = 1. **(06 Marks)**

c. If for a two – dimensional potential flow, the velocity potential is given by $\phi = 4x(3y-4)$, determine the velocity at the point (2,3). Determine also the value of stream function ψ at the point (2, 3). **(08 Marks)**

5 a. What is Euler's equation of motion? How will you obtain Bernoulli's equation from it? **(06 Marks)**

b. A pipe through which water is flowing, is having diameters 40cm and 20cm at the cross – section 1 and 2 respectively. The velocity of water at section 1 is given 5m/s. Find the velocity head at the section 1 and 2 and also rate of discharge. **(06 Marks)**

c. The water is flowing through a pipe having diameters 20cm and 10cm at section 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6m above datum and section 2 is 4m above datum. If the pressure at section 1 is 39.24 N/cm^2. Find the intensity of pressure at section 2. **(08 Marks)**

6 a. What is a Pitot tube? How will you determine the velocity at any point with the help of pitot – tube? **(06 Marks)**

b. A 20 × 10cm veturimeter is provided in a vertical pipe line carrying oil of sq. gr 0.8, the flow being upwards. The difference in elevation of the throat section and entrance section of the venturimeter is 50cm. The differential U – tube mercury manometer shows a gauge deflection of 40cm. Calculate i) the discharge of oil ii) the pressure difference between the entrance section and the throat section. Take $C_d = 0.98$ and Sp. Gr of mercury as 13.6. **(06 Marks)**

c. A pitot – tube is inserted in a pipe of 300mm diameter. The static pressure in pipe is 100mm of mercury (vaccum). The stagnation pressure at the centre of the pipe recorded by the pitot tube is 0.981 N/cm^2. Calculate the rate of flow of water through pipe. If the mean velocity of flow is 0.85 times the central velocity. Take CV = 0.98. **(08 Marks)**

7 a. Explain the classification of orifices and mouth pieces based in their shape , size and sharpness. **(06 Marks)**

b. The head of water over an orifice of diameter 100mm is 5m. The water coming out from orifice is collected in a circular tank of diameter 2m. The rise of water level in circular tank is 45m in 30 seconds. Also the co-ordinates of a certain point on the jet, measured from vena – contracta are 100cm horizontal and 5.2cm vertical. Find the hydraulic co-efficients C_d, C_v and C_c. **(06 Marks)**

c. A tank has two identical orifices on one of its vertical sides. The upper orifice is 3m below the water surface and lower one is 5m below the water surface. If the value of C_v for each orifice is 0.96, find the point of intersection of the two jets. **(08 Marks)**

8 a. How are the weirs and notches classified? **(06 Marks)**

b. A right angled V – notch is inserted in the side of a tank of length 4m and width 2.5m. Initial height of water above the apex of the notch is 30cm. Find the height of water above the apex, if the time required to lower the head in tank from 30cm to final height is 3 minutes. Take $C_d = 0.6$. **(06 Marks)**

c. A Cipolletti weir of crest length 60cm discharges water. The head of water over the weir is 360mm. Find the discharge over the weir if the channel is 80cm wide and 50cm deep. Take $C_d = 0.6$ **(08 Marks)**

9 a. What do you understand by Total energy line, Hydraulic gradient line, Pipes in series, Pipes in parallel and Equivalent pipe? **(05 Marks)**

b. An oil of sp. gr. 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200mm at the rate of 60 litres/s. Find the head loss due to friction for a 500m length of pipe. Find the power required to maintain this flow. **(07 Marks)**

c. The rate of flow of water through a horizontal pipe is $0.25 m^3/s$. The diameter of the pipe which is 200mm is suddenly enlarged to 400mm. The pressure intensity in the smaller pipe is $11.772 N/cm^2$. Determine i) Loss of head due to sudden enlargement ii) Pressure intensity in the large pipe iii) Power lost due to enlargement. **(08 Marks)**

10 a. Explain the phenomenon of water hammer. Obtain an expression for the rise of pressure when the flowing water in a pipe is brought to rest by closing the valve gradually. **(06 Marks)**

b. The water is flowing with a velocity of 1.5m/s in a pipe of length 2500m and of diameter 500mm. At the end of the pipe, a valve is provided. Find the rise in pressure of the valve is closed in 25 seconds. Take the value of C = 1460 m/s. **(06 Marks)**

c. A valve is provided at the end of a cast iron pipe of diameter 150mm and of thickness 10mm. The water is flowing through the pipe which is suddenly stopped by closing the valve. Find the maximum velocity of water, when the rise of pressure due to sudden closure of valve is $196.2 N/cm^2$. Take K for water as $19.62 \times 10^4 N/cm^2$ and E for cast iron pipe as $11.772 \times 10^6 N/cm^2$. **(08 Marks)**

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18CV34

Third Semester B.E. Degree Examination, July/August 2021
Building Materials and Construction

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. What are the requirements of good building stones? Explain. **(06 Marks)**
b. Describe the constituents of good brick earth along with their importance. **(06 Marks)**
c. Explain the importance of shape, size and texture of coarse aggregates in cement concrete making. **(08 Marks)**

2 a. Explain bulking of sand with its practical importance. **(06 Marks)**
b. Which are the factors causing deterioration of stone? And write about preservation of stones. **(06 Marks)**
c. Describe the construction and working of Bull's Trench Kiln with sketch. **(08 Marks)**

3 a. Explain the functions of foundation. **(06 Marks)**
b. How piles are classified based on function? Explain with sketches. **(06 Marks)**
c. Draw the plan of one and half brick thick English bond. Mention its salient features. **(08 Marks)**

4 a. Differentiate between strip footing and strap footing with sketch. **(06 Marks)**
b. Write a note on Ashlar type of stone masonry. **(06 Marks)**
c. Describe the construction and necessity of Grillage foundation with its plan sketch. **(08 Marks)**

5 a. Draw the sketch of an elementary arch and level its parts. **(06 Marks)**
b. Write a note on : i) Stone lintel ii) RCC lintel. **(06 Marks)**
c. What are requirements of a good floor? Draw the sketch of ground floor marble flooring with its components. **(08 Marks)**

6 a. Explain various modes of failure of an arch with its remedial measures. **(06 Marks)**
b. Differentiate between sloped roof and flat roof with reference to advantages. **(06 Marks)**
c. Draw the sketch of King post wooden roof truss (half part) and label its parts. **(08 Marks)**

7 a. Differentiate brick layer's scaffolding over Mason's Scaffolding. **(06 Marks)**
b. What are the requirements of good stair? Briefly explain the types of stairs. **(06 Marks)**
c. With a neat sketch, explain i) Bay window ii) Dormer window. **(08 Marks)**

8 a. Explain Raking shore with a neat sketch. **(06 Marks)**
b. Write the requirements of locating door and window. **(06 Marks)**
c. Explain salient features of framed and paneled double shutter door with sketch. **(08 Marks)**

9 a. What are the objects and requirements of good plaster? **(06 Marks)**
b. Name and explain constituents of oil paint. **(06 Marks)**
c. Explain procedure of painting i) New wood surface ii) New plastered surface. **(08 Marks)**

10 a. Explain the defects in plastering. **(06 Marks)**
b. Explain the procedure adopted in cement – lime plastering. **(06 Marks)**
c. Briefly explain the methods of damp proofing. **(08 Marks)**

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18CV35

Third Semester B.E. Degree Examination, July/August 2021
Basic Surveying

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions.*
2. *Assume any missing data suitably.*
3. *Draw sketches wherever necessary.*

1 a. State atleast three differences between:
(i) Plane survey and geodetic survey
(ii) Accuracy and precision **(06 Marks)**

b. Length of a line measured with 20.0 m chain was 1341.0 m. The same line when measured with 30.0 m chain, which was 20 cm tooshort was found to be 1350.0 m. What was the error in 20 m chain? **(06 Marks)**

c. To continue a line $\overline{AB}$ post an obstacle, a line $\overline{BC}$ measuring 200 m was set out perpendicular at B to $\overline{AB}$. From point 'C' $\angle BCD = 60°$ and $\angle BCE = 45°$ were set. Determine $\overline{CE}$ and $\overline{CD}$ such that points A, B, E and D are in a straight line. Also calculate the obstructed distance $\overline{BE}$. **(08 Marks)**

2 a. List three parameters under which surveying is classified. **(06 Marks)**

b. Brief the working principle of and EDM with sketch. **(06 Marks)**

c. A line was measured with a steel tape which was exactly 30 m at a temperature of 20°C and pull of 10 kg. the measured length was 1650 m. The temperature during measurement was 30°C and applied pull was 15 kg. Find the true length of line, if cross sectional area of the tape was 0.025 cm^2. Coefficient of thermal expansion of the tape is 3.5×10^{-6}/°C, $E = 2.1 \times 10^6$ kg/cm^2. **(08 Marks)**

3 a. Compare between prismatic and surveyor's compass for atleast six differences. **(06 Marks)**

b. What is meant by local attraction? How is it detected? **(06 Marks)**

c. The following bearings are observed in a closed traverse. Determine the correct bearings of lines affected by local attraction. Tabulate the results.

Line	AB	BC	CD	DA
FB	32°30′	124°30′	181°0′	289°30′
BB	214°30′	303°15′	1°0′	108°45′

(08 Marks)

4 a. Mention the differences (at least two) between:
(i) WCB and QB (ii) Dip Declination (iii) Magnetic bearing and True bearing **(06 Marks)**

b. Explain how closing error is adjusted by Bowditch's Transit rule. **(06 Marks)**

c. Length and bearings of a compass traverse ABCD are given below. The length and bearing of line DA is omitted due to obstruction. Calculate the same.

Length m	AB	BC	CD
Length m	485	1720	1050
Bearing	342°	16°	140°

(08 Marks)

5 a. Define the following terms with respect to leveling:
(i) Bench mark (ii) Elevation (iii) Height of collimation
(iv) Change point (v) Back sight (vi) Station **(06 Marks)**

b. Describe in sequence, the temporary adjustments to a dumpy level while starting leveling work. **(06 Marks)**

c. Following details were recorded in level work. Calculate:
(i) True RL of point B
(ii) Angular error in collimation
(iii) Combined correction for curvature and refraction

Inst. At	Staff Reading on		Remarks
	A	B	
A	1.030	1.630	AB = 800.00 m
B	0.950	1.540	RL of A = 450.00

(08 Marks)

6 a. State the different methods of leveling. Explain any one method. **(06 Marks)**

b. Enumerate profile leveling in detail with sketch. **(06 Marks)**

c. Following readings were taken consecutively with 4.00 m level staff and a level on a sloping ground at a common interval of 5.0 m. Calculate the R.L of all points by Rise and Fall method. Determine the gradient between First and last point. Apply usual check. A reading 0.780 is observed on a BM of 180.750 m.
1.535, 1.955, 2.430, 2.985, 3.640, 0.935, 1.045, 1.630, 2.480, 3.480, 1.550, 1.960 and 2.225.
(08 Marks)

7 a. Name the Accessories used in plane table surveying. Mention their uses. **(08 Marks)**

b. Write a note on "orientation". Explain the two methods adopted for orienting a plane table. **(12 Marks)**

8 a. State the advantages and disadvantages of plane table surveying. **(08 Marks)**

b. Describe the method of Resection by Bessel's three point graphical method. **(12 Marks)**

9 a. What is a "Contour" in surveying? List atleast four characteristics of a contour. **(06 Marks)**

b. Perpendicular offsets are taken at 10.0 m interval along a Base line to an irregular boundary line. Calculate the area enclosed by boundary line and base line between First and Last offset by (i) Trapezoidal rule (ii) Simpson's rule. **(06 Marks)**

c. Explain "Mid ordinate" of calculating area of an irregular shaped plot in plan. **(08 Marks)**

10 a. What is palnimeter? Explain the polar planimeter along with essential parts. **(12 Marks)**

b. A Railway embankment is 10 mt wide with side slopes 1½ :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 heights at 20 mt intervals being in meters.
2.2, 3.7, 3.8, 4.0, 3.8, 2.8, 2.5
Use Trapezoidal and Prismoidal rules. **(08 Marks)**

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18CV36

Third Semester B.E. Degree Examination, July/August 2021
Engineering Geology

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. What is Geology? Describe the role of Geology in Civil Engineering. **(10 Marks)**
b. Define Mineral. Describe following physical properties of Minerals :
i) FORMS ii) Fracture iii) Hardness. **(10 Marks)**

2 a. Give a detailed account of Interior of Earth. **(10 Marks)**
b. Write the physical properties , chemical composition and uses of
i) Calcite ii) Hematite iii) Mica. **(10 Marks)**

3 a. What is Igneous Rock? Give the classification of Igneous Rocks based on origin. **(10 Marks)**
b. What are Sedimentary Rocks? Explain primary structure of Sedimentary Rocks. **(10 Marks)**

4 a. What is Weathering? Explain causes and types of weathering. **(10 Marks)**
b. What is Soil? Explain Soil profile. **(05 Marks)**
c. Explain different types of Drainage patterns. **(05 Marks)**

5 a. What are Joint? Explain types of Joints and write importance in Civil Engineering field. **(10 Marks)**
b. What is Outcrop? Add note on : i) DIP ii) Strike. **(05 Marks)**
c. Write a note on Rock Quality Determination (RQD). **(05 Marks)**

6 a. What is Fault? Give the classification of Faults with neat sketch. **(10 Marks)**
b. Define Unconformity. Describe the types of unconformity and mention the field evidence of unconformity. **(10 Marks)**

7 a. Discuss the groundwater exploration by Electrical Resistivity method. **(10 Marks)**
b. What is Rain Water Harvesting? Explain different methods of Rain Water Harvesting. **(05 Marks)**
c. Explain Hydrological cycle. **(05 Marks)**

8 a. What is Aquifer? Explain different types of Aquifer. **(10 Marks)**
b. Explain following :
i) Causes of Sea water Intrusions in coastal area ii) Cyclones and its effects. **(10 Marks)**

9 a. What is an Earthquake? Write the causes and effects of Earthquake. **(10 Marks)**
b. What is Remote Sensing? Explain important Application of Remote Sensing in Water resources field. **(05 Marks)**
c. What is GPS? Describe application of GPS. **(05 Marks)**

10 a. Define GIS. Explain application of GIS and components of GIS. **(10 Marks)**
b. What is Landslide? Explain main causes of landslide. **(10 Marks)**

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CBCS SCHEME

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18MATDIP31

Third Semester B.E. Degree Examination, July/August 2021
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Show that $(1+\cos\theta+i\sin\theta)^n+(1+\cos\theta-i\sin\theta)^n = 2^{n+1}\cos^n\left(\frac{\theta}{2}\right)\cos\left(\frac{n\theta}{2}\right)$. **(07 Marks)**

b. Express $1-i\sqrt{3}$ in polar form and hence find its modulus and amplitude. **(06 Marks)**

c. Express $\frac{1}{1-\cos\theta+i\sin\theta}$ in the form a + ib and also find its conjugate. **(07 Marks)**

2 a. Define dot product between two vectors A and B. Find the sine of the angle between the vectors $\vec{A}=2\hat{i}-2\hat{j}+\hat{k}$ and $\vec{B}=\hat{i}-2\hat{j}+2\hat{k}$. **(07 Marks)**

b. If $\vec{A}=\hat{i}-2\hat{j}+3\hat{k}$, $\vec{B}=-\hat{i}+2\hat{j}+\hat{k}$ and $\vec{C}=3\hat{i}+\hat{j}$, find the value of p such that $\vec{A}-p\vec{B}$ is perpendicular to $\vec{C}$. **(06 Marks)**

c. Find $\vec{a}\cdot(\vec{b}\times\vec{c})$, $\vec{b}\times(\vec{a}\times\vec{c})$ and $\vec{c}\cdot(\vec{a}\times\vec{b})$ where $\vec{a}=\hat{i}+\hat{j}-\hat{k}$, $\vec{b}=2\hat{i}-\hat{j}+2\hat{k}$, $\vec{c}=3\hat{i}-\hat{j}-\hat{k}$. **(07 Marks)**

3 a. Obtain the Maclaurin's series expansion of log(sec x) upto the terms containing x^6. **(07 Marks)**

b. If $u=\tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ then using Euler's theorem, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u$. **(06 Marks)**

c. If u = f(x – y, y – z, z – x), prove that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$. **(07 Marks)**

4 a. Obtain the Maclaurin's series expansion of the function $\sqrt{1+\sin 2x}$ upto x^4. **(07 Marks)**

b. If $u=e^{\frac{x^2y^2}{x+y}}$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=3u\log u$ using Euler's theorem. **(06 Marks)**

c. If $u=\frac{yz}{x}$, $v=\frac{zx}{y}$, $w=\frac{xy}{z}$ then show that $\frac{\partial(u,v,w)}{\partial(x,y,z)}=4$ **(07 Marks)**

5 a. A particle moves along a curve $x = 3t^2$, $y = t^3 - 4t$, $z = 3t + 4$ where t is the time variable. Determine the components of velocity and acceleration vectors at t = 2 in the direction $\hat{i}-2\hat{j}+2\hat{k}$. **(07 Marks)**

b. Find the unit normal vector to the surface $xy^3z^2 = 4$ at the point (–1, –1, 2). **(06 Marks)**

c. Show that the vector field $\vec{F}=(2x+yz)\hat{i}+(4y+zx)\hat{j}-(6z-xy)\hat{k}$ is irrotational. Also find ϕ such that $\vec{F}=\nabla\phi$. **(07 Marks)**

6 a. Find div $\vec{F}$ and Curl $\vec{F}$, where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. **(07 Marks)**

b. If $\vec{F} = (3x^2y - z)\hat{i} + (xz^3 + y^4)\hat{j} - 2x^3z^2\hat{k}$ then find $\nabla \cdot \vec{F}$, $\nabla \times \vec{F}$ and $\nabla \cdot (\nabla \times \vec{F})$ at (2, −1, 0). **(06 Marks)**

c. Determine the constant 'a' such that the vector $(2x + 3y)\hat{i} + (ay - 3z)\hat{j} + (6x - 12z)\hat{k}$ is Solenoidal. **(07 Marks)**

7 a. Obtain a reduction formula for $\int_0^{\pi/2} \cos^n x dx (n > 0)$. **(07 Marks)**

b. Evaluate $\int_0^a x^4 \sqrt{a^2 - x^2} dx$. **(06 Marks)**

c. Evaluate $\int_1^5 \int_1^{x^2} x(x^2 + y^2) dx dy$. **(07 Marks)**

8 a. Obtain a reduction formula for $\int_0^{\pi/2} \sin^n x dx \ (n > 0)$. **(07 Marks)**

b. Evaluate $\int_0^{2a} x^2 \sqrt{2ax - x^2} dx$ **(06 Marks)**

c. Evaluate $\int_{-1}^{1} \int_0^{z} \int_{x-z}^{x+z} (x + y + z) dy dx dz$ **(07 Marks)**

9 a. Solve $(2x^3 - xy^2 - 2y + 3)dx - (x^2y + 2x)dy = 0$ **(07 Marks)**

b. Solve $\frac{dy}{dx} - y \tan x = y^2 \sec x$. **(06 Marks)**

c. Solve $3x(x + y^2)dy + (x^3 - 3xy - 2y^3)dx = 0$ **(07 Marks)**

10 a. Solve $\frac{dy}{dx} + y \cot x = \sin x$. **(07 Marks)**

b. Solve $(x + 3y - 4)dx + (3x + 9y - 2)dy = 0$ **(06 Marks)**

c. Solve $[1 + (x + y)\tan y]\frac{dy}{dx} + 1 = 0$ **(07 Marks)**

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