

B000311(014)

B.Tech. (Third Semester) Examination

Nov-Dec. 2023

common to all branches

(Civil Engg. Branch)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) is compulsory of each question and attempt any two from (b), (c) and (d) of each questions.

Unit-I

1. (a) Write formula for Laplace transform of a periodic function. 4

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(b) (i) Find out $L(t^2 \sin at)$ 4

(ii) Apply Laplace Transform to Evaluate : 4

$$\int_0^{\infty} te^{-2t} \sin 3t dt$$

(c) (i) Evaluate : 4

$$L^{-1} \left\{ \frac{1}{(s^2+1)(s^2+9)} \right\}$$

(ii) Evaluate : 4

$$L^{-1} \left\{ \frac{s+2}{(s^2+4s+5)^2} \right\}$$

(d) Apply Laplace Transform to find solution

$$ty'' + 2y' + ty = \cos t,$$

given that $y(0) = 1$. 8

Unit-II

2. (a) Form a partial differential equation from the given arbitrary function $f(x^2 + y^2, z - xy) = 0$. 4

(b) Solve the given equation : 8

$$(x^2 - y^2 - z^2)p + 2xyq - 2xz = 0$$

(c) Solve the following equation 8

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6 \frac{\partial^2 z}{\partial y^2} = y \cos x$$

(d) Apply method of separation of variables to solve

$$4 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u, \text{ given } u(0, y) = 3e^{-y} - e^{-5y}. \quad 8$$

Unit-III

3. (a) The probability density function of a continuous random variable is given by

$$f(x) = \begin{cases} \frac{k}{x^3} & , 5 \leq x \leq 10 \\ 0 & , \text{ otherwise} \end{cases}$$

Find value of k . 4

[4]

(b) From a bag containing 3 red and 2 white balls, a man is to draw 2 balls at random without replacement, being promised ₹ 20 for each red ball and ₹ 10 for each white one. Find his expectation. 8

(c) Fit a Poisson distribution to the set of observations :

x	:	0	1	2	3	4
$f(x)$:	122	60	15	2	1

Do all the computation for two decimal places. 8

(d) A certain number of articles manufactured in one batch were classified into three categories according to a particular characteristics, being less than 50, between 50 and 60 and greater than 60. If this characteristics is known to be normally distributed, determine the mean and standard deviation for this batch if 60%, 35% and 5% were found in these categories. 8

Unit-IV

4. (a) Find the missing terms in the following data : 4

x	:	45	50	55	60	65
$f(x)$:	3	-	2	-	-2.4

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(b) Apply Newton's Backward interpolation formula and obtain the cubic polynomial which takes the following values : 8

x	:	0	1	2	3
$f(x)$:	1	2	1	10

(c) Apply Stirling's and Bessel's central interpolation formula respectively to find $f(29)$ and $f(32)$ from the following data :

x	:	20	25	30	35	40
$f(x)$:	11.4699	12.7834	1.7648	14.4982	15.0463

Do all the calculations for four decimal places. 8

(d) Apply Newton's Divide Difference formula to obtain $f(x)$ as a cubic polynomial which represents the following data : 8

x	:	1	2	7	8
$f(x)$:	1	5	5	4

Unit-V

5. (a) Write Adams-Bashforth predictor - corrector formula, 4

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- (b) Apply Taylor's series and find out series solution up to four non-zero terms for the given equation

$$\frac{dy}{dx} = xy^{\frac{1}{2}} \text{ and } y(1) = 1$$

Do all the calculation for four decimal places and find numerical solution at $y(1.2)$. 8

- (c) Apply Runge Kutta method of fourth order to find out numerical solution of the given differential equation

$$\frac{dy}{dx} + y + xy^2 = 0, \text{ at } y(0.2), \text{ by taking } h = 0.1. \text{ Do}$$

all the calculation for four decimal places. 8

- (d) Apply Milne's predictor corrector method to find numerical solution $y(0.4)$ for the given equation

$$2 \frac{dy}{dx} = (1+x^2)y^2, \text{ where } y(0) = 1, \text{ also given}$$

$y(0.1) = 1.06, y(0.2) = 1.12 \text{ and } y(0.3) = 1.21.$

Do all the calculation for four decimal places. 8

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**B. Tech. (Third Semester) Examination,
Nov.-Dec. 2023**

(AICTE Scheme)

(Civil Engineering Branch)

INTRODUCTION to FLUID MECHANICS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

*Note : Part (a) is compulsory from each question.
Attempt any two parts from (b), (c) and (d).
Part (a) carries 4 marks and (b), (c) and (d)
carries 8 marks each.*

Unit-I

1. (a) Explain Newton's law of viscosity. 4
- (b) Derive an expression for the meta centric height of a floating body. 8

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- (c) A space 25 mm wide between top large plane surfaces is filled with glycerin. What force is required to drag a very thin plate 0.75 m^2 in area between the surfaces at a speed of 0.5 m/s .
- (i) If plate remains equidistant from the two surfaces.
(ii) If it is at a distance of 10 cm from one of the surface.

Take $\mu = 0.785 \text{ N-s/m}^2$.

- (d) What is Manometer? Write notes on measurement of pressure by manometers.

Unit-II

2. (a) Define :
- (i) Steady and Unsteady flow
(ii) Uniform and Non-uniform flow
- (b) Derive continuity equation of liquid flow based on conservation of mass principle.
- (c) An incompressible flow is given by :
- $$v = (6xt + yz^2)i + (3t + xy^2)j + (xy - 2xyz - 6tz)k$$
- (i) Verify whether the continuity equation is satisfied.
(ii) Determine the acceleration vector at point $A(1, 1, 1)$ at $t = 1.0$.

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- (d) Write a notes on :
- (i) Stream function
(ii) Velocity potential function
(iii) Circulation
(iv) Vorticity

Unit-III

3. (a) Explain Impulse-Momentum equation.
- (b) State and derive the Euler's equation of motion for fluid flow.
- (c) An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$.
- (d) Explain pitot tube with its principle, construction, working and expression.

Unit-IV

4. (a) Explain :
- (i) Reynold's number
(ii) Froude's number

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- (b) Derive the hagen-Poiseville equation for Laminar flow. 8
- (c) (i) Discuss the "Minor Losses in pipe flow."
(ii) Explain H.W.A. and L.D.A. 8
- (d) A rectangular channel is to be dug in the portion of soil. Find its most economical dimension, if it is to convey $12 \text{ m}^3/\text{s}$ discharge of water, if water with an average velocity of 3 m/s . Take Chezy's constant $C = 50$. 8

Unit-V

5. (a) Compare orifice and mouthpiece. 4
- (b) Explain the different "Hydraulic Co-efficients". 8
- (c) Derive discharge formula for "Triangular Notch" or "V-Notch". 8
- (d) A sharp edged orifice of 5 cm diameter discharge water under a head of 5 m . Find the value of coefficient of velocity, contraction and discharge if measured rate of flow is 0.012 cumecs . The diameter of the jet at the vena contracta is 4 cm . 8

B020313(020)**B.Tech. (Third Semester) Examination****Nov.-Dec. 2023****(New Scheme)****(Civil Engineering Branch)****INTRODUCTION to SOLID MECHANICS*****Time Allowed : Three hours******Maximum Marks : 100******Minimum Pass Marks : 35***

Note : Attempt all questions. Part (a) of each question is compulsory and carries 4 marks. Attempt any two parts from (b), (c), (d) which carry 8 marks each.

Unit-I

1. (a) What is strain? Explain its types. 4

(b) Derive the relation between K , G and μ , where 8

μ = poisson's ratio

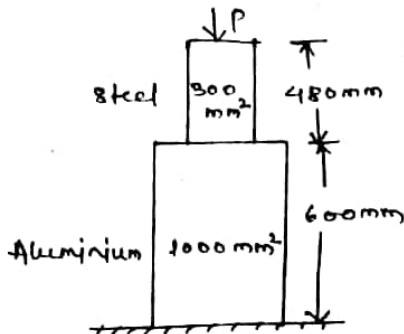
G = modulus of rigidity

k = Bulk modulus

[2]

- (c) A member is formed by connecting a steel bar to an aluminium bar as shown in fig. The cross sectional area of steel is 300 mm^2 and that of aluminium is 1000 mm^2 . Calculate the magnitude of axial force P that will cause the total length of member to decrease, by 0.3 mm . Take $E_s = 2 \times 10^5 \text{ N/mm}^2$ and $E_a = 0.7 \times 10^5 \text{ N/mm}^2$.

8



- (d) A cylindrical shell 3 m long and 90 cm internal diameter and 12 mm metal thickness is subjected to an internal pressure of 1.6 N/mm^2 . Determine :
- Maximum intensity of shear stress.
 - Changes in the dimension of shell

8

[3]

Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $\mu = 0.3$.

Unit-II

- Define the terms : 4
 - Major principal stress and plane
 - Minor principal stress and plane
 - Derive expressions for stresses on an inclined plane in a body subjected to a biaxial stress condition. 8
 - Draw Mohr's stress circle for direct stress of 45 N/mm^2 (tensile) and 25 N/mm^2 (Compressive) and find the magnitude and direction of resultant stresses on planes making angles of 30° and 60° with the plane of first principal stress. Also find the normal and tangential stresses on these planes. 8
 - A block of material is subjected to a tensile strain of 12×10^{-6} and compressive strain of 15×10^{-6} on planes at right angles to each other. There is also a shear strain of 12×10^{-6} and there is no strain on planes at right angles to above planes. Calculate principal strain in magnitude and direction. 8

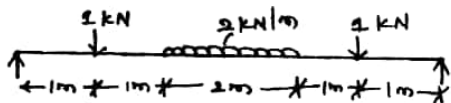
Unit-III

- Define the terms : 4

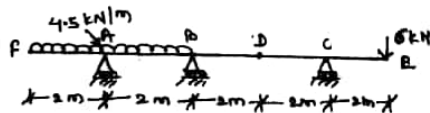
(i) Bending stress

(ii) Pure bending

- (b) The beam is loaded as shown in figure. Draw the shear force and bending moment diagram, indicating the values at important location. 8



- (c) For the beam loaded as shown in figure draw the shear force and bending moment diagrams. 8



- (d) Derive the expression for pure bending theory. 8

$$\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$$

Unit-IV

4. (a) Define the terms : 8

(i) Radius of gyration

(ii) Slenderness ratio

- (b) A masonry retaining wall, trapezoidal in section, with one face vertical is 1m wide at top and 3m at base and 8m high. The material retained on the vertical face exerts a lateral pressure varying from zero at top to 25 kN/m² at the base. If weight of masonry is 21 kN/m³, calculate the maximum and minimum stress intensities induced in base. 8

- (c) Derive the equation of Euler load when both the ends of column are fixed. 8

- (d) Calculate the buckling load for street of T-section the flange width being 100 mm, overall depth 80 mm and with both flange and stem 10 mm thick, the streets is 3 m long and hinged at both ends. 8

$$E = 200 \text{ GN/mm}^2$$

Unit-V

5. (a) Explain the Unsymmetrical Bending of beams? Explain the reasons of unsymmetrical bending. 8

- (b) Prove that : 8

$$\frac{Z}{R} = \frac{G\theta}{L}$$

- (c) A close coiled helical compression spring is made up of 10 mm steel wire closely coiled to a mean diameter of 100 mm with 20 coils. A weight of 100 N is dropped on to the spring. If the maximum instantaneous compression is 60 mm, calculate height of drop. Take $N = 0.85 \times 10^5 \text{ N/mm}^2$. 8
- (d) Determine the diameter of solid shaft which will transmit 440 kW at 280 rpm. The angle of twist must not exceed one degree per meter length and maximum torsional shear stress is to be limited to 40 kN/mm². Assume $G = 84 \text{ G N/mm}^2$. 8

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**B. Tech. (Third Semester) Examination,
Nov.-Dec. 2023**

(New Scheme)

(Civil Engg. Branch)

PLANE SURVEYING

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) is compulsory and carries 4 marks. Attempt any two parts from (b), (c) and (d) of each question which carry 8 marks each.

Unit-I

1. (a) How will you continue levelling across a lake or Pond?

4

- (b) Discuss briefly the effect of curvature & refraction in levelling. Derive an expression for curvature & for combined curvature & refraction correction. 8
- (c) When the bubble is at the centre, the reading on the staff, 100 m from the level is 2.550 m. The bubble is then deviated by five divisions & the staff reading is 2.500 m. If the length of one division of the bubble is 2 mm, calculate the Radius of curvature of the bubble tube and the angular of the bubble. 8
- (d) The following records refer to an operation involving reciprocal levelling. 8

Instrumental	Staff Reading		Remark
	A	B	
A	1.155	2.595	Distance $AB = 500$ m
B	0.985	2.415	R.L. of $A = 525.500$

Find :

- (a) True RL of B
- (b) The combined correction for curvature & Refraction
- (c) The collimation error

Unit-II

2. (a) Why is the horizontal equivalent not can start? 4
- (b) What are the various methods of interpolating contours? State suitability of each one of them. 8
- (c) What are the different methods of locating contours? 8
- (d) Explain the use of Abney level & planimeter with neat sketches. 8

Unit-III

3. (a) What are the two methods of measuring horizontal angles? Comment on the suitability of the methods. 4
- (b) What are face left & face right observations? Why is it necessary to take both these observations? 8
- (c) How would you measure a horizontal angle by repetition method? Also write its advantages. 8
- (d) The following observations were taken from station P & Q. 8

[4]		
Line	Length (m)	Bearings
PA	125	S 60°30' W
PQ	200	N 30°30' E
QB	150.5	N 50°15' W

Calculate the length & bearing of AB , and also the angle $\angle PAB$ & $\angle QBA$.

Unit-IV

4. (a) For what reason at rough compass is used in plane tabling? 4
- (b) State the three point problem. Explain how it is solved by the graphical method. 8
- (c) What is orientation? What are the methods of orientation? Describe the methods with a sketch. 8
- (d) In an open traverse ABCDE, it is required to fix the mid point of the line joining A & E. Find the length & bearing of that point from the station C when the records of the traverse are as follows: 8

Line	Length (m)	Bearings
AB	130.5	N 20°30' E

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[5]		
BC	215.0	N 60°15' E
CD	155.5	S 30°30' E
DE	120.5	N 80°30' E

Unit-V

5. (a) Why it is important to learn thoroughly about the elements of simple circular curves? 4
- (b) Explain the elements of simple circular curve. Give their relationship. 8
- (c) Explain the process of setting out a simple circular curve using the method of offsets from chord produced. 8
- (d) Calculate the RL of the various stations pegs on a vertical curve connecting two grades of +0.6% & -0.6%. The chainage & the R.L. of intersection point are 550 & 320.50 m respectively. The rate of change of grade B 0.1% per 30 m. 8

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**B. Tech. (Third Semester) Examination,
Nov.-Dec. 2023**

(Bachelor of Technology Scheme)

(Civil Engg Branch)

BUILDING MATERIALS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) of each question is compulsory & carry 4 marks. Attempt any two parts from (b), (c) and (d) and carry 8 marks.

Unit-I

1. (a) What are Bouge's compounds?

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- (b) What do you understand by Pozzolona? Also explain its applications.
- (c) State and explain the classification of aggregate.
- (d) Explain any two :
- (i) Consistency test
 - (ii) Air permeability test
 - (iii) Soundness test

Unit-II

2. (a) What do you understand by Segregation and Bleeding in concrete?
- (b) Define water-cement ratio. How does it influence the strength of concrete?
- (c) What do you understand with durability of concrete? What are the major factors affecting it.
- (d) Define Workability? What are the different factors affecting it?

Unit-III

3. (a) What are the characteristics of good timber?
- (b) Write short notes on industrial waste and agricultural waste. Explain with examples.
- (c) Write the types and uses of Plywood and Hardboards.
- (d) Explain manufacturing process, uses and advantages of Veneers and Plywood.

Unit-IV

4. (a) What do you understand by PVC?
- (b) What are various ingredients of Paints? Describe their function in them.
- (c) Explain Varnish with suitable example.
- (d) Write and explain process involve in painting a new and old wood surface.

Unit-V

5. (a) What do you understand by Ceramics? Explain its properties.

- (b) Explain types of plastics and their applications in construction industry.
- (c) Explain different uses of aluminum as a building material.
- (d) Write note on types of tiles and its method of manufacturing.