

Seat No.	
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S.Y. B.Tech. (Civil Engineering) (CBCS) (Semester - III)
Examination, January - 2023
PCC-CV 302 : SURVEYING - I
Sub. Code : 73198

Day and Date : Monday, 23 - 01 - 2023

Total Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

- Instructions :
- 1) Attempt any three questions from each section.
 - 2) Figures to the right indicate full marks.
 - 3) Assume suitable data, if necessary and state them clearly.
 - 4) Answer shall be supported by adequate sketches.
 - 5) Use non-programmable calculator is allowed.

SECTION - I

Q1) Attempt all questions.

- a) Explain Reciprocal Levelling in detail. [6]
- b) Describe in detail two peg method of permanent adjustment of dumpy level. [6]

Q2) Attempt any Two.

- a) Explain area of zero circle with neat sketch. [5]
- b) Explain average ordinate rule for area calculation. [5]
- c) The following offsets were taken from a chain line to an irregular boundary line at an interval of 10m. [6]

0, 2.5, 3.5, 5.00, 4.60, 3.20, 0

Compute area between the chain line, the irregular boundary line and the end offsets by i) The mid ordinate rule ii) The average ordinate rule iii) The trapezoidal rule iv) simpsons rule.

Q3) Attempt any Two.

- a) Explain principal of plane table and accessories in plane table survey. [5]
- b) Explain Intersection Method of plane table survey. [5]
- c) Explain temporary adjustments in plane table survey. [6]

P.T.O.

Q4) Attempt any Four.

- a) Explain Factors affecting sensitivity of bubble. [4]
- b) Explain characteristics of contour. [4]
- c) Explain methods of interpolation of contours. [4]
- d) Explain orientation, any one method. [4]
- e) What are errors in plane table surveying. [4]

SECTION - II

Q5) Attempt all questions.

- a) Explain various components of Vernier Theodolite. [6]
- b) What are temporary adjustments of Vernier Theodolite. [6]

Q6) Attempt any Two.

- a) What do you understand by omitted measurements? Name the different possible case. [5]
- b) Describe case in trigonometrical levelling when the base of the object is accessible. [5]
- c) Explain procedure of balancing traverse with Bowditch rule. [6]

Q7) Attempt any Two.

- a) Explain with neat sketch hand level and abney level. [5]
- b) Explain usage of ghat tracer and box sextant. [5]
- c) Explain Tunnel survey in detail. [6]

Q8) Attempt any Four.

- a) What are uses of Vernier Thodolite. [4]
- b) Explain various sources of errors in theodolite. [4]
- c) Explain latitude and departure with neat sketch. [4]
- d) What are applications of box sextant. [4]
- e) What are various usage of abney level. [4]



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S.Y. B. Tech. (Civil Engineering) (CBCS) (Semester - III)

Examination, January - 2023

ENGINEERING MATHEMATICS - III

Sub. Code : 73197

Day and Date : Friday, 20 - 01 - 2023

Total Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

- Instructions :
- 1) Attempt any three questions from each section.
 - 2) Figures to the right indicates full marks.
 - 3) Use of non-programmable calculator is allowed.

SECTION - I

Q1) a) Solve $\frac{d^3 y}{dx^3} - 3\frac{d^2 y}{dx^2} + 4y = e^{2x}$. [6]

b) Solve $(D^2 - 4D + 4)y = x^3 + \cos 2x$. [6]

Q2) a) Find the directional derivative of $\phi = xy^2 + yz^3$ at the point $(2, -1, 1)$ in the direction of the normal to the surface $x \log z - y^2 = -4$ at the point $(-1, 2, 1)$. [5]

b) Prove that : [6]

(i) $\text{grad } r^n = nr^{n-2}\vec{r}$ (ii) $\text{div}\left(\frac{\vec{r}}{r^3}\right) = 0$

Q3) a) The two regression equations of the variables x and y are, $x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$. Find \bar{x} , \bar{y} and the coefficient of correlation between x and y . [5]

b) Fit a least square geometric curve $y = ax^b$ to the following data: [6]

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

P.T.O.

Q4) Attempt any Two from the following:

a) Solve $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + y = \frac{\sin(\log x) + 1}{x}$. [6]

b) Prove that, $\vec{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is solenoidal and determine the constants a, b, c if \vec{F} is irrotational. [6]

c) Fit a second degree curve to the following data: [6]

x	3	2	1	0	-1	-2	-3
y	10	8	3	1	2	6	8

SECTION - II

Q5) a) A random variable X has the following probability distribution function. [6]

X	0	1	2	3	4	5	6	7	8
P(X)	0	3a	5a	7a	9a	11a	13a	15a	17a

Determine:

- i) Value of 'a'
 - ii) $P(X < 3), P(X > 3)$,
 - iii) $P(0 < X \leq 5)$
- b) 10% of the tools produced in a certain manufacturing process turn out to be defective. Find the probability that out of 20 tools selected at random there are: [6]
- i) Exactly two
 - ii) At least two will be defective

Q6) a) Evaluate using Laplace transform $\int_0^\infty e^{-3t} \cdot \sin t \, dt$. [6]

b) Find inverse Laplace transform of $\frac{2s+3}{(s+1)^2(s+2)}$. [5]

Q7) a) Find the approximate value of $\int_0^6 e^x \, dx$ by using Trapezoidal rule by dividing the interval into 6 sub intervals. [6]

b) Evaluate $\int_4^{5.2} \log_e x \, dx$ using Simpson's $\left(\frac{3}{8}\right)^{\text{th}}$ rule by dividing the interval into 6 equal parts. [5]

Q8) Attempt any two of the following: [12]

- a) An Aptitude Test for selecting engineers in an industry is conducted on 100 candidates. The average score is 42 and standard deviation is 24. Assuming normal distribution for the scores find:
- i) The number of candidates whose score is more than 60.
 - ii) The number of candidates whose score lies between 30 and 60.

(Given: For S.N.V. z the area under normal curve from $z = 0$ to $z = 0.5$ is 0.1915 and from $z = 0$ to $z = 0.75$ is 0.2735).

b) Use Laplace transform method to solve $\frac{d^2 y}{dt^2} - 3 \frac{dy}{dt} + 2y = 4 e^{et}$, when $y(0) = -3$ and $y'(0) = 5$ at $t = 0$.

c) Using Simpson's $\left(\frac{1}{3}\right)^{\text{rd}}$ rule to obtain value of the $\int_1^2 \frac{dx}{x}$ taking 10 equal intervals.



SB - 251

Calculate the strain energy in a bar 2.5 m long and 50 mm in diameter when it is subjected to gradually applied tensile load of 100 kN. What will then be the modulus of resilience of the material at the bar? Take $E=2 \times 10^5 \text{ N/mm}^2$. [7]

Q8) Attempt any Four. [16]

- Define resilience and proof resilience.
- Draw shear stress distribution of rectangular, I and T section.
- State assumption made simple bending theory.
- Calculate section modulus for rectangular and circular section.
- Explain moment of resistance.

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Total No. of Pages : 4

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S.E.B.Tech. (Civil) (Part - III) (Semester - III) (CBCS) (Revised)

Examination, January - 2023

STRENGTH OF MATERIALS

Sub. Code : 73199

Day and Date : Wednesday, 25 - 01 - 2023

Total Marks : 100

Time : 10.30 a.m. to 1.00 p.m.

- Instructions :
- Attempt any three questions of each section.
 - Figures to the right indicate full marks.
 - Assume suitable data if necessary and state them clearly.
 - Answer shall be supported by adequate sketches.

SECTION - I

Q1) Attempt all questions. [17]

- A rectangular bar of $50\text{mm} \times 30\text{mm} \times 1\text{m}$ carries axial tensile force of 100kN in the direction of length. Modulus of elasticity is 200 Gpa. Find: [10]
 - Tensile stress
 - Strain
 - Change the length

OR

A reinforced concrete column $500\text{mm} \times 500\text{mm}$ in section is reinforced with 4 steel bars of 25mm diameter one each corner. The column is carrying a load of 1000 kN. Find stresses in concrete and steel bars. Take $E_s = 210 \text{ Gpa}$ and $E_c = 14 \text{ Gps}$. [10]

- A 50 mm square steel bar is subjected to axial tensile load of 250 kN. If poisson's ratio is 0.25 and modulus of elasticity is 200 GPa, find decrease in lateral dimension. [7]

Q2) Attempt all questions.

- a) Draw SFD and BMD for a beam ABCD with A as free end, hinge support at B, internal hinge at C and fixed support at D. span AB is 1m, BC= 3m and CD is 2 m. The beam is subjected to udL of 15 kN/m over entire span. Also find location of point of contraflexure and maximum bending moment and calculate magnitude of maximum bending moment.

[10]

- b) Draw SFD and BMD for cantilever beam subjected to point load at the end.

[7]

Q3) Attempt all questions..

[17]

- a) A hollow cylindrical shaft is 1.5 m long. It has an inner and outer diameter as 40 mm and 60 mm respectively. What is the largest torque that can be applied to the shaft if shearing stress is not to exceed 120 MPa? What is the corresponding minimum value of shearing stress in the shaft? [9]

- b) A shaft transmits 75 kW power at 120 rpm. Determine the diameter of shaft if allowable shear stress is 50 N/mm². The twist in the shaft not exceed 1.5° in 5 m length. Take $C = 85 \text{ kN/mm}^2$. [8]

OR

Find the external diameter of hollow shaft of internal diameter equal to 60% of external diameter, to transmit 150 kW at 250 rpm if shearing stress not to exceed 70 N/mm². [8]

Q4) Attempt any Four.

[16]

- Explain point of zero shear force and point of contra flexure.
- Define stress, strain and Modulus of Elasticity.
- State and Explain Hooks Law.
- Draw SFD and BMD for a cantilever beam AB 'L' subjected to clockwise couple M at free end.
- Find the maximum shear stress induced in a solid circular shaft of 200 mm diameter if the shaft transmits 200 kW power at 180 rpm.

SECTION - II

Q5) Attempt all questions.

[17]

- a) An unsymmetrical cast iron beam has overall depth 300 mm, top flange 150 mm × 25 mm, bottom flange 250 mm × 50 mm and web thickness 25 mm. The beam is 5 m long and simply supported at ends. If permissible stresses are 100 N/mm² in compression and 25 N/mm² tension. What uniformly distributed load will beam can carry safety. [10]

- b) A timber beam 200 mm wide and 300 mm deep is reinforced by a steel plate 200 mm wide and 10 mm thick bolted to its bottom edge, giving a composite beam 200 mm × 310 mm. Calculate maximum stress in steel and timber when the composite beam is subjected to bending moment of 60 kNm. Take $E_s = 2 \times 10^5 \text{ N/mm}^2$. [7]

Q6) Attempt all questions.

[17]

- a) The cross-section of beam is at section 80 mm × 130 mm × 10 mm with 80 mm side horizontal. Find the maximum stress and draw shear stress distribution diagram if it has to resist a shear force of 60 kN. [7]

- b) A Symmetrical beam having I Section has flanges 150mm × 20 mm and web 300 mm × 10 mm. If it is subjected to shear force 80KN. Find maximum shear stress induced in the beam. [10]

Q7) Attempt all questions.

[17]

- a) A tensile load of 100 kN is gradually applied to a circular bar of 4 cm diameter and 5 m long. Assuming $E = 2 \times 10^5 \text{ N/mm}^2$. Determine: [10]

- Stress in the rod
- Stretch in the rod
- Strain energy absorbed by the rod

- b) Determine the instantaneous stress and deformation of a rod of length 1m and diameter 6 mm. It a mass of 5kg 0 falls through a height of 10 cm and strikes the bottom of the rod. The rod is freely suspended and fixed at the top. Assume $E = 210 \text{ GPa}$. [7]

OR