

**BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE
(AUTONOMOUS)**

**II - B. Tech I-Semester Supplementary Examinations (BR23), Mar - 2026
STRENGTH OF MATERIALS (CIVIL ENGINEERING)**

Time: 3 hours

Max. Marks: 70

*Question Paper consists of Part-A and Part-B
Answer ALL the question in Part-A and Part-B*

PART-A (10X2 = 20M)

	Marks	CO	BL
1. a) Define (i) Poisson's ratio and (ii) Volumetric strain	(2M)	CO1	BL1
b) Define Hooke's law	(2M)	CO1	BL1
c) Draw the B.M.D of a cantilever beam of L, subjected to a couple M at the free end.	(2M)	CO2	BL2
d) Write types of beams with neat sketches.	(2M)	CO2	BL2
e) Write section modulus for circular & rectangular section.	(2M)	CO3	BL1
f) Write the shear stress equation and explain the terms.	(2M)	CO3	BL1
g) State the moment area theorems.	(2M)	CO4	BL1
h) Find the slope, of a simply supported beam of span, L carrying a central point load.	(2M)	CO4	BL2
i) Write limitations of Euler's column theory.	(2M)	CO5	BL2
j) Define circumferential stresses & longitudinal stresses.	(2M)	CO5	BL1

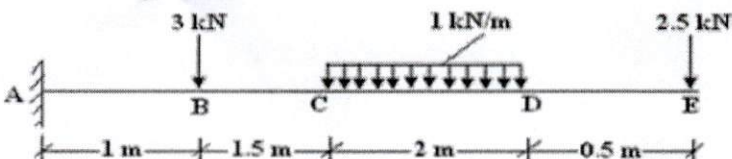
PART-B (5X10 = 50M)

- 2a. Determine the changes in length, breadth and thickness of a steel bar which is 4m long, 30mm wide and 20mm thick and is subjected to an axial pull of 30 kN in the direction of its length. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio = 0.3 (5M) CO1 BL3
- b. Deduce an expression among three elastic of a material. (5M) CO1 BL4

(OR)

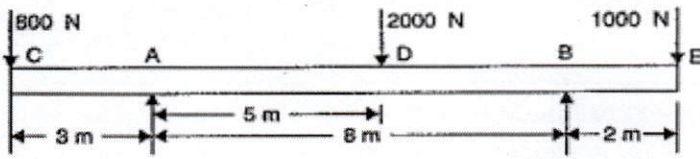
- 3a. Derive the relation between the Modulus of Elasticity and Bulk Modulus from fundamentals. (5M) CO1 BL3
- b. Determine the Bulk modulus and Poisson's ratio of the material, for which young's modulus is $1.2 \times 10^5 \text{ N/mm}^2$ and modulus of rigidity is $4.8 \times 10^4 \text{ N/mm}^2$. (5M) CO1 BL3

Draw the shear force and bending moment diagrams for the cantilever beam as shown in Fig.

4.  (10M) CO2 BL4

(OR)

5. Draw the Shear force and bending moment diagrams for the beam which is loaded as shown in fig .Determine the points of contra flexure with in the span of AB.



(10M) CO2 BL4

6. Derive an equation for torsion of the circular shaft and write assumptions made in this theory

(10M) CO3 BL4

(OR)

- 7a. Deduce the section modulus for a hollow circular section of internal diameter, d and external diameter, D .

(5M) CO3 BL3

- b. A T – section beam with 100 mm x 15 mm flange and 150 mm x 15 mm web is subjected to a shear force of 10 kN at a section. Draw the variation of shear stress across the depth of the beam and obtain the value of maximum shear stress of the section.

(5M) CO3 BL4

8. A simply supported beam of span 6 m loaded point load of 14 kN at its centre, in addition to the UDL of 6 kN/m for the whole span. Find slopes at the supports and maximum deflection. Use double integration method.

(10M) CO4 BL4

(OR)

9. A beam is 10 m long and is simply supported at the ends. It carries concentrated loads of 125 kN and 75 kN at distances of 2 m and 5 m respectively from left end. Calculate the deflection under each load. Take $I = 16 \times 10^8 \text{ mm}^4$ and $E = 2.1 \times 10^5 \text{ N/mm}^2$.

(10M) CO4 BL4

- 10a. Derive an expression for circumferential stress for a thin cylinder of internal diameter d , wall thickness t , is subjected to an internal pressure p .

(5M) CO5 BL3

- b. A thin cylindrical shell 90 cm long, 20 cm internal diameter having thickness of metal as 8 mm is filled with fluid at atmospheric pressure. If an additional 20 cm^3 of fluid is pumped into the cylinder, find (i) the pressure exerted by the fluid on the cylinder and (ii) the hoop stresses induced. Take $E = 2.1 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio = 0.30

(5M) CO5 BL3

(OR)

11. Derive an expression for Euler's crippling load for column when one end is fixed and other end is free and write assumptions made in Euler's theory.

(10M) CO5 BL4
