

Reg No.: _____



Jyothi Engineering College(Autonomous)
B. Tech Degree S2 (R) Examination, May 2026(2025
Scheme)

25CET205 - MECHANICS OF SOLIDS

Total Mark: 60



Total Time: 2 hrs 30 min

GO MARK

PART A

(Answer All Questions. Each question carries 3 marks)

1. Define working stress and factor of safety. CO1 (3)
2. Define simple shear and punching shear. CO1 (3)
3. With neat sketches, explain the different types of beams. CO2 (3)
4. A simply supported beam of span L carries a clockwise moment M at its centre. Draw the SFD and BMD. CO3 (3)
5. Show that the maximum shear stresses in a rectangular cross section is 1.5 times the average stress. CO3 (3)
6. Write down the expression for the value of maximum deflection of a cantilever beam with UDL throughout the span. CO3 (3)
7. Why are hollow circular shafts preferred when compared to solid circular shafts? CO1 (3)
8. Define slenderness ratio of a column. CO1 (3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

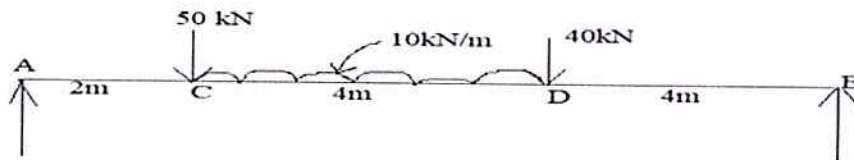
9. A steel specimen of 12mm diameter was tested in a tension testing machine and the following observations were made:
Gauge length = 200mm
Elongation at a load of 25KN = 0.22mm
Decrease in diameter = 0.0033mm
Load at yield point = 46.5KN
Calculate the elastic constants. CO4 (9)

OR

10. A steel bar ABCD consists of three sections: AB is of 20 mm diameter and 200mm long, BC is 25 mm square and 400 mm long and CD is of 12 mm diameter and 200mm long. The bar is subjected to an axial compressive load which induces a stress of 30 MPa on the largest cross section. Determine total decrease in length of the bar when the load is applied. $E = 210 \text{ GPa}$. CO3 (9)

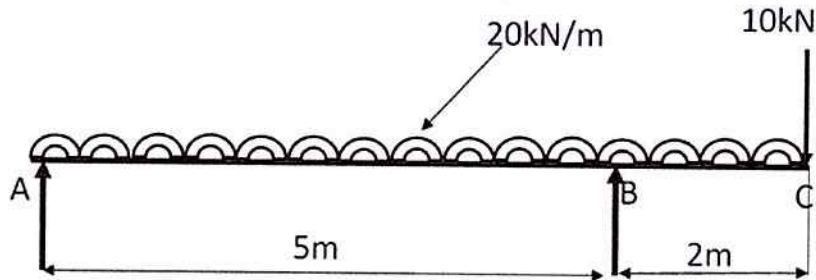
Module - 2

11. Draw SFD and BMD for the beam shown in figure and find the maximum bending moment. CO2 (9)



OR

12. Analyse the overhanging beam shown in figure below. Draw the shear force diagram and bending moment diagram and mark all the salient points including point of contraflexure. CO2 (9)



Module - 3

13. A simply supported beam AB of 5m span is carrying a uniformly distributed load of 20kN/m. The beam is made up of rectangular cross section of dimensions 300mm x 450 mm. CO6 (9)

- i) Draw the bending stress distribution at the critical section for bending.
- ii) Draw the shear stress distribution considering the critical section for shear.
- iii) Also calculate bending stress and shear stress on layer located 50mm above the neutral axis on the cross section at the mid-point of the beam.
- iv) Assess whether the beam can safely carry the loads given the allowable stresses in bending and shear are 8MPa and 0.75 MPa respectively.

OR

14. A beam of I section 200 mm wide and 300 mm deep with flange and web thickness 20 mm is used as a simply supported beam over a span of 7 m. The beam carries a distributed load of 5 kN/m over the whole span and a concentrated load of 20 kN at mid span. Determine the maximum bending stress and sketch the stress distribution. CO3 (9)

Module - 4

15. The external and internal diameters of a hollow shaft are 50 mm and 40 mm respectively. Find the maximum power that can be transmitted by the shaft at 600 rpm, if the permissible shear stress is 100N/mm^2 and the permissible rate of twist is 3 degree per meter. Take modulus of rigidity of shaft material, $C = 1 \times 10^5 \text{N/mm}^2$ CO6 (9)

OR

16. A short column of rectangular cross section 80 mm X 60 mm carries a load of 40 kN at a point 20 mm from the longer side and 35 mm from shorter side. Determine the stresses at all corners of the column. Draw stress distribution diagram for any one side. CO3 (9)
