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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Mech. Engg.) II Year I-Semester Backlog Examinations, December-2017

Mechanics of Materials

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. If the modulus of elasticity of a material is 200000 MPa and Poisson's ratio is 0.25 then determine shear modulus.
2. Define ductility of steel rod and how it is measured in tension test?
3. Draw SFD and BMD, when a cantilever is subjected to UDL throughout the beam.
4. Draw bending stress diagram for rectangular section and symmetrical 'I' section.
5. Draw shear stress distribution across the depth of T and L sections.
6. Indicate uses of Mohr's circle
7. Give expressions for deflection and slope at mid span, if a simply supported beam of length 'L' subjected to a point load 'W' at mid span.
8. What are the limitations of double integration method?
9. Define slenderness ratio and kernel of a section.
10. A thin cylindrical shell of diameter 1.2 m and thick 15 mm is subjected to an internal pressure of 20 N/mm^2. Find the ratio of circumferential and longitudinal stresses.

Part-B (5 × 10 = 50 Marks)

11. a) Briefly explain principle of superposition. [3]

    b) A compound tube consists of a steel tube 120 mm internal diameter and 140 mm external diameter and an outer brass tube 140 mm internal diameter and 160 mm external diameter. The two tubes are of the same length. The compound tube carries an axial load of 1000 kN. Find the stresses and the load carried by each tube and the amount of shortening. Length of each tube is 140 mm. Take E for steel is 2×10^5 N/mm^2 and for brass is 1×10^5 N/mm^2. [7]

12. a) Deduce the relation between load, shear force and bending moment. [4]

    b) A beam of simply supported at ends and having cross section of 'I' with top flange 220 mm × 15 mm, bottom flange 150 mm × 15 mm and web 20 mm × 200 mm. If the beam is 8 m long, find the safe uniformly distributed load (which is at throughout of the span), if the maximum permissible bending stress in tension is limited to 25 MN/m^2 and in compression to 35 MN/m^2. [6]

13. a) Explain about Mohr's circle with an example. [5]

    b) An inverted T- section having flange 200 mm × 20mm at top, and web 210 mm× 20 mm is used as a beam (simply supported). If at a section, it is subjected to a shear force of 150 kN. Find the greatest intensity of shear stress in the beam and show also the variation of shear stress across the section. [5]

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14. a) Briefly explain torsional rigidity and polar modulus. [4]

    b) A simply supported beam of length 4 m and cross section 200 mm × 400mm is loaded with two point loads 10kN and 20kN at distances of 1 m and 2 m from left support. Determine slope at supports and maximum deflection. Take $E=2\times10^5 N/mm^2$. [6]

15. a) Distinguish between direct stress and bending stresses by means of a diagram. [4]

    b) A hollow thick cylinder has an external diameter 220 mm and thickness of wall is 50mm. The cylinder is subjected to an internal fluid pressure $35N/mm^2$ and external pressure $3.5N/mm^2$. Calculate the maximum and minimum circumferential stresses and sketch the variation of the stresses across the wall thickness. [6]

16. a) Define Poisson's ratio and establish a relation between bulk modulus and Young's modulus. [5]

    b) Define bending moment, shear force, pure bending, section modulus and flexural rigidity. [5]

17. Answer any ***two*** of the following:

    a) Show that the maximum shear stress in rectangular section is 1.5 times average shear stress. [5]

    b) Draw and explain the shear stress distribution through the cross section of a circular shaft under pure torsion for (a) solid shaft and (b) hollow shaft. [5]

    c) Derive the Euler's formula for crippling load. [5]