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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. II Year (Civil Engg.) I-Semester Supplementary Examinations, May/June-2017

Strength of Materials-I

Time: 3 hours Max. Marks: 70

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

Part-A (10 X 2=20 Marks)

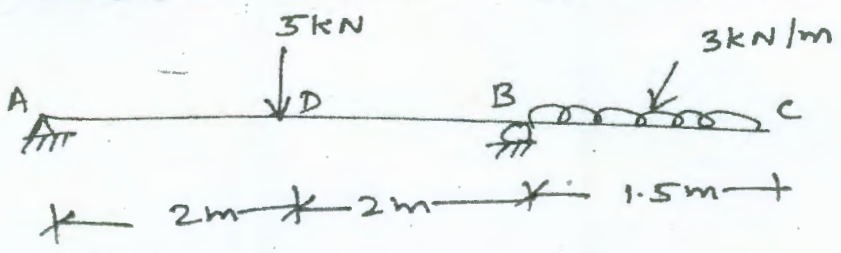
1. Sketch the stress-strain curve for mild steel and show important points.
2. Differentiate between working stress and ultimate stress.
3. Obtain the relationship between loading, shear force and bending moment.
4. A beam is supported over a span of '*l*' with two equal overhangs of '*l/4*' on both ends. The entire beam is loaded with a UDL of w/unit run. Draw SFD.
5. Sketch Flexural stress distribution for an I section and rectangular section.
6. Define pure bending.
7. What is core of a section? Sketch the core of a rectangular section.
8. Draw Mohr's circle for a state of stress where two perpendicular direct stresses of 60N/mm^2 (both tensile) are acting.
9. List out the assumptions made in thick cylinder theory.
10. What are prestressed thin cylinders? Discuss their advantages.

Part-B (5 X 1 0 =50 Marks)

11. a) What are temperature stresses? [2]

    b) A steel rod 20 mm in dia. passes through a copper tube 22 mm internal dia. and 30mm external dia. both fixed together at the ends. The temperature of whole assembly is raised to 390^{0}C and the nuts are tightened. Find the stresses if the common temperature falls to 300^{0}C. Take Es = 200kN/mm^2, Ec = 100 kN/mm^2, $\alpha_s = 12 \times 10^{-6}$ per ^{0}C and $\alpha_c = 20 \times 10^{-6}$ per ^{0}C. [8]

12. a) For the overhanging beam loaded as shown in Fig., obtain the S.F. and B.F. diagrams. [6]



    b) Find the magnitude and location of max. S.F and max. B.M. in the above beam. [4]

13. a) For a given stress, compare the moments of resistance of a beam of square section placed with *(i)* two sides horizontal *(ii)* a diagonal horizontal. [5]

    b) A symmetrical section 200mm deep has a moment of inertia of 2.26 × 10^{-5} m4 about its neural axis. Determine the longest span over which when simply supported the beam would carry a uniformly distributed load of 4kN/m run without the stress due to bending exceeding 125 MN/m^2. [5]

Contd...2

14. a) Discuss the concept of ellipse of stress with a neat sketch. [3]

b) A piece of material is subjected to tensile stresses of $60N/mm^2$ and $30N/mm^2$ at right angles to each other. Find the stresses on a plane the normal of which makes an angle of 50° with the $60N/mm^2$ stress. [7]

15. a) Explain the difference in the behavior of thin and thick cylindrical shells. [3]

b) A cylindrical shell 3m long, 1m in internal dia. is subjected to an internal pressure of $20\ N/mm^2$. Calculate the thickness of metal required if the permissible stress is not to exceed $650\ N/mm^2$. Calculate the changes in dimensions of the shell if $E = 2\times10^5\ N/mm^2$ and Poisson's ratio (μ) = 0.25. [7]

16. a) Draw SFD and BMD for a cantilever whose half span from fixed support is loaded with a uniformly distributed load of w/unit run. [4]

b) The x, y and z axes are oriented along the length, width and thickness of a rectangular block 200 × 120 × 100 mm. It is subjected to axial forces in the 3-directions: [6]
Px = 120 kN (tensile) Py = 75kN (tensile) Pz = 100kN (compressive)
Calculate the stresses and strains in the 3 directions, volumetric strain and change in volume, taking modulus of elasticity = $2 \times 10^5\ N/mm^2$ and Poisson's ratio (μ) = 0.25

17. Answer any *two* of the following:

a) A rectangular strut is 200mm wide 150mm thick, it carries a load of 60kN at an eccentricity of 20mm in a plane bisecting the thickness. Find the maximum and minimum intensities of stress in the section. [5]

b) A pipe of 200mm internal diameter and 100mm thickness contains a fluid at a pressure of $10N/mm^2$. Find the maximum and minimum hoop stress across the section. [5]

c) Write a short note on the construction of Mohr's circle for two mutually perpendicular like stresses σ_1 *and* σ_2 acting on a body. [5]

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