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Question Paper Code: 54705

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Fourth Semester

Mechanical Engineering

01UME405 – STRENGTH OF MATERIALS

(Regulation 2013)

Duration: 1.15 hrs

Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. The ratio between the change in volume and original volume of the body is called _____ strain
(a) tensile (b) compressive (c) shear (d) volumetric
2. The internal resistance which the body offers to meet the load or external force is called
(a) stress (b) pressure (c) strain (d) none of these
3. The strength of the beam mainly depends on
(a) Bending moment (b) c.g of the section
(c) Section modulus (d) its weight
4. In a cantilever with uniformly distributed load the shearing force varies following a
(a) Linear law (b) Parabolic law
(c) Either (a) or (b) (d) None of these
5. In case of a laminated spring the load at which the plates become straight is called
(a) working load (b) safe load (c) proof load (d) none of these

6. _____ are called cantilever elliptical springs
- (a) Semi elliptical springs (b) Quarter elliptical springs
(c) Both (a) and (b) (d) none of these
7. The amount of deflection of a beam subjected to some type of loading depends upon
- (a) cross-section (b) bending moment
(c) either (a) or (b) (d) both (a) and (b)
8. The slope and deflection at a section in a loaded beam can be found out by which of the following methods
- (a) Double integration method (b) Moment area method
(c) Macaulay's method (d) any of the above
9. Which of the following are usually considered as thin cylinders
- (a) Boilers (b) Tanks
(c) Steam pipes (d) All of the above
10. Vessels used for storing fluid under pressure are called
- (a) cylinders (b) spheres (c) shells (d) none of these

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. A steel rod of 20mm diameter passes centrally through a copper tube of 50mm external diameter and 40mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 50 °C, calculate the stress developed in copper and steel. Take E for steel and copper as 200 GN/m² and 100 GN/m² and α for steel and copper as 12 x 10⁻⁶ per °C and 18 x 10⁻⁶ per °C. (8)
12. A Simply supported beam 6 m span carries an UDL of 20 kN/m for left half of span and two point loads of 25 kN and 35 kN at 4 m and 5 m from left support. Find maximum shear force (SF) and bending moment (BM) and their location drawing SF and BM diagrams. (8)
13. Find the diameter of a solid shaft to transmit 120 kW at 180 rpm, such that the shear stress is limited to 70 N/mm². The maximum torque is likely to exceed the mean torque by 40%. Also find the permissible length of the shaft, if the twist is not to exceed 1 degree over the entire length. Take rigidity modulus as 0.8 x 10⁵ N/mm².

(8)

14. A cantilever of length 4 m carries a u.d.l of 12 kN/m for a length of 2.5 m from fixed end and a point load of 10 kN at free end. Determine the maximum slope and deflection using moment area method. Take $EI = 6.3 \times 10^4 \text{ kN/m}^2$. (8)
15. A point in a strained material the horizontal tensile stress is 80 N/mm^2 and the vertical compressive stress is 140 N/mm^2 . The shear stress is 40 N/mm^2 . Find the principal stresses and the principal planes. Find also the maximum shear stress and its planes. (8)