

8. (a) Define unsymmetrical bending.
(b) What are the reasons for unsymmetrical bending ?
(c) How will you calculate the stress due to unsymmetrical bending ? $3 \times 5 = 15$

(Compulsory Question)

9. Attempt any *six* questions :
- (a) Define the Tangential Stress.
(b) Define the Longitudinal Stress.
(c) Define the thin rotating rim.
(d) Define the solid rotating cylinder.
(e) Explain the Euler's formula.
(f) Define the leaf springs.
(g) What are the assumptions made in the analysis of curved bars ?
(h) A cast-iron pipe of 750 mm diameter is used to carry water under a head of 60 m. Water is the thickness of pipe if the permissible stress is to be 20 MPa ? $6 \times 2.5 = 15$

Roll No.

Total Pages : 04

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B. Tech. EXAMINATION, 2021

Semester IV (CBCS)

(ME, AE)

ME-402

Strength of Materials-II

Time : 2 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D.
Q. No. 9 is compulsory.

Section A

1. A cylindrical steel pressure vessel 400 mm in diameter with a wall thickness of 20 mm, is subjected to an internal pressure of 4.5 MN/m^2 :

- (a) Calculate the tangential and longitudinal stresses in the steel. **7.5**
- (b) To what value may the internal pressure be increased if the stress in the steel is limited to 120 MN/m^2 ? **7.5**
2. (a) Calculate the maximum allowable pressure difference between the inside and outside of a sphere 50 mm mean diameter with a wall 0.6 mm thick if the maximum allowable stress is 1.5 MPa. **7.5**
- (b) A sphere is 120 mm mean diameter with a wall 1 mm thick. The pressure outside is 1 MPa more than the pressure inside. Calculate the change in volume. Take $E=205 \text{ GPa}$ and $\nu=0.26$. **7.5**

Section B

3. A flywheel with a moment of inertia of 300 kg.m^2 rotates at 300 rpm. If the maximum stress is not to exceed 6 MPa, find the thickness of the rim. Take the width of the rim as 150 mm and the density of materials 7400 kg/m^3 . Neglect the effect of inertia of spokes. **15**
4. A disc of uniform thickness and of 600 mm diameter rotates at 1800 rpm. Find the maximum stress developed in the disc. If a hole of 100 mm diameter

is made at the centre of the disc, find the maximum values of radial and hoop stress. Density of the material of the disc = 7700 kg/m^3 and $\nu=0.3$. **15**

Section C

5. A beam is fixed at both ends is loaded transversely by total uniformly distributed load of 32 kN. It is found that deflection at centre is $1/325$ of span. Now if this transverse load is removed and beam is loaded axially, find out safe axial load for the condition such that it fails by buckling only. Take factor of safety = 4, and $E = 200 \text{ GPa}$. **15**
6. A close coiled helical spring of circular section has coils of 75 mm mean diameter. When loaded with an axial load of 250 N, it is found to extend 160 mm and when subjected to a twisting couple of 3 N-m, there is an angular rotation of 60° degrees. Determine the Poisson's ratio for the material. **15**

Section D

7. Briefly explain the following with sketch : **3×5=15**
- (a) Crane hooks
- (b) Rings
- (c) Chain links.