SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | | **Total number of pages:[2]**

Total number of questions:06

B.Tech. || CHE ||4TH Sem

STRENGTH OF MATERIALS

Subject Code:BTCH-404A

Time allowed: 3 Hrs **Max Marks: 60**

Important Instructions:

- **All questions are compulsory**
- **Assume any missing data**

PART A (2×10)

Q. 1. Short-Answer Questions: All COs

(a) Define beam. What are the various types of beams ?

(b) What are compound bars?

(c) Differentiate between shear stress and normal stress.

(d) Relate slope and deflection with Bending moment.

(e)What is the significance of theories of failure ?

(f)What is critical load and slenderness ratio in buckling of columns?

(g)Write Rankine Gordon Formula.

(h) Explain Young's Modulus and Modulus of rigidity.

(i)Write the relation for circumferential and hoop stresses as applicable to cylindrical vessels.

(j) What are principal planes and principal stresses?

PART B (8×5)

Q. 2. A solid shaft of 10cm diameter transmits 74kW at 150rpm. Calculate the torque on the shaft, the maximum shear stress developed, the angle of twist in a length of 1.5m and the shear stress at a radius of 3cm. Take G=80GPa. CO2

OR

Derive Torsion equation stating all assumptions.

Q. 3. Explain Macaulay's method for finding slope and deflection taking a suitable example. CO3

OR

A simply supported beam of 3m span carries point loads of 120kN and 80kN at a distance of 0.6m and 2m respectively from the left hand support. If $I=16*10^8$ mm^4 and E=210GPa, find the deflection under the loads.

Q. 4. A 1.5m long column has a circular cross section of 5 cm diameter. One of the ends of the column is fixed in direction and position and the other end is free. Taking the factor of safety as 3, calculate the safe load using: CO5

- Euler's formula; Young's modulus for Cast Iron is 120 GPa.

OR

Derive the relation for critical load for a strut pinned at both ends stating assumptions for Euler's theory. Also write what is the limitation of Euler's theory.

Q. 5. A 6m long mild steel bar is 5cm in diameter for 3m of its length and 2.5 cm in diameter for the rest of the length. The bar is in tension and the stress on the smallest section is 112MPa. Find the total elongation of the bar. E=200GPa. CO1

OR

Explain Thermal stress.
A rod is 2m long at a temperature of 10°C. Find the expansion of the rod when the temperature is raised to 80°C. If this expansion is prevented, then find the stress in the material of the rod. Take E =100GPa and $\alpha = 0.000012$ /°C.

Q. 6. A solid circular shaft is subjected to a bending moment of 8KNm and a torques of 12KNm. In a uniaxial tensile test the shaft material gave the following results. E=200GPa, stress at yield point = 300Pa, poisson's ratio=0.3. Estimate the least diameter of the shaft using maximum principal stress theory. Take 3 as factor of safety. CO4

OR

In a two dimensional problem, the stresses at a point are σx = 100MPa, σy= 60MPa . If the Principal stress is limited to 150 MPa, find the value of shear stress τxy. Also find the inclination of the Principal planes and the magnitude of maximum shear stress.