

Th-2 Strength of Material

Full Marks:80

TIME:3 Hour

Answer any five question including QNO 1 & 2 are compulsory.

Figures in the right hand margin indicate marks.

N01. Answer all questions. (2X10)

- (a) Define temperature stress
- (b) What is the difference between stress and strain?
- (c) Define point of contra-flexure.
- (d) Define cantilever beam with example.
- (e) What is resilience?
- (f) What do you mean by hoop stress and longitudinal stress?
- (g) What do you mean by column?
- (h) Define torsion
- (i) What do you mean by section modulus?
- (j) Define principal stress and its uses.

N02. Answer any six questions. (5X6)

- (a) A rod 150cm long and of diameter 2.0cm is subjected to an axial pull of 20KN. If the modulus of elasticity of the material of the rod is $2 \times 10^5 \text{ N/mm}^2$. Determine (I) the stress (II) the strain, and (III) the elongation of the rod.
- (b) Show diagrammatically different types of beams and loads.
- (c) What are the assumptions taken while deriving bending equations under theory of simple bending? <https://www.sctevtonline.com>
- (d) Derive expression for hoop stress and longitudinal stress in case of thin cylindrical shell.
- (e) Find the maximum shear stress induced in a solid circular shaft of diameter 15cm when the shaft transmits 150kw power at 180 r.p.m
- (f) Derive the formula section modulus for rectangular section and circular section.
- (g) Derive relationship between modulus of elasticity and modulus of rigidity.
- (h) A point in a strained material is subjected to two mutually perpendicular tensile stresses of 200Mpa and 100Mpa. Determine the intensities of normal, shear and resultant stresses on a plane inclined at 30° with the axis of minor tensile stress.

NO3. Prove the relation

$$M/I = \sigma/y = E/R$$

Where M= bending moment

I= moment of inertia

σ = bending stress in a fibre, at a distance y from the neutral axis

E= young's modulus and

R= radius of curvature (10)

NO4. A simply supported beam of length 6m carries point load of 3KN and 6KN at distances of 2m and 4m from the left end. Draw the shear force and bending moment diagram for the beam. (10)

NO5. A reinforced short concrete column 250mmX250mm in section is reinforced with 8 steel bars. The total area of steel bars is 2500mm². The column carries a load of 390KN. If the modulus of elasticity for steel is 15times that of concrete, find the stresses in concrete and steel. (10)

NO6. Define buckling load. State formula for buckling load in column with various end condition. (10)

NO7. A brass bar having cross-sectional area of 1000mm² is subjected to axial forces shown in the figure. Find the total elongation of the bar. Modulus of elasticity of brass is 100GN/m². (10)

