

Total No. of Pages : 03

B.Tech. (CE) (Sem.-3rd)

Subject Code : CE-207

Paper ID : [A0604]

Max. Marks : 60

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. SECTION-B contains **FIVE** questions carrying **FIVE** marks each and students has to attempt any **FOUR** questions.
3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students has to attempt any **TWO** questions.

1. Write briefly :

- Find the ratio of second moment of area about the centroidal axis to the second moment of area about the base of a triangle with base = 300 mm and altitude = 600 mm.
- A hollow circular shaft (outer diameter = 2 times the inner diameter) is subjected to a bending moment M and torque T . What is the ratio of maximum bending stress to maximum shear stress in the shaft?
- How are the Young's Modulus of elasticity and modulus of rigidity related?
- What is the limitation of Euler's Formula for calculating the crippling load on the columns?
- A bar of steel is 1m long. For the first 0.4m it is 25mm in diameter, for next 0.3m it is 20mm in diameter and for remaining 0.3m it is 15mm in diameter. Find the change in length if it is subjected to a tensile load of 100 kN. The value of $E = 0.210 \text{ MN/mm}^2$.

- f) Define proof resilience.
- g) What are flitched beams?
- h) What is the nature of variation of stress in a beam?
- i) List out the instances where moment of resistance is not convenient to use.
- j) List the various theories of elastic failure.

- 2) A Solid round bar 3 m long and 4 cm diameter is subjected to a tensile load of 100 kN with both ends hinged. Determine the crippling load of the column if the ends are fixed. Take $E = 200 \text{ GPa}$.
- 3) A cantilever beam of span 1.5 m carries a point load of 10 kN at the free end. The cross section of the beam is I-section with flange width, 240 mm overall depth and web thickness 10 mm. Determine the max. bending stress and draw the bending stress diagram.
- 4) A rectangular block of material is subjected to a compressive stress of 100 N/mm^2 on one plane and a tensile stress of 50 N/mm^2 on the other plane at right angles, together with shear stress of 30 N/mm^2 . Determine magnitude of the principal stresses and the direction of principal stresses.
- 5) A cantilever beam AB (Fixed at A) is subjected to a point load of 2 kN acting at free end. The cross-section is rectangular with width 100 mm and span is 1 m. Determine the strain energy stored in the beam.
- 6) Derive torsion equation and state the assumptions made.

SECTION - C

- 7) Derive the expression (Bending Equation).

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$$

- 8) The stresses at a point in a component are 100 MPa (tensile) and 50 MPa (compressive). Determine analytically as well as graphically the magnitude of normal and shear stresses on a plane inclined at an angle of 25° with tensile stress. Also determine the direction of resultant stress and the magnitude of maximum intensity of shear stress.
- 9) A simply supported beam of length 8m rests on supports 6m apart the right hand end is overhanging by 2m. The beam carries a uniformly distributed load of 1500N/m over the entire length. Draw S.F. and B.M diagrams and find the point of contra flexure, if any.