

Code: 9D15103

M.Tech I Semester Supplementary Examinations August 2016

ADVANCED MECHANICS OF SOLIDS

(Machine Design)

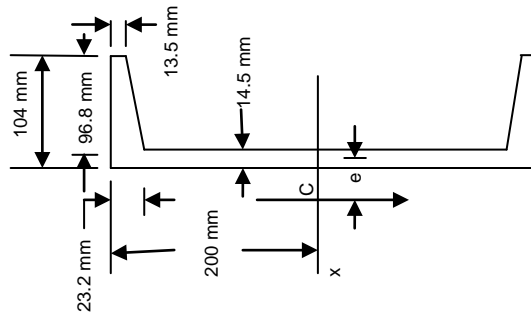
(For students admitted in 2012, 2013, 2014 & 2015 only)

Time: 3 hours

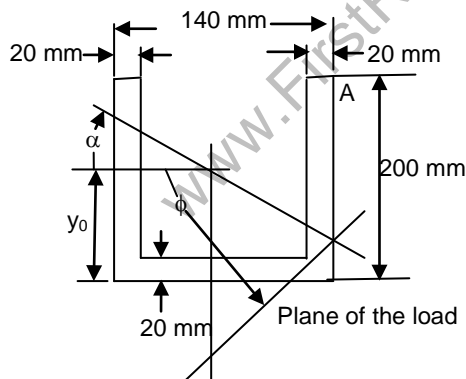
Max. Marks: 60

Answer any FIVE questions
All questions carry equal marks

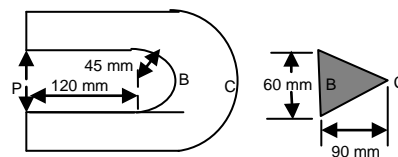
- 1 (a) What is shear centre and bending axis?
- (b) Locate shear centre for the beam cross section shown in figure below:



- 2 (a) What are the equations of equilibrium bending stresses for a beams subjected to nonsymmetrical bending? Explain.
- (b) A channel section beam length of 80 m loaded as a simple beam with a concentrated load $P = 35 \text{ kN}$ acting at the center of the beam as shown in figure below. Determine the maximum tensile and compressive stresses in the beam if $\phi = 5\pi/9$. If the beam made of is an aluminum alloy ($E = 72 \text{ GPa}$), determine the maximum deflection of the beam.



- 3 (a) The curved beam in figure has a triangular cross section as shown in figure below. Determine the stress at B and C for $P = 40 \text{ kN}$.

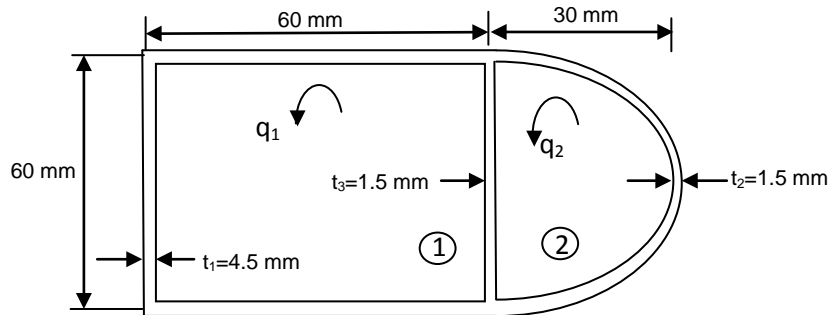


- (b) What are the stresses in chain links? Explain with example.

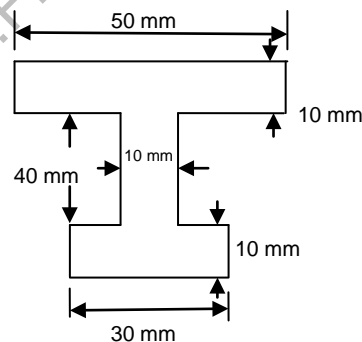
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- 4 (a) What are the stresses developed when the disc is rotating? Derive the formulas for when disc is subjected to uniform strength.
- (b) A hollow thin-wall torsion member sectional dimensions as indicated in figure. The material is an aluminum alloy for which $G = 26 \text{ GPa}$. Determine the torque and unit angle of twist if the maximum shear stress, at locations away from stress concentrations, is 40 MPa .



- 5 (a) Derive an expression for the stress concentration at the tip of a elliptical hole introduced in a plate subjected to far field stress of σ .
- (b) Determine the expression for the contact stress developed in a single row ball bearing.
- 6 (a) Explain a plane stress and plane strain problem in rectangular coordinates with suitable example.
- (b) What is the effect of the shear force on deflection of beam with UDL.
- 7 (a) Discuss the general yielding mode of failure. Explain: elastic perfectly plastic; nonlinear; lower bound load; and upper bound for the general yielding mode of failure. Distinguish fully plastic load for an axial member and the plastic moment for a beam subjected to pure bending.
- (b) Derive expression for the stresses in a circular disc.
- 8 (a) A beam as shown in figure is subjected to pure bending. The material has a yield point σ_y . Determine the ratio of the plastic moment and the maximum elastic moment.



- (b) Explain about pure bending of three dimensional plates with suitable example.
