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Total No. of Questions : 09] [Total No. of Pages : 02

Paper ID [CE207]

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B.Tech. (Semester - 3rd)

SOLID MECHANICS (CE - 207)

Time : 03 Hours Maximum Marks : 60

Instruction to Candidates:

1) Section - A is **Compulsory.**
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 x 2 = 20)*

a) Define Young's modulus.

b) Define factor of safety.

c) What do you mean by a principal plane?

d) What is meant by point of contraflexure? Show it on a beam.

e) What do you understand by section modulus?

f) Where do we use closed coiled helical springs?

g) Define Torsional Rigidity.

h) Define resilience and proof resilience.

i) Differentiate between column and strut.

j) List the various theories of elastic failure.

Section - B

(4 x 5 = 20)

Q2) Differentiate between upper and lower yield point. Show ultimate stress and breaking stress on a stress-strain curve.

Q3) Two wires, one of steel and other of copper, have the same length and are subjected to equal axial tensile forces. The copper wire has a diameter of 1 mm. What is the diameter of the steel wire if both wires are elongated by the same amount?

P.T.O.

Q4) Derive the relations for the principal stresses and principal strains.

Q5) Two lengths of shaft 15 cm diameter are connected by a flange coupling with 6 bolts on a 25 cm diameter pitch circle. If the limits of shearing stress are 48 N/mm^2 in the shaft and 40 N/mm^2 in the bolts (assume uniform), calculate the power transmitted at 280 rpm and the diameter of the bolts required.

Q6) A steel bar of 500 mm length, 30 mm width and 20 mm thickness is subjected to a direct tensile load of 60 kN. If Young's modulus of the bar material is 200 GN/m^2, find the strain energy and resilience of the bar. Find also the modulus of resilience if the elastic limit for the material in tension is 220 N/m^2.

Section - C

(2 x 10 = 20)

Q7) Draw the S.F. and B.M. diagram for a cantilever of length L carrying a point load W at the free end.

Q8) A wooden beam of 10 cm breadth and 10 cm depth is used as a simply supported beam over a span of 4 meters. If Young's Modulus of elasticity for wood is 10 kN/mm^2, what magnitude of a central load W will this beam carry to cause deflection of 2 mm at the center? Find the slope at the ends and also deflection at each meter length. Express maximum deflection as a percentage of span.

Q9) An aluminum strip of rectangular cross section, 80 mm deep and 40 mm wide is bent into an arc of radius 100 m. Find:

(a) Maximum tensile stress developed
(b) Maximum compressive stress developed
(c) BM applied.
(d) Concentrated load at the center if simply supported
(e) UDL over the entire span if simply supported
(f) Concentrated load at the free end if acting as a cantilever
(g) UDL over the entire span if acting as a cantilever
(h) Moment of resistance if the ultimate tensile stress is 280 N/mm^2 with a factor of safety of 2.5. Take E = 70 GN/m^2 and length as 4 m.

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