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# Paper ID [CE207]

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B.Tech. (Sem. - 3rd)

SOLID MECHANICS (CE - 207)

MAY 2008

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

*(10 × 2 = 20)*

*Q1)*

a) Distinguish between stress and force.

b) Define a composite bar.

c) What is the angle between two principle stresses?

d) What do you understand by point of inflexion?

e) What do you understand by flitched beams?

f) Where do we use closed coiled helical springs?

g) List out the instances where moment area method is particularly convenient to use.

h) Define resilience and proof resilience.

i) Differentiate between column and strut.

j) State limitations of Euler's theory.

## Section - B

*(4 × 5 = 20)*

*Q2)* How will you find the stresses and load carried by each member of composite bar?

*Q3)* A rectangular bar of cross-sectional area 12000 $mm^2$ is subjected to an axial load of 360 $N/mm^2$. Determine the normal and shear stresses on a section which is inclined at an angle of 30° with the normal cross-section of the bar.

*Q4)* A cast iron pipe of external diameter 60 mm, internal diameter of 40 mm and of length 5 m is supported at its ends. Calculate the maximum bending stress induced in the pipe if it carries a point load of 100 N at its centre.

*Q5)* Derive torsion equation and state the assumptions made.

*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 × 10 = 20)*

*Q7)* Derive an expression for crippling load when both the ends of the column are hinged.

*Q8)* Draw the S.F. and B.M. diagram for a cantilever of length L carrying a point load W at the free end.

*Q9)* Determine the mean coil radius, wire diameter and number of turns of a closed coiled spring of 1 kN/m stiffness and solid length 45 mm. The shear stress in the spring under the axial load of 75 N should not exceed 180 MPa modulus of rigidity for the spring material = 82 GPa.