Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(CE) (Sem.–3)

SOLID MECHANICS

Subject Code : CE-207

Paper ID : [A0604]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

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 have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Q1. Write briefly :

a) Define lateral strain and Poisson's ratio.

b) Describe the effect of couple on SF and BM diagrams of a beam.

c) Explain briefly relationship between SF and BM at a section.

d) Define the term bending stress and explain clearly the theory of simple bending.

e) What are the assumptions made for finding out shear stress in a circular shaft subjected to torsion?

f) What do you understand by column and strut? Distinguish clearly between long and short columns.

g) Give the Johson's straight line and parabolic formula for columns.

h) A steel rod 25 mm in dia. and 2m long is subjected to an axial pull of 45kN. Find :

i) intensity of stress

ii) elongation. Take $E = 2 \times 10^5$ N/mm^2

i) Derive an expression to determine stiffness of closed coiled helical springs.

j) Give relationship between various elastic constants.

SECTION-B

Q2. Derive an expression to determine extension of a tapering rod.

Q3. At a certain point in a strained material the horizontal tensile stress is 800 kg/cm^2 and the vertical compressive stress is 1400 kg/cm^2. The shear stress is 400 kg/cm^2. Find the principal stresses and the direction of planes.

Q4. A beam 5m long and simply supported at each end, has a UDL of 1000 N/m extending from left end to a point 2m away. There is also a clockwise couple of 1500 N-m applied at the centre of the beam. Draw SFD and BMD and find the maximum BM.

Q5. A hollow shaft of internal diameter 40 cm and of metal thickness 3 cm is required to transmit power at 180rpm. Determine the power it can transmit if shear stress in the shaft is not to exceed 600 kg/cm^2 and the maximum torque exceeds the mean by 30%.

Q6. Derive an expression to find the maximum stress induced when load is applied with impact.

SECTION-C

Q7. A compound beam is formed by joining two bars, one of brass and other of steel, each 40 mm wide and 10 mm deep. This beam is supported over a span of 1 m with the brass bar placed over the steel bar as shown.

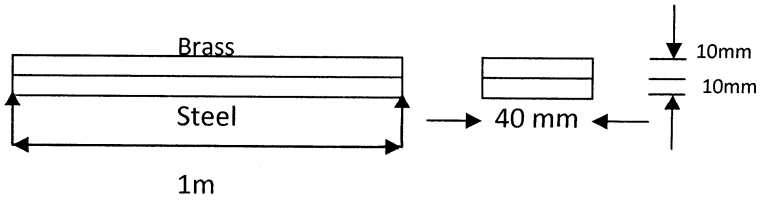
Determine the maximum load, which can be applied at the centre of the beam, when the bars are :

a) Separate and can bend independently

b) Firmly secured to each other, throughout their length

Take $E_s = 2 \times 106$ kg/cm^2 ; $E_b = 0.8 \times 106$ kg/cm^2

$F_s = 1125$ kg/cm^2 ; $f_b = 750$ kg/cm^2



Q8. A beam 12 m span is freely supported at its ends. It carries a gradually varying load from 30 kN/m at the left hand end to 20 kN/m at the right. Find the deflection at the centre of the beam. Take I = 2 × 10^9 mm^4 and E = 208 × 10^3 N/mm^2.

Q9. Derive an expression to determine critical load on column with one end fixed and other hinged.