

JK Lakshmipat University, Jaipur
Institute of Engineering and Technology
End Term Examination

B. Tech. Mechanical Engineering, Semester 3rd/2013



Course Name: Mechanics of Deformable Bodies

Max Marks: 40

Course Code: ME 302

Time: 03.00 hr

- Note:** - 1. Question Paper has total three section in which section A & C are compulsory.
 2. Students have to attempt any six questions in total.
 3. Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
 4. Before answering the question, read it carefully.
 5. Mobile phones are strictly prohibited in the examination hall.

Section A

(10 Marks)

Q. No. 1 Define the followings:

(1×5 = 5 Marks)

- Spring Index
- Modulus of Resilience
- Torsional Rigidity
- Superficial Strain
- Beam

Q. No. 2 Derive the relationship between various Elastic constants.

(5 Marks)

Section B

(20 Marks)

Q. No. 3 (a) A steel bar 25 mm diameter is loaded as shown in fig. 1. Determine the stresses in each part and the total elongation. When $E = 210 \text{ GPa}$.

(2 Marks)

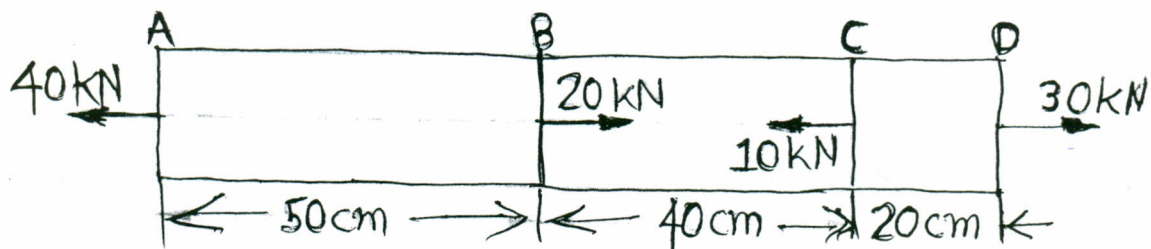


Fig. 1

Q. No. 3 (b) The normal stresses at a certain point in a body are 80 MPa tensile and 50 MPa compressive. There are also shear stresses across the plane of tension and compression equal to 30 MPa. Calculate the maximum direct stress and maximum shear stress in the material. **(3 Marks)**

Q. No. 4 (a) A beam of 10 m length is simply supported at its ends. It carries a uniformly distributed load of 20 kN/m run over the length of left half of its span, together with concentrated load of 20, 40 and 20 kN situated at 1.5, 2.5 and 5 m respectively from right hand support. **(3 Marks)**

BEST OF LUCK!

- Q. No. 4 (b) List out the limitations of Euler's Formula for Buckling of Columns. (2 Marks)
- Q. No. 5 A steel pipe 30 cm in diameter and 6 mm thick is subjected to a pressure of 2.8 MPa. Estimate the hoop stress in the pipe under this pressure and also when wound, before stressing with wire 2.5 mm diameter, carrying a tension of 70 MPa. What is the stress in the wire when the pipe is under pressure? Assume $E_s = 210 \text{ GPa}$, $\nu_s = 0.25$ (5 Marks)
- Q. No. 6 What percentage of Strength of a solid circular steel shaft 10 cm diameter is lost by boring of 5 cm axial hole in it? Compare the strength – weight ratios of the two cases. (5 Marks)
- Q. No. 7 Derive the relation for the deflection, stiffness, maximum resultant shear stress and axial torque for Closed Coil Helical Spring. (5 Marks)

Section C

(6 + 4 = 10 Marks)

- Q. No. 8 (a) Derive the Simple Bending equation.
- Q. No. 8 (b) A beam of I –Section 50 cm deep and 19 cm wide, has flanges 2.5 cm thick and web 1.5 cm thick. It carries a shearing force of 400 kN at a section. Calculate the maximum intensity of the shear stress in the section, assuming the moment of inertia to be $64,500 \text{ cm}^4$. Also calculate the total shear force carried by the web and sketch the shear stress distribution across the section.