Printed Pages: 02 **Sub Code:KCE402**

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B.TECH.
(SEM IV) THEORY EXAMINATION 2022-23
INTRODUCTION TO SOLID MECHANICS

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

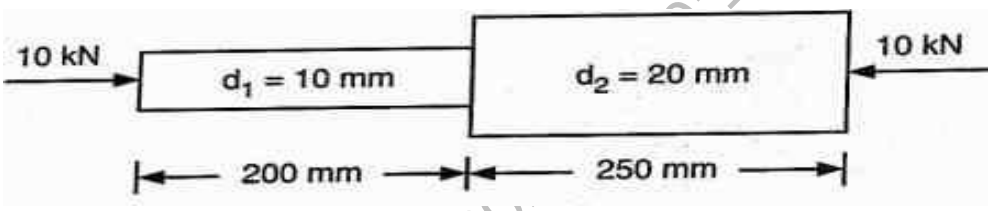
1. Attempt *all* questions in brief. **2 x 10 = 20**

a. Write the difference between stress and pressure.
b. What do you understand by elongation of a bar?
c. What do you know about shear force diagram and bending moment diagram?
d. Define point of inflexion.
e. What do you know about neutral axis?
f. A screw driver corresponds to a solid steel shaft of 3 mm diameter. Make calculation for the maximum torque that can be transmitted by it.Maximum permissible shear stress for steel is 250 MN/m^2.
g. Give any three methods for find out slope and deflection.
h. Write the limitations of Euler's formula.
i. What are the functions of springs?
j. Define thin walled spheres.

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a. A straight bar 450 mm long is 10 mm diameter for the first 200 mm length and 20 mm in diameter for the remaining length. If the bar is subjected to an axial push of 19 kN, determine decrease in length of bar. Take E= 2 x 10^5 N/mm^2



b. Write the important points for drawing shear force and bending moment diagrams.
c. A rectangular section beam, 6 cm wide and 12 cm deep , is subjected to a shear force of 150 kN. Calculate the shear stresses induced at distances 0, 1, 2, 3, 4, 5 and 6 cm measured from the neutral axis. Sketch the variation of shear stress along the depth of beam and comment on the nature of plot.
d. Find out the Euler's crippling load for a column with one end fixed and another end pinned.
e. Write the short notes on the following for compound cylinders:
   (i) Shrinking stress
   (ii) Compounding

SECTION C

3. Attempt any *one* part of the following: 10x1=10

a. How Mohr's circle can be constructed to find stresses in a rectangular element subjected to normal stresses σ_x and σ_y and shear stress? Explain

b. Three bars of the same length have their area of cross section in the ratio 1:2:3. Make a comparison in the strain energy of three bars when (i) acted upon by equal loads (ii) Subjected to equal stresses

4. Attempt any *one* part of the following: 10x1=10

a. A cantilever beam of length 2.0 m carries a UDL load of 2kN/m length over the whole length and a point load of 3 kN at the free end. Draw the S.F.D. and B.M.D. for the cantilever.

b. Derive the relation between load, shear force and bending moment for a simply supported beam with UDL.

5. Attempt any *one* part of the following: 10x1=10

a. Find out the shear distribution for rectangular section.

b. What do you know about section modulus? Find the dimensions of the strongest beam that can be cut out of a log of 200 mm.

6. Attempt any *one* part of the following: 10x1=10

a. A beam 4 m long is freely supported at the ends. It carries concentrated loads of 29 kN each at points 1 m from the ends by Macaulay's metod. Determine (i) maximum slope and deflection of the beam (ii) slope and deflection under each load. Take Flexural rigidity of the beam = 1300 kN/m^2

b. A round steel bar 12 mm diameter and 1.25 m long is subjected to gradually increasing axial compressive load. If both ends of the column are taken as hinged, determine Euler's crippling load for column. Proceed to calculate the maximum lateral deflection corresponding to buckling condition. Take Young's modulus of steel E= 2 x 10^5 N/mm^2, and yield stress = 250 N/mm^2

7. Attempt any *one* part of the following: 10x1=10

a. Derive the expression for maximum shear stress and axial deflection for a closed coiled helical spring in terms of mean coil radius, axial load, diameter of wire, modulus of rigidity and number of turns.

b. A thick cylinder of 20 cm outer diameter and 2.5 cm thickness is closed at both ends. It is subjected to internal pressure p in addition to an axial tensile load of 45 kN. If the cylinder material can sustain a maximum stress of 60 MN/m2 (tension or compression) what should the internal fluid pressure in bar?