compression is required in the spring, calculate the height from which the weight should be dropped before it strikes the spring.

Take modulus of rigidity of spring material = 8×10^4 N/mm^2. **15**

Section D

7. Determine (i) location of neutral axis (ii) maximum and minimum stresses, when a curved beam of trapezoidal section of bottom width 45 mm, top width 30 mm and height is 60 mm subjected to pure bending moment of +1350 Nm. The bottom width is toward the centre of curvature. The radius of curvature is 75 mm and bean is curved in a plane parallel to depth. Also plot the variation of stresses across the section. **15**

8. A I-section beam of 2.4 metre is used as cantilever beam to support the load of 200 N at the free end which makes 30° with vertical. Determine the resulting bending stresses at corner A and B. **15**

Roll No. ..... **Total Pages : 05**

MAR-21-210051

B. Tech. EXAMINATION, March 2021

Semester IV (CBCS)

STRENGTH OF MATERIALS-II (ME, AE)

ME-402

Time : 3 *Hours* *Maximum Marks :* 60

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from each Sections A, B, C and D. All questions carry equal marks. Assume suitable data any if missing.

Section A

1. A boiler is subjected to an internal steam pressure of 3 N/mm^2. The thickness of the boiler plate is 2.5 cm and the permissible tensile stress is 125 N/mm^2. Find

out the maximum diameter, when efficiency of longitudinal joints is 90% and that of circumferential joint is 35%. **15**

2. A steel cylinder of 200 mm external diameter is to be shrunk to another steel cylinder of 100 mm internal diameter. After shrinking the diameter at the junction is 150 mm and the radial pressure at the junction is 12.5 N/mm^2. Find the original difference in radii at the junction. Take $E = 2\times10^5$ N/mm^2. **15**

Section B

3. A long cylinder of 25 cm radius has been designed to operate a speed of 4200 revolution/minute. For the cylinder material mass density is 7500 kg/m^3 and Poisson ratio is 0.28.

(a) Make calculation for maximum circumferential and radial stresses in the cylinder.

(b) Set up the relations for variation in circumferential and radial stresses along the cylinder radius.

(c) Compute the circumferential and radial stresses at the radius of 15 cm. **15**

4. A built up ring comprising an inner copper ring and outer steel ring has 800 mm diameter at the surface of contact of two rings. Both the rings of rectangular cross-section, 20 mm in the radial direction and 28 mm in the direction perpendicular to the plane of ring. If the ring rotates at 3000 rpm, make calculations for stresses that develop in the ring materials. Assume the following values for modulus of modulus elasticity and mass density. **15**

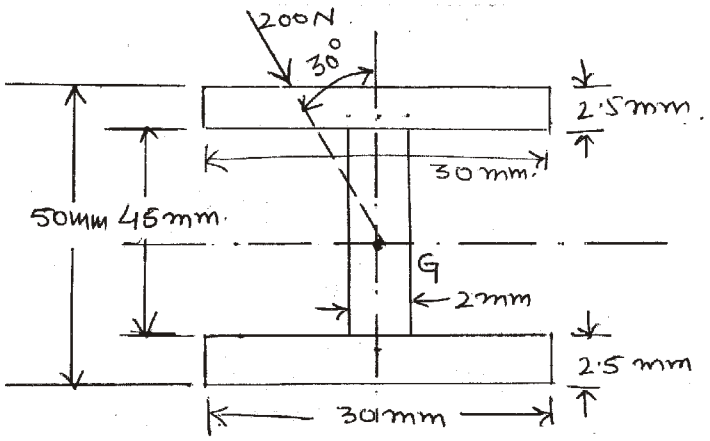
For Steel E = 200 GPa and ρ = 7500 kg/m^3

For Copper E = 100 GPa and ρ = 8500 kg/m^3

Section C

5. The external and internal diameters of a hollow cast iron column are 5 cm and 4 cm respectively. If the length of this column is 3 m and both of its ends are fixed, determine the crippling load using Rankine formula. Take the values of σ_c = 500 N/mm^2 and $\alpha = \frac{1}{1600}$ in Rankine formula. **15**

6. A close-coil helical spring of 15 cm diameter is made up of 2.5 cm diameter rod and has 20 turns. A 3 kN load is to made fall on this spring. If 16 cm of



9. (a) Differentiate between a thin cylinder and thick cylinder. **2**

(b) What are the different methods of reducing the hoop stresses ? **2**

(c) What do you mean by disc of uniform strength ? **2**

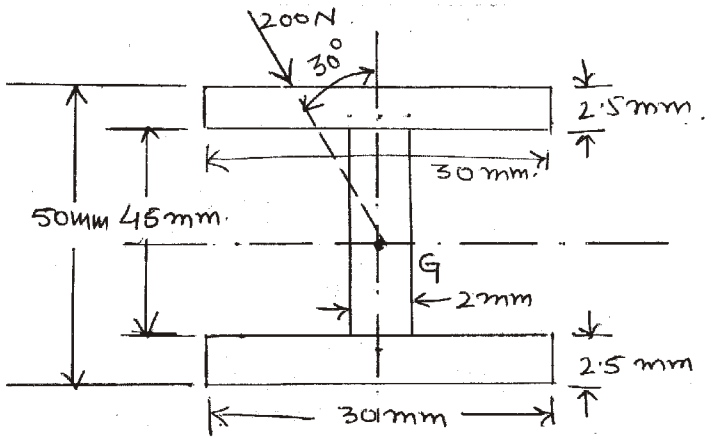
(d) Write the maximum values for circumferential and radial stresses for along rotating cylinder. **2**

(e) What is equivalent length of column ? **2**

(f) What is the difference between closed coil and helical spring ? **2**

(g) Write down the assumptions made in derivation of curved bars. **2**

(h) What do you mean by shear centre ? **1**



9. (a) Differentiate between a thin cylinder and thick cylinder. **2**

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