Printed Pages : 6 | 440 | ME-304

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 140314 | Roll No. | | | | | | | | | |

B. Tech.

(SEM. III) THEORY EXAMINATION, 2015-16

STRENGTH OF MATERIAL AND MACHINE DRAWING-I

[Time : 3 hours] [Total Marks : 100]

SECTION–A

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)

   (a) Define bulk modulus and poisons ratio.

   (b) Define principal plane and angle of obliquity.

   (c) Define flexural stiffness and torsional rigidity.

   (d) Write the formula for horizontal shear stress distribution in a beam and abbreviate the terms used in it.

(e) Differentiate between open coil helical and closed coil helical spring.

(f) Define slenderness ratio and state any two limitations.

(g) Write the formula for hoop and longitudinal stresses action in thin cylinder and abbreviate the terms used in it.

(h) Differentiate between thick and thin clyinder along with examples.

(i) State any four assumptions made during the analysis of curved beam.

(j) Define product moment of inertia and give the same for rectangular cross section having dimension B x H.

SECTION–B

Attempt **any five** questions from the following : (10×5=50)

2. Explain briefly the following theories of failures.

i) Maximum Principal stress theory.

ii) Maximum Shear stress theory.

iii) Maximum Shear strain energy theory.

3. The principal stresses at a point in a bar are 200 kN/mm² (tensile) in X direction and 100 kN/mm² (compressive) in Y direction. Determine the resultant stress in magnitude and direction on a plane at 60° to the axis of the major principal stress. Also determine the maximum intensity of shear stress in the material at the point.

4. State the assumption made in theory of pure bending and derive the expression $\frac{M}{I}=\frac{E}{R}=\frac{\sigma}{y}$.

5. A solid shaft, 100 mm diameter, transmits 75 kW at 150 rpm. Determine the value of the maximum shear stress set up in the shaft and angle of twist per meter of the shaft. Take G=80 Gpa. If the shaft is now bored in order to reduce weight to produce a tube of 100 mm outside diameter and 60 mn inside diameter, what torque could be carried if the same maximum shear tress is not too exceeded?

6. State the assumption made by Euler's theory in column and derive the expression for crippling load for a column which is fixed at both the ends.

7. A closed coil helical spring made of 12 mm round steel wire has 12 coils and mean diameter of coil is 16 cm. The spring is subjected to an axial load of 150N. Determine the elongation, intensity of torsional stress and strain energy per cubic meter under the load conditions. G=84 GPa. If the axial load is removed and an axial torque of 10N-m is applied, determine the axial twist, intensity of bending stress and energy stored per cubic meter in spring. E=210 GPa.

8. A thin cylinder 75 mm internal diameter, 250 mm long with wall 2.5 mm thickness is subjected to an internal pressure of 7 Mpa. Determine the change in the internal diameter, length and volume. If in addition to the internal pressure the cylinder subjected to a torque of 200 Nm, find principal stresses on the cylinder. Take E=200 Gpa and $\mu = 0.3$.

9. A ring carrying a load of 30 kN is as shown in fig.1. Calculate the stresses at section 1 and 2.

SECTION–C

Attempt **any two** questions from this sections. (15×2=30)

10. State the assumptions made in the Lame's equation and derive the same for the thick cylinder.

11. Draw the SFD and BMD for the given beam below and also find the point of contra-flexure.

12. A 60 mm X 40 mm X 6mm L shaped is placed as shown in the fig. 3. It is subjected to a bending moment 12 kN-mm acting in the vertical plane through the centroid of the section. Determine the maximum bending stress induced in the section.

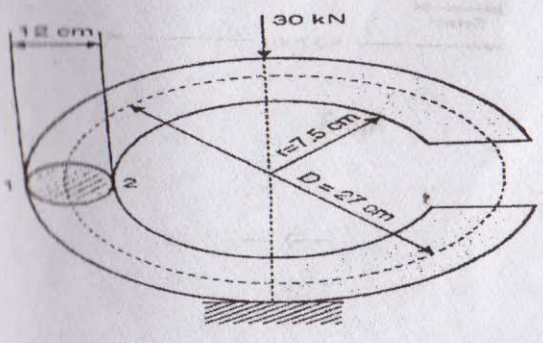

fig: 1

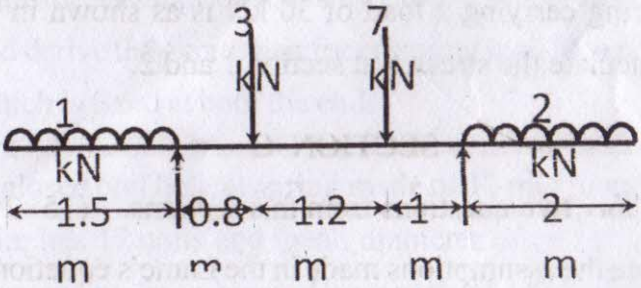
3
kN
7
kN
1
kN
2
kN
1.5
m
0.8
m
1.2
m
1
m
2
m

fig: 2

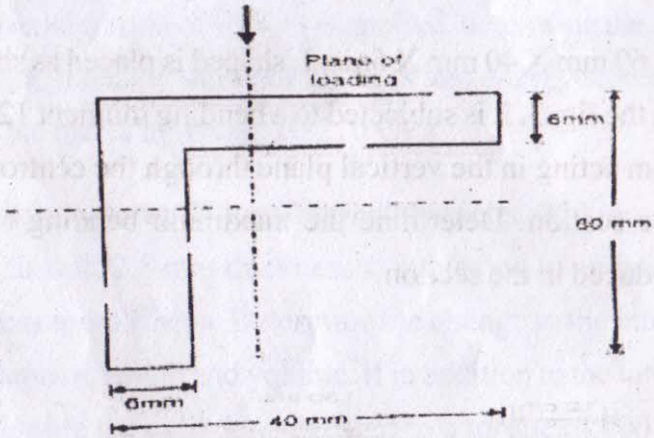
Plane of loading
6mm
60 mm
6mm
40 mm

fig: 3

—x—