PVP 14

Code: ME3T5

II B.Tech - I Semester–Regular/Supplementary Examinations
November 2016

MECHANICS OF SOLIDS - I
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) What do you understand by “resilience”?
b) Differentiate the statically determinate structures and statically indeterminate structures.
c) Define the 'Beam' and the types.
d) What do you mean by shear stress in beams?
e) Write the formula for bending equation, and elaborate each term.
f) List out the importance of principle stresses.
g) Define shear force and bending moment.
h) List out any four assumptions made in simple bending theory.
i) What is the difference between factor of safety and margin of safety?
j) Write the difference between ductility and brittleness.
k) What are temperature stresses? How it will be develop in machine/structural elements?

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.
3 x 16 = 48 M

2.

a) Draw the stress strain diagram for mild steel and discuss its salient points. 8 M

b) A tensile test was conducted on a mild steel bar. The following data was obtained from the test: 8 M
i) Diameter of the steel bar = 3 cm
ii) Gauge length of the bar = 20cm
iii) Load at elastic limit = 250 kN
iv) Extension at a load of 150 kN = 0.21 mm
v) Maximum load = 380 kN
vi) Total extension = 60 mm
vii) Diameter of rod at failure = 2.25 cm
Determine: 1) The Young's modulus
2) The stress at elastic limit
3) The percentage of elongation
4) The percentage decrease in area.

3. Draw Mohr's circle for direct stresses of 45N/mm^2 (tensile) and 25N/mm^2 (compressive) and determine the magnitude and direction of resultant stress on planes making angles of 30^0 & 60^0 with the plane of first principal stress. Also find the normal & tangential stress on these planes. 16 M

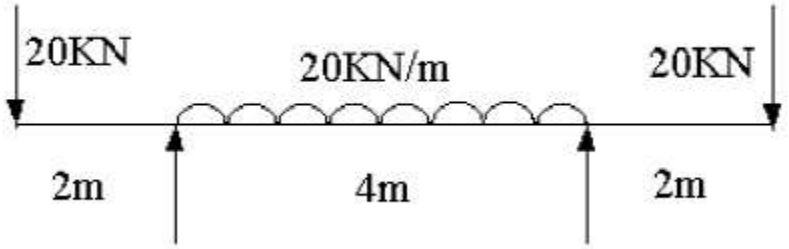
4.

a) A steel bar of length 20cm and 5cm x 5cm in section is connected at its end to an aluminum bar of 25cm length and 8cm x 8cm in section, such that they have a common

longitudinal axis. Find the load which will reduce the total length by 0.25mm. Find also the total work done. Take E_s = 200 GPa and E_a = 70 GPa 8 M

b) An aluminum bar 60mm diameter when subjected to an axial tensile load 100 kN elongates 0.20mm in a gauge length 300mm and the diameter is decreased by 0.012mm. Calculate the modulus of elasticity and the Poisson's ratio of the material. 8 M

5. Construct the S. F. D & B. M. D for the beam with over hangs as shown in Figure. 16 M



6.

a) What do you understand by section modulus? Obtain the dimensions of the strongest rectangular section that can be cut from a circular log of wood of 30cm diameter. 8 M

b) Find the maximum shear stress induced by a load of 4kN in the vertical section of a hollow beam of a square section if the outside width is 10 cm and the thickness of material is 2 cm. 8 M