Code No: 123BJ

R15

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2016
STRENGTH OF MATERIALS-I
(Common to CE, CEE)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A
(25 Marks)

1.a) Define Longitudinal strain and Poission's ratio. [2]
b) A circular bar of diameter 50mm is subjected to a tensile force of 120kN. Find longitudinal strain and lateral strain, Take 'E'= 200Gpa and 1/m = 0.3. [3]
c) Define point of contra flexure. [2]
d) Draw SFD and BMD for a Cantilever beam of span 3m subjected to point load of 50kN at its free end. [3]
e) Sketch the Bending stress and Shear stress distribution across the depth of a circular section. [2]
f) List out the assumptions made in the derivation of bending equation. [3]
g) Define maximum principal stress theory. [2]
h) Define principal planes and principal stresses. [3]
i) Define Conjugate beam. [2]
j) Calculate slope and deflection of a cantilever beam span 'L' subjected to load 'W' at free end, Use moment area method. [3]

PART-B
(50 Marks)

2.a) A steel bar 300mm long and 30mm×30mm cross section, is subjected to a tensile force of 150kn in the direction of its length. Determine the change in volume. Take 'E' = 200 Gpa and 1/m = 0.3.
b) A hammer is having a mass of 10 kg falls from a height of 1.5 m on a 50 mm cube iron block before coming to rest. Find the amount by which the block will be compressed and the instantaneous stress induced in it. Also find the velocity with which the hammer will strike the block. Take 'E' = 200Gpa. [5+5]

OR

3.a) Rails of 20 m length were laid on the track when the temperature was 20^0C. A gap of 1.6 mm was kept between two consecutive rails. At what max temperature the rails will remain stress free? If the temperature is raised further by 15^0C, what will be the magnitude and nature of stresses induced in the rails?
b) A composite bar of length 700 mm is made up of an aluminium of length 400 mm and steel bar of length 300 mm. The cross sectional areas of Aluminium and steel bars are of 100 mm × 100 mm and 50 mm × 50 mm respectively. Assuming that the bars are prevented from buckling sideways, calculate the compressive force P to be applied to the composite bar that will cause the total length of the bar decease by 0.25 mm. Take modulus of elasticity of Aluminium and steel as 70 GPa and 200 Gpa respectively. [5+5]

4.a) Derive the relation between rate of loading, Shear force and Bending moment.
b) Draw S. F. D and B. M. D for the cantilever beam loaded as shown in figure 1. [5+5]

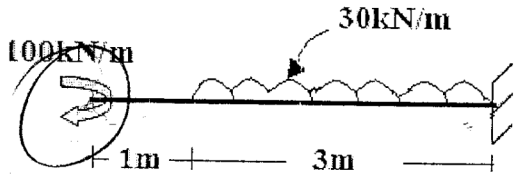

Figure: 1

OR

5. Draw S. F. D and B. M. D for the beam shown in figure 2. [10]

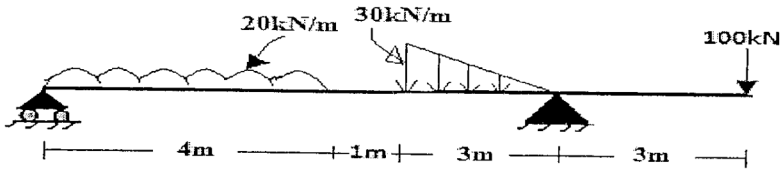

Figure: 2

6. Design the cross section for a beam acted upon by a bending moment of 80kN-m. If width of beam is 230 mm, calculate depth. Take stress f = 10 Mpa. [10]

OR

7. An I beam 300 mm deep and 100 mm wide has equal flanges of 10 mm thick top flange and 8mm thick bottom flange is subjected to a shearing force of 200 kN. Draw the shear stress distribution across the depth. Obtain what percentage of shearing force is carried by the web? [10]

8. An element in a plane is subjected to normal stresses p_1 = 150 Mpa, p_2 = 50 Mpa in two mutually perpendicular directions accompanied by a shear stress q = 40 Mpa. Determine the stresses acting on an element rotated through an angle by 40^0 clockwise. Also determine the principal stresses and the planes on which they act. [10]

OR

9. Discuss in detail about various theories of failures. [10]

10. A simply supported beam 8 m long carries concentrated loads of 40 kN each at a distance 2 m from the ends. Calculate:
a) Maximum slope and deflection for the beam, and
b) Slope and deflection under each load.
Take: EI = 1.2×10^4 kN.m^2. [5+5]

OR

11. Determine the slopes at the ends and deflection at the mid span section of a beam loaded shown in figure 3 using Conjugate beam method. Take elastic modulus as 'E'. [10]

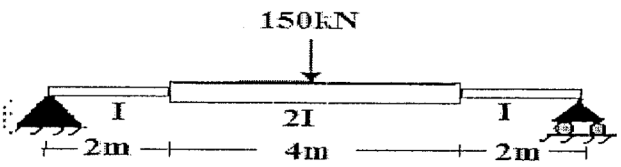

Figure: 3

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