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Code No: 133BT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November/December - 2018

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) Distinguish between Tensile stress and Compressive strain. [2]
b) Draw the stress strain diagram for mild steel and identify the significant points. [3]
c) Draw the SFD and BMD for a cantilever beam of length L subjected to udl w per unit length. [2]
d) List any three important points to be kept in mind while drawing SFD and BMD. [3]
e) Define Neutral Axis and Moment of Resistance for a beam. [2]
f) List the assumptions made in the theory of simple bending. [3]
g) List the cases where Mohr's theorem is conveniently used. [2]
h) A rectangular bar of cross sectional area 10000mm^2 is subjected to an axial load of 25kN. Determine the normal stress on a section which is inclined at 30^0 with normal cross section of the bar. [3]
i) Define principal stresses and strains. [2]
j) What is meant by Mohr's circle of stresses? [3]

PART-B

(50 Marks)

2. A reinforced concrete column 500mm ×500mm has Four Reinforcement bars of Steel each 18 mm in diameter one in each corner. Find the stresses in concrete and steel bars when the column is subjected to a load of 2MN. Take E for steel is 2.1×10^5 N/mm^2 and for concrete as 1.4×10^5 N/mm^2. [10]

OR

3. A steel rod of 20mm diameter passes centrally through a copper tube of 50mm external diameter and 40mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly on the projecting parts of the rod. If the temperature of the assembly is raised by 50^{0}C, calculate the stresses developed in copper and steel. Take E for steel and copper as 200GN/m^2 and 100GN/m^2 and α for steel and copper as 12×10^{-6} per ^{0}C and 18×10^{-6} per ^{0}C. [10]

4. A simply supported beam of length 12m, carries the uniformly distributed load of 10kN/m over a length of 4m starting from 4m from the left support. Point loads of 50kN and 40kN acts at a distance of 4m and 8m from the left support. Draw the S.F and B.M diagrams for the beam. Also calculate the maximum bending moment. [10]

OR

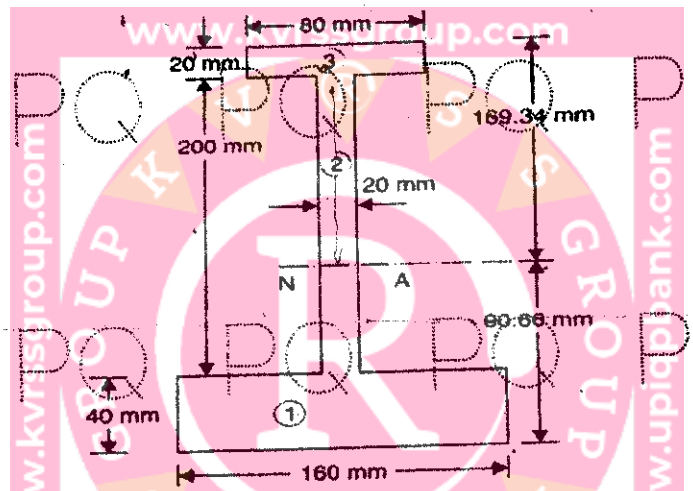
5. A cantilever beam of length 2m carries the point loads 200N, 400N and 700N at distances 0.5m, 1.2m and 2m respectively from the fixed end. Draw the SF and BM diagrams for cantilever beam. [10]

6.a) A steel plate of width 100mm and of thickness 18mm is bent into a circular arc of radius 10m. Determine the maximum stress induced and the bending moment which will be produce the maximum stress. Take $E=2\times10^5$ N/mm^2.

b) A rectangular beam 100mm wide and 250mm deep is subjected to a maximum shear force of 50kN. Determine Average shear stress, maximum shear stress and shear stress at a distance of 25mm above the neutral axis. [5+5]

OR

7. A cast iron beam is of I-Section is as shown in Figure. The beam is simply supported on a span of 5 meters. If the tensile stress is not to exceed 20 N/mm^2, find the safe uniformly load which the beam can carry. Find also the maximum compressive stress and draw bending stress distribution of the section and locate the stresses. [10]



8. Derive the deflection equation for a simply supported beam of length L carrying a point load W at the centre. [10]

OR

9. A simply supported beam of length 4m carries a point load of 3kN at a distance of 1m from each end. Take $E=2\times10^5$N/mm^2 and $I=10^8$ mm^4 for the beam. Using conjugate beam method determine (a) Slope at each end and under each load. (b) Deflection under each load and at the center. [10]

10.a) At a point in a strained material, the principal stresses are 400N/mm^2 and 300N/mm^2. The first one is tensile in nature and the second one is compressive in nature. Determine the following stresses on a plane inclined at 60^0 to the direction of the larger stress. (i) Normal stress. (ii) Shear stress. (iii) Resultant stress.

b) A rectangular bar of cross sectional area 10000mm^2 is subjected to a tensile load of P. The permissible normal and shear stresses on the oblique plane which is inclined at 60^0 are 8N/mm^2 and 8N/mm^2. Determine the safe value of P. [5+5]

OR

11. Discuss in detail various prominent theories of failures. [10]

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