Code: 15A01303 **R15**

B.Tech II Year I Semester (R15) Regular Examinations November/December 2016

STRENGTH OF MATERIALS – I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Differentiate between elasticity and plasticity.

(b) Define the terms Resilience, proof resilience and modulus of resilience.

(c) Define the terms shear force and bending moment at a section with sign conventions.

(d) Define the term section modulus.

(e) Write the expressions for section modulus rectangular and circular sections.

(f) Draw the shear stress distribution across the triangular and typical I-sections and mark the salient values.

(g) State moment area theorems.

(h) Write the expression for prop reaction in a propped cantilever of span 'L' when it carries a central counter clockwise moment of M.

(i) Write the limitations of conjugate beam method

(j) What is meant by core of a section? Write its significance in practical applications.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

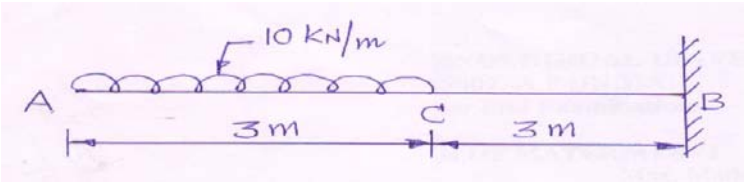
2 The modulus of rigidity of a material is 39 kN/mm^2. A 10 mm diameter bar of the material is subjected to an axial tensile force of 5 kN and the change in its diameter is observed to be 0.002 mm. Calculate Poisson's ratio and the modulus of elasticity of the material.

OR

3 A circular wrought iron bar of 12.5 mm diameter and gauge length of 100 mm was tested in tension up to fracture and the following observations are made: Yield load = 29.6 kN, Maximum load = 44.8 kN, Load at the fracture = 37 kN, Diameter at the neck = 9.1 mm, Total extension in sample = 27.6 mm. Determine the yield strength, ultimate tensile strength, actual breaking strength and the percentage elongation in the bar.

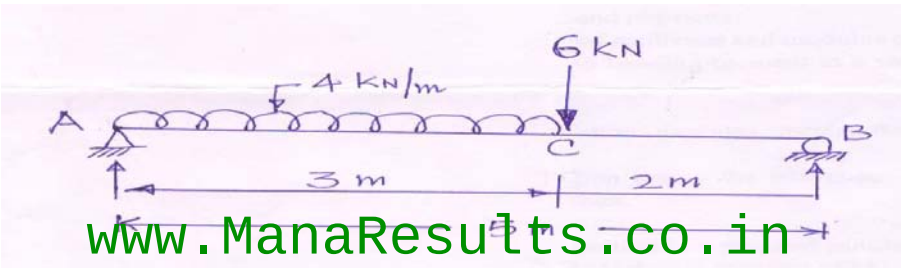
UNIT – II

4 A 6 m long cantilever AB is fixed at end B and carries a uniformly distributed load of 10 kN/m over AC = 3 m as shown in the figure below. Determine the support reactions. Draw S.F.D and B.M.D diagram of the cantilever.



OR

5 A 5 meter long beam AB carries a uniformly distributed load of intensity 4 kN/m over AC = 3 m and a point load of 6 kN at C as shown in the figure below**.** Determine the support reactions and draw B.M.D and S.F.D of beam.



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UNIT – III

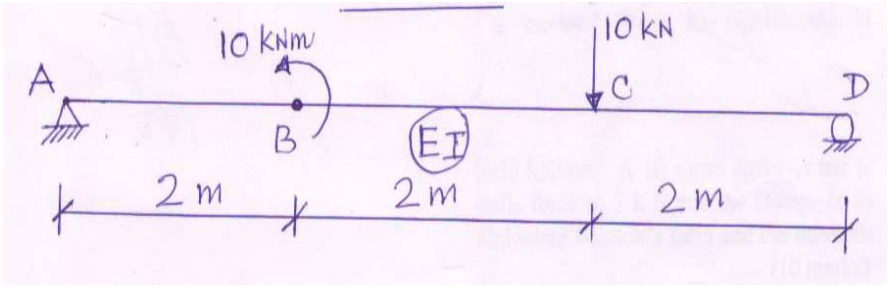
6 A girder of I-section is simply supported over a span of 10 m and it is subjected to a u.d.l of 9.6 kN/m. Properties of I-section are Z = 965.3 x 10^3 mm^3, overall depth is 400 mm and width is 105 mm. It is strengthened by fixing 2 flange plates of 20 mm thick, on both sides so that the maximum stress in the section is not to exceed 80 N/mm^2. Determine the width of the flange plates of the section

OR

7 A cast iron beam of unequal I-section with top flange (150 mm x 10 mm), bottom flange (200 mm x 15 mm) and web (275 mm x 10 mm) is supported as a cantilever of length 3 m. What load can be applied at the free end of the cantilever, if the tensile stress in the section is limited to 80 N/mm^2, if the top flange of the beam comes under tension?

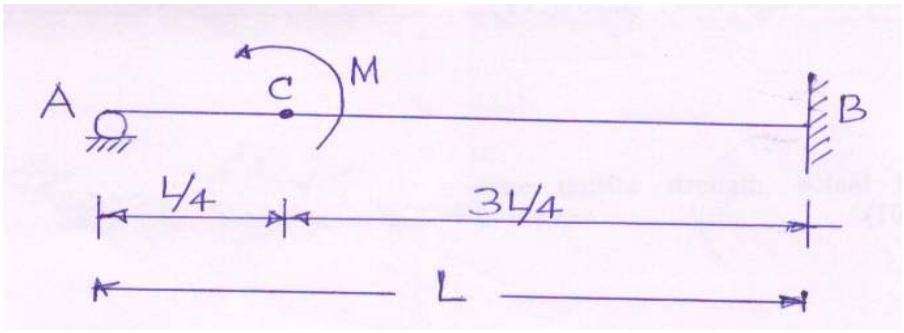
UNIT – IV

8 A beam ABCD, 6 meters long is hinged at end A and roller supported at end D. It is subjected to a moment and a point load as shown in the figure below. Determine the deflection under the load and the slope at B by taking the flexural rigidity as 'EI' for the beam.



OR

9 A propped cantilever of length' L' is fixed at one end and roller supported at the other end .Cantilever is subjected to a couple 'M' at L/4 from A as shown in the figure below**.** Determine the reaction at propped end and deflection at C.



UNIT – V

10 A tapering chimney of hollow circular section is 45 m high. Its external diameter at the base is 3.6 m and at the top is 2.4 m. It is subjected to a wind pressure of 22 kN /m^2 of the projected area. Calculate the over turning moment at the base. If the weight of the chimney is 6000 kN and the internal diameter at the base is 1.20 m, determine the maximum and minimum stress at the base.

OR

11 A short column of hollow circular section of internal diameter 'd' and external diameter 'D' is loaded with a compressive load W. If D is 1.5 d, deter mine the diameter of the core.

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