JAYA GROUPS OF INSTITUTION- Thiruninravur

4th Sem – B.E

INTERNAL ASSESMENT II (MODEL EXAMINATION II)

Sub. Title : **SOLID MECHANICS**
Sub. Code : **CE 6452**
Duration : **3 Hours**

Date: **06.03.2015**
Branch: **TEXTILE ENGG.**
Max. Marks : **100**

Part A (10 X 2 = 20) (Answer All Questions)

1. State any four conditions of simple Bending
2. State the two moment area theorems or Mohr's theorems
3. Define shear stress and bending moment
4. What is the relation between slope, deflection and radius of curvature of beam?
5. What is flexural rigidity of the beam? How it is calculated?
6. What is flitched beam?
7. Sketch the bending stress as well as shear stress distribution for beam of rectangular cross section.
8. Show the shear stress distribution in beams made of i) T Section ii) Channel or I section
9. Show shear stress distribution over a rectangular section is parabolic.
10. What is meant by neutral axis of beam? Write the expression for simple or pure bending.

PART B (5 X 16 = 80) Answer All Questions

11. a) Derive an expression for the slope and deflection of a simply supported beam, carrying an UDL of 'w' kN/m acting entire span of length 'L'. Find also the maximum deflection of a beam. Use Double Integration method. (16 marks)

OR

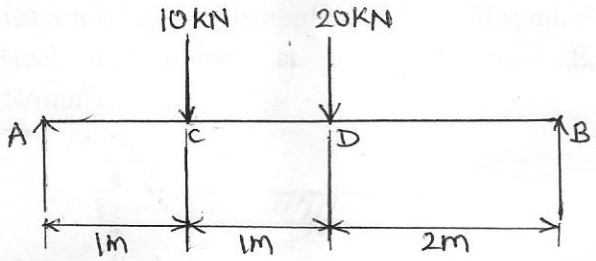
11. b) Derive an expression for the slope and deflection of a simply supported beam, carrying a point load 'W' at a distance 'a' from left support and at a distance 'b' from right support. Where a>b. use Macaulay's method. (16 marks)

12. a) A Simply supported Beam of 10m span carries a point load of 12kN at its centre. It is also subjects to a UDL of 2kN/m over its entire span. Find the maximum deflection of beam by Macaulay's method. Give $E = 400kN/mm^2$, $I = 200 \times 10^6\ mm^4$. (16 marks)

OR

12. b) A Simply supported Beam of 10m span carries a point load of 12kN at its centre. It is also subjects to a UDL of 2kN/m over its entire span. Give $E = 400kN/mm^2$, $I = 200 \times 10^6\ mm^4$.
i) Find the maximum deflection of beam by Double Integration method.
ii) Find the maximum deflection of beam by Moment Area method. (16 marks)

13. a) A simply supported beam is loaded as shown in the Fig. is 200mm wide and 400mm deep. Find the slope at the supports and deflections under loads. Take E = $2x10^4$ N/mm^2. (16 marks)

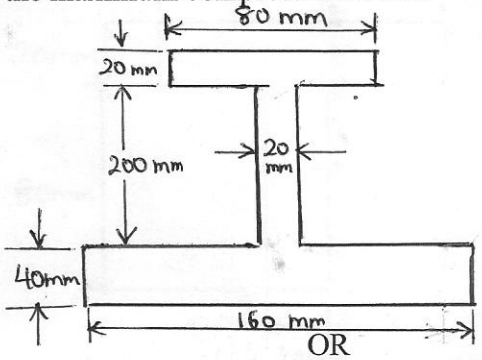


OR

13. b) i) Write the theory of simple bending to derive the expression for simple or pure bending. (10 marks)

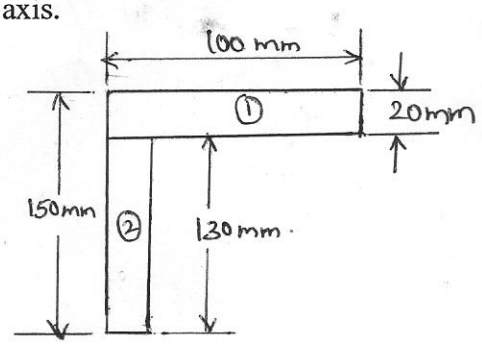
ii) A carriage steel spring of semi-elliptical type has 1000mm long and 50mm width. It carries a central load of 5kN. It the maximum deflection of the spring not exceeds 50mm and maximum stress should not exceed 150 N/mm^2. Calculate the following;
(I) The thickness of the plate (II) Number of plates.
Take E = $200x10^3$ N/mm^2. (6 marks)

14. a) A cast iron beam is of I section. The beam is simply supported on a span of 5 m. If the tensile stress is not to exceed 20N/mm^2. Find the safe uniform load which the beam can carry. Find also the maximum compressive stress. (16 marks)

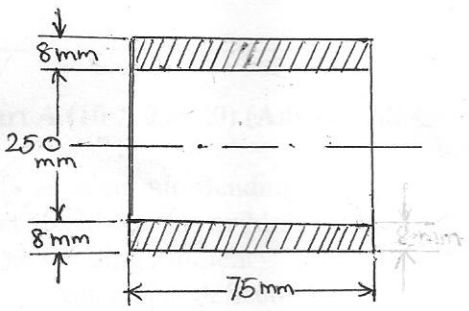


OR

14. b) A 150x100x20 mm unequal angle bar is placed with the longer leg vertical and used a joist freely supported at the ends. Find what UDL will be carried by the joist over a span of 4m if the maximum bending stress is not to exceed 5 MN/m^2 and assuming that the section bends about the X-X axis. (16 marks)



15. a) A timber beam of rectangular section 250mm deep by 75mm wide is to be reinforced by steel strips 8mm thick on both sides. The composite beam is simply supported at its ends 4m apart and carries a load of 8kN is applied at the mid span. Find the maximum bending stress in the steel and timber at the mid span. $E_{steel} = 2.1x10^5$ N/mm^2; $E_{timber} = 0.12x10^5$ N/mm^2. (16 marks)



OR

15. b) A T-section of a simply supported beam has a width of flange = 100mm, overall depth = 100mm, thickness of flange and stem = 20mm. Determine the maximum stress in beam when a bending moment of 12kN-m is acting on the section. Also calculate the shear stress at neutral axis and at the junction of web and flange when shear force of 50kN acting on beam. Draw the stress distribution diagram (16marks)