SATHYABAMA UNIVERSITY
(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E – CIVIL
Title of the paper: Mechanics of Solids - II
Semester: IV Max.Marks: 80
Sub.Code: 6C0082(2006-2007) Time: 3 Hours
Date: 27-04-2009 Session: FN

PART – A (10 x 2 = 20)
Answer All the Questions

1. Write the expressions for determining the slope and deflection of a simply supported beam, carrying a uniformly distributed load of w/unit length over the entire span.

2. What is a cantilever?

3. Define the terms: column and strut.

4. Enumerate the limitations of Euler's formula.

5. Name the stresses set up in a thin cylinder subjected to internal fluid pressure.

6. Differentiate between a thin cylinder and a thick cylinder.

7. Briefly explain principal planes and principal stresses.

8. State St. Venant's theory.

9. Define the terms: neutral axis and section modulus.

10. What do you mean by unsymmetrical bending?

PART – B (5 x 12 = 60)

Answer All the Questions

11. What is Maraculay's method? Where is it used? Find an expression for deflection at any section of a simply supported beam with an eccentric point load, using Macaulay's method.

(or)

12. (a) A cantilever of length 3m is carrying a point load of 25 kN at the free end. If the moment of inertia of the beam = 10^8 mm^4 and value of E = 2 x 10^5 N/mm^2, find the slope and defection of the cantilever at the free end. (4)

(b) A cantilever of length 2m carries a uniformly distributed load 2 kN/m over a length of 1m from the free end, and a point load of 1 kN at the free end. Find the slope and deflection at the free end if E = 2 x 10^5 N/mm^2, and I = 6.667 x 10^7 mm^4. (8)

13. Using Euler's formula, calculate the critical stresses for a series of struts having slenderness ratio of 40, 80, 120, 160 and 200 under the following conditions.
(a) both ends hinged and
(b) both ends fixed. Take E = 2.05 x 10^5 N/mm^2

(or)

14. A hollow cylindrical cast iron column is 4m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety of 5. Take the internal diameter as 0.8 times the external diameter. Take f_c = 550 N/mm^2 and a =1/1600 in Rankine's formula.

15. A boiler shell is to be made of 15mm thick plate having a limiting tensile stress of 120 N/mm^2. If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively, determine
(a) the maximum permissible diameter of the shell for an internal pressure of 2 N/mm^2, and

(b) permissible intensity of internal pressure when the shell diameter is 1.5m.

(or)

16. A steel tube of 200mm external diameter is to be shrunk on to another steel tube of 60mm internal diameter. The diameter of the junction after shrinking is 120mm. Before shrinking on the difference of diameters at the junction is 0.08mm. Calculate the radial pressure at the junction and the hoop stresses developed in the two tubes after shrinking on. Take $E = 2 \times 10^5$ N/mm^2.

17. Derive an expression for the major and minor principal stresses of an oblique plane, when the body is subjected to direct stresses in two mutually perpendicular directions accompanied by a shear stress.

(or)

18. A bending moment M applied to a solid shaft carries a maximum direct stress σ at elastic failure. Determine the numerical relationships between M and a twisting moment T which, acting alone on the shaft , will produce elastic failure, according to each of the following theories of failure.
(a) Maximum principal stress (b) Maximum principal strain
(c) Maximum strain energy (d) Maximum shear stress
(e) Shear strain energy. [Poisson's Ratio = 0.30]

19. A beam of angle section 150 mm x 100 mm x 10 mm is simply supported beam over a span of 1.6 m with 150 mm leg vertical. A uniformly distributed vertical load of 10 kN/m is applied through out the span. Determine the following. Take E = 210 GN/m^2.
(a) Maximum bending stress (b) Direction of neutral axis and c. Deflection at the centre.

(or)

20. Locate the shear centre of the section shown in Fig.1 and 2.

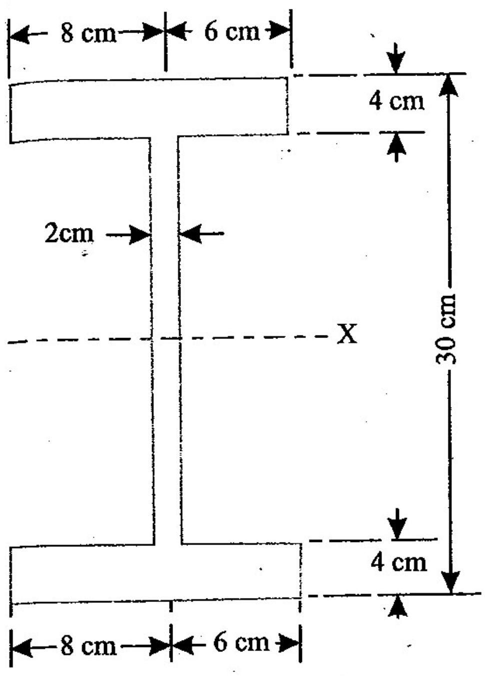
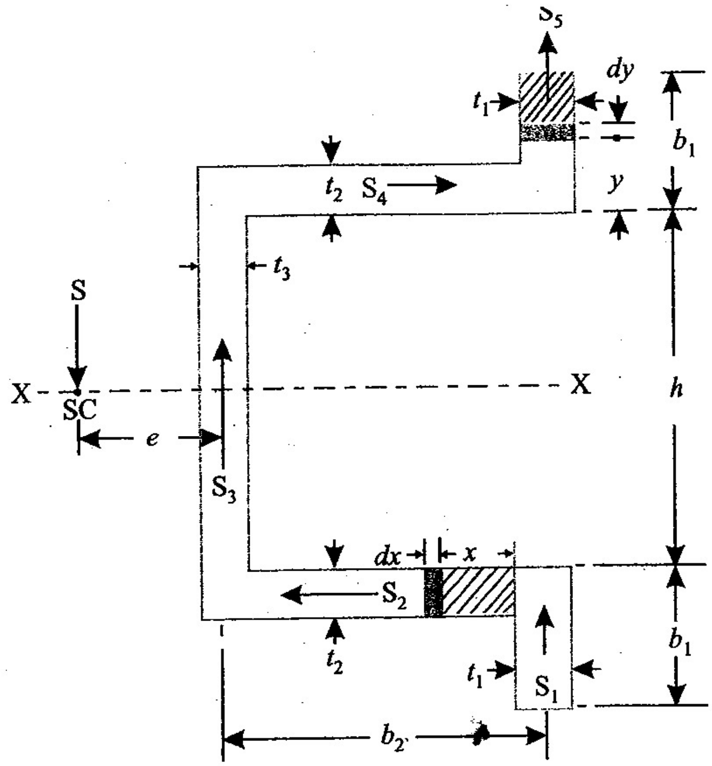

8 cm
6 cm
4 cm
2cm
X
30 cm
4 cm
8 cm
6 cm

Fig. 1


S5
dy
t1
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X
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X
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t1
S1
b2

Fig. 2.