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: 20402(2002/2003/2005)/6C0082 Time: 3 Hours
Date: 24-04-2008 Session: FN

PART – A (10 x 2 = 20)

Answer All the Questions

1. Differentiate between determinate and indeterminate beams?

2. Draw the conjugate beam of a cantilever beam subjected to point load at the free end.

3. What are the assumptions made in the Euler's theory for long columns.

4. What is meant by effective length of columns?

5. What are the stresses set up in a thin cylinder subjected to internal fluid pressure?

6. What is meant by shrink fit in thick cylinders?

7. What are the significant of failure theories?

8. State distortion energy theory of failure.

9. Define shear centre.

10. What are the causes for unsymmetrical bending?

PART – B (5 x 12 = 60)

Answer All the Questions

11. A beam of length 5m and of uniform rectangular cross section is supported at its ends and carries uniformly distributed load over the entire span. Calculate the depth of the section if the maximum permissible bending stress is $8N/mm^2$ and central deflection is not to exceed 10mm.

(or)

12. Determine the slope at supports, deflection under the load and maximum deflection of a simply supported beam of length 10m, which carries a point load of 10kN at a distance of 6m from the left end. Take $E = 2 \times 10^5 N/mm^2$ and $I = 1 \times 10^8 mm^4$.

13. Derive the expression for Euler's crippling load when both ends of the column are fixed.

(or)

14. A hollow steel column whose outside diameter is 200mm has a thickness of 20mm. It is 4.5m long and is hinged at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 4. Calculate the slenderness ratio and the ratio of Euler's and Rankine's critical loads. Take $f_c = 550N/mm^2$ a = 1/1600 in Rankine's formula and $E = 9.4 \times 10^5 N/mm^2$.

15. A boiler is subjected to an internal steam pressure of $3N/mm^2$. The thickness of the boiler plate is 2.5cm and the permissible tensile stress is $125N/mm^2$. Find out the maximum diameter when the efficiency of longitudinal joint is 90% and that of circumferential joint is 35%.

(or)

16. A steel cylinder of 200mm external diameter is to be shrunk to another steel cylinder of 100mm internal diameter. After shrinking, the diameter at the junction is 150mm and the radial

pressure at the junction is 12.5N/mm^2. Find the original difference in radii at the junction. Take E = 2 x 10^{5}N/mm^2.

17. A bolt is under an axial thrust of 7.2kN together with a transverse shear force of 3.6kN. Calculate the diameter of the bolt according to

    (a) Maximum principal stress theory
    (b) Maximum shear stress theory
    (c) Maximum strain energy theory

    Take elastic limit in simple tension = 200N/mm^2, factor of safety = 3 and Poisson's ratio = 0.3.

(or)

18. State and explain and five theories of failure.

19. Locate the shear centre for a channel section.

(or)

20. A cantilever beam of span 4m has a rectangular cross section 40mm wide and 60mm deep. The beam is subjected to a concentrated load of 3kN which is inclined at an angle of 30° to the vertical plane and located at the free end of the cantilever. Calculate the bending stress developed at points A, B and C near the fixed end.