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

Course & Branch :B.E - CIVIL
Title of the Paper :Mechanics of Solids – II   Max. Marks :80
Sub. Code :6C0082   Time : 3 Hours
Date :19/11/2009   Session :AN

PART - A   (10 x 2 = 20)
Answer ALL the Questions

1. State Conjugate beam Theorem.

2. A simply supported beam of span ‘1’ is carrying point load W at the mid span. What is the deflection at the centre of the beam?

3. Define Slenderness ratio.

4. What is “Equivalent length of a column”?

5. What are the types of Stresses developed, when thin cylinders are subjected to internal fluid pressures?

6. Write the importance of Lame’s Theory.

7. Define Principal Stress.

8. Name the failure theory which is suitable for Ductile material.

9. Write two reasons for unsymmetrical bending.

10. Write the principle involved in locating the shear centre for a Cross Section of a beam.

PART – B   (5 x 12 = 60)
Answer ALL the Questions

11. A steel girder of uniform section, 14 metres long is simply supported at its ends. It carries concentrated load of 902kN and 60kN at two points 3 metres and 4.5 metres from the two ends respectively. Using Macaulay's method calculate:
(a) The deflection of the girder at the points under the two loads.
(b) The maximum deflection.
Take: $I = 64 \times 10^{-4}\ m^4$ and $E = 210 \times 10^6\ KN/m^2$.

(or)

12. A cantilever beam of 3m span is 15cm wide and 23cm deep. It carries a uniformly distributed load of 20kN/m over its whole span and 25kN load at the free end. Using moment area method, calculate the maximum slope and deflection. Take: $E = 210\ GN/m^2$.

13. A bar of length 4m when used as a simply supported beam and subjected to a u.d.l of 30kN/m over the whole span deflects 15mm at the centre. Using Euler's formula, determine the crippling loads when it is used as a column with following end conditions:
(a) Both ends pin-jointed
(b) One end fixed and other end hinged
(c) Both ends fixed

(or)

14. A mild steel column is of hollow circular section 100mm as external diameter and 80mm as internal diameter. The column is 2.4m long and is hinged at both the ends. Using Perry's formula, calculate the maximum permissible load with a eccentricity of 16mm, if the maximum compressive stress is limited to $80 N/mm^2$
Take: $E = 2 \times 10^5 N/mm^2$.

15. A cylindrical vessel whose ends are closed by means of rigid flange Plates is made of steel plate 3mm thick. The internal length and diameter of vessel are 50cm and 25cm respectively.

Determine the longitudinal and circumferential stresses in the cylindrical shell due to an internal fluid pressure of $3MN/m^2$. Also calculate increase in length, diameter and volume of the vessel

Take:E = 200 GN/m^2 and Poisson's ratio = 0.3

(or)

16. A spherical shell of 120mm internal diameter has to withstand an Internal pressure of $30MN/m^2$. If the permissible tensile stress is $80MN/m^2$, calculate the thickness of the shell.

17. A bolt is under an axial thrust of 9.6kN together with a transverse force of 4.8kN. Calculate its diameter according to
    (a) Maximum principal stress theory
    (b) Maximum shear stress theory

    Factor of safety = 3, Yield strength of material of bolt = 270 N/mm^2 Piosson's ratio = 0.3

(or)

18. At a certain point in a strained material, the stresses on two planes, at right angle to each other are $20N/mm^2$ and $10N/mm^2$ both tensile. They are accompanied by a shear stress of a magnitude of $10N/mm^2$. Using analytical method, find the location of Principal planes and Evaluate the Principal Stresses?

19. A channel section has flanges 12cm x 2cm and web 16cm x 1cm. Determine the shear centre of the channel.

(or)

20. A cantilever, of I section, 2.4m long is subjected to a load of 600N at the free end. This load is inclined at 20° to vertical and passing through the centroid of the section. I section has the following Dimensions: Flanges 30mm x 2.5mm and Web 45mm x 2.5mm. Determine the resulting bending stress at the corners.