Register Number.....

B.TECH. DEGREE EXAMINATIONS: APRIL /MAY 2009

Third Semester

TEXTILE TECHNOLOGY

U 07TT301 Mechanics of Solids

Time: Three Hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (20 × 1 = 20 Marks)

1. The deformation per unit length is known as

   A. stress B. strain C. Hooker's law D. volumetric strain

2. The ratio between lateral strain to linear strain is called as

   A. Yield stress B. Bulk modulus C. Poisson's ratio D. Rigidity modulus

3. The relationship between young modulus and shear modulus is

   A. $E = 2G(1-\mu)$ B. $E = 2G(2-\mu)$ C. $E = 3G(1+\mu)$ D. $E = 2G(1+\mu)$

4. The magnitude of direct stress, across a plane is known is

   A. Principle stress B. Principle plane C. Normal plane D. Shear stress

5. If a cantilever beam is subjected to a point load at its free end, then the shear force under the point load is

   A. Zero B. Less than the Load C. Equal to the Load D. More than the Load

6. The B.M at the centre of a simply supported beam carrying a udl is

   A. w.l B. $\frac{wl^2}{8}$ C. $\frac{wl^2}{4}$ D. $\frac{wl}{2}$

7. When shear force at a point is Zero, then bending moment at that point will be

   A. Maximum B. Minimum C. Zero D. Infinity

8. The section modulus of a rectangular section having width (b) and depth is (d)

   A. $\frac{bd}{6}$ B. $\frac{bd^2}{6}$ C. $\frac{bd^3}{6}$ D. $\frac{b^2d}{6}$

9. When a rectangular section of a beam is subjected to a shearing force, the ratio of maximum shear stress to the average shear stress is

   A. 2.0 B. 1.75 C. 1.5 D. 1.25

10. In a triangular section, the maximum shear stress occurs at

    A. apex of the height B. Mid of the height

    C. 1/3 of the height D. Base of the height

11. A simply supported beam of span (l) is subjected to a udl (w) per unit length over t whole span. The maximum deflection at the centre if the beam is

A. $\frac{(5wl^5)}{48EI}$ B. $\frac{(5wl^4)}{96EI}$ C. $\frac{(5wl^4)}{192EI}$ D. $\frac{(5wl^3)}{384EI}$

12. A simply supported beam carries a point load (W) at its centre. The slope at its suppo is

A. $\frac{wl^2}{16EI}$ B. $\frac{wl^3}{16EI}$ C. $\frac{wl^2}{48EI}$ D. $\frac{wl^3}{48EI}$

13. Torque transmitted by a solid shaft of diameter (D), when subjected to a shear stress (is equal to

A. $\frac{\pi\ \lambda D^2}{16}$ B. $\frac{\pi\ \lambda D^3}{16}$ C. $\frac{\pi\ \lambda D^2}{32}$ D. $\frac{\pi\ \lambda D^3}{32}$

14. Polar moment of inertia of a solid shaft of diameter (D) is

A. $\frac{\pi D^3}{16}$ B. $\frac{\pi D^4}{16}$ C. $\frac{\pi D^3}{32}$ D. $\frac{\pi D^4}{32}$

15. When a solid shaft is subjected to torsion the shear stress induced in the shaft at it cent is

A. Zero B. Minimum C. Maximum D. Average

16. When a closely coiled spring is subjected to an axial load, it is said to be under

A. Bending B. Shear C. Torsion D. Bulk modular

17. In a thin shell, the ratio of longitudinal stress to the circumferential stress is

A. (1/2) B. (3/4) C. 1 D. 2

18. A thin cylindrical shell of diameter (d), length (l) is subjected to an internal pressu (p). The circumferential stress in the shell is

A. (Pd/2t) B. (Pd/4t) C. (Pd/6t) D. (Pd/8t)

19. A column of length is hinged at its both ends. Its equivalent length will be equal to

A. 2l B. l C. (l/2) D. $(l/\sqrt{2})$

20. The slenderness ratio of a long column is

A. 10 to 20 B. 20 to 30 C. Above 80 D. 50 to 60

PART B (5 x 16 = 80 Marks)

21. (a)A load of 270 KN is carried by a short concrete column 250 mm x 250 mm in size. The column is reinforced with 8 bars of 16 mm diameter. Find the stresses in concrete and steel. If the modulus of elasticity for the steel is 18 times that of concrete.If the stress in concrete is not to exceed $5N/mm^2$, find the area of steel required, so that the column may carry a load of 500 KN.

(OR)

(b)The stress at a point of a machine component are 150 MPa and 50 Mpa both tensile. Find the intensities of normal, shear and resistant stresses on plane inclined at an angle of 55^o with the axis of major tensile stress. Also find the magnitude of the maximum shear stress in the component.

22. (a)A cantilever beam AB 1.8 m long carries a point load of 2.5 KN at its free end and a uniformly distributed load of 1 KN/m over the entire span of beam. Draw the shear force and Bending moment diagrams.

(OR)

(b)A simply supported beam 6m long is carrying a udl of 5 KN/m over a length of 3m from the right end. Draw the S.F and B.M. diagrams for the beam and also calculate the maximum B.M on the section.

23. (a)A T-shaped C.S of a beam of flange dimension 200 mm x 50 mm and web dimensions 200 mm x 50 mm is subjected to a vertical shear force of 100 KN. Calculate the shear stress at important points and draw shear stress distribution diagrams across the section of beam

(OR)

(b)A horizontal steel girder having uniform C.S is 14m long and is simply supported at its ends. It carries two concentrated loads of 12KN and 8KN acting at 3m and 9.5m from the left end support respectively. Calculate the deflections of the beam under the loads and maximum deflection. Take E = 200 GPa and I = 160 x 10^6 mm^4.

24. (a)A solid shaft is subjected to a torque of 1.6KN/m. Find the necessary diameter of the shaft, if the allowable shear stress 60 MPa and the allowable twist is 1^0 for every 20 diameters length of the shaft. Take C = 80 GPa.

(OR)

(b)A closely coiled helical spring is made of 6 mm wire. The maximum shear stress and deflection under a 200N load is not to exceed 80 MPa and 11 mm respectively. Determine the number of coils and their mean diameter. Take shear modulus of spring is 84 GPa.

25. (a)Find the Euler's crippling load for a hollow cylindrical steel column of 38mm external diameter and 2.5mm thick. Take length of the diameter and hinged at its both ends. Take E = 205 GPa.Also determine the crippling load by Rankine's formula using constants as 335 Map and (1/7500).

(OR)

(b)A cylindrical thin drum 800 mm in diameter and 4m long is made of 10mm thick plates. If the drum is subjected to an internal pressure of 2.5 Map, determine its changes in diameter, length and volume. Also find the hoop stress, longitudinal stress and maximum shear stress. Take E = 200 GPa and Poisson's ratio as 0.25.

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