9. (A). Find the young's modulus of a rod of diameter 30mm and of length 300mm which is subjected to a tensile load of 60 KN and the extension of the rod is equal to 0.4 mm.

(B). The ultimate stress for a hollow steel column which carries an axial load of 2MN is 500 N/mm^2 .If the external diameter of the column is 250mm, determine the internal diameter Take the factor of safety as 4.0

10. The extension in a rectangular steel bar of length 400mm and thickness 3mm is found be 0.21mm .The bar tapers uniformly in width from 20mm to 60mm E for the bar is $2x\ 10^5$ N/mm^2.Determine the axial load on the bar.

UNIT II

BEAMS – LOADS AND STRESSES

PART- A (2 Marks)

1. State the different types of supports.
2. What is cantilever beam?
3. Write the equation for the simple bending theory.
4. What do you mean by the point of contraflexure?
5. What is mean by positive or sagging BM?
6. Define shear force and bending moment.
7. What is Shear stress diagram?
8. What is Bending moment diagram?
9. What are the different types of loading?
10. Write the assumption in the theory of simple bending.
11. What are the types of beams?
12. When will bending moment is maximum.
13. Write down relations for maximum shear force and bending moment in case of a cantilever beam subjected to uniformly distributed load running over entire span.
14. Draw the shear force diagram for a cantilever beam of span 4 m and carrying a point load of 50 KN at mid span.
15. Sketch (a) the bending stress distribution (b) shear stress distribution for a beam of rectangular cross section.
16. A cantilever beam 3 m long carries a load of 20 KN at its free end. Calculate the shear force and bending moment at a section 2 m from the free end.
17. Derive the relation between the intensity of load and shear force, in bending theory.
18. A clockwise moment M is applied at the free end of a cantilever. Draw the SF and BM diagrams for the cantilever.
19. What is maximum bending moment in a simply supported beam of span 'L' subjected to UDL of 'w' over entire span?
20. What is mean by negative or hogging BM?

PART- B (16 Marks)

1. Three blanks of each 50 x200 mm timber are built up to a symmetrical I section for a beam. The maximum shear force over the beam is 4KN. Propose an alternate rectangular section of the same material so that the maximum shear stress developed is same in both

sections. Assume then width of the section to be 2/3 of the depth.

2. A beam of uniform section 10 m long carries a udl of 2KN/m for the entire length and a concentrated load of 10 KN at right end. The beam is freely supported at the left end. Find the position of the second support so that the maximum bending moment in the beam is as minimum as possible. Also compute the maximum bending moment

3. A beam of size 150 mm wide, 250 mm deep carries a uniformly distributed load of w kN/m over entire span of 4 m. A concentrated load 1 kN is acting at a distance of 1.2 m from the left support. If the bending stress at a section 1.8 m from the left support is not to exceed 3.25 N/mm^2 find the load w.

4. A cantilever of 2m length carries a point load of 20 KN at 0.8 m from the fixed end and another point of 5 KN at the free end. In addition, a u.d.l. of 15 KN/m is spread over the entire length of the cantilever. Draw the S.F.D, and B.M.D.

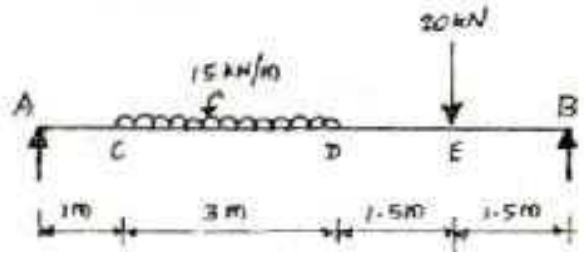
5. A Simply supported beam of effective span 6 m carries three point loads of 30 KN, 25 KN and 40 KN at 1m, 3m and 4.5m respectively from the left support. Draw the SFD and BMD. Indicating values at salient points.

6. A Simply supported beam of length 6 metres carries a udl of 20KN/m throughout its length and a point of 30 KN at 2 metres from the right support. Draw the shear force and bending moment diagram. Also find the position and magnitude of maximum Bending moment.

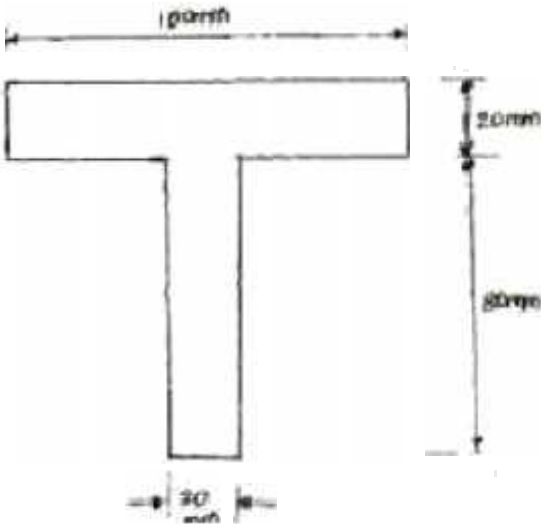
7. A Simply supported beam 6 metre span carries udl of 20 KN/m for left half of span and two point loads of 25 KN end 35 KN at 4 m and 5 m from left support. Find maximum SF and BM and their location drawing SF and BM diagrams.

8. A cantilever 1.5m long is loaded with a uniformly distribution load of 2 kN/m run over a length of 1.25m from the free end it also carries a point load of 3kn at a distance of 0.25m from the free end. Draw the shear force and bending moment diagram of the cantilever.

9. For the simply supported beam loaded as shown in Fig. , draw the shear force diagram and bending moment diagram. Also, obtain the maximum bending moment.



10. A cast iron beam is of T-section as shown in Fig. The beam is simply supported on a span of 6 m. The beam carries a uniformly distributed load of 2kN/m on the entire length (span). Determine the maximum tensile and maximum compressive stress.



UNIT III
TORSION
PART-A (2 Marks)

1. Define torsional rigidity of the solid circular shaft.

2. Distinguish between closed coil helical spring and open coil helical spring.

3. What is meant by composite shaft?

4. What is called Twisting moment?

5. What is Polar Modulus ?

6. Define: Torsional rigidity of a shaft.

7. What do mean by strength of a shaft?

8. Write down the equation for Wahl factor.

9. Define: Torsional stiffness.

10. What are springs? Name the two important types.

11. How will you find maximum shear stress induced in the wire of a close-coiled helical spring carrying an axial load?

12. Write the expressions for stiffness of a close coiled helical spring.

13. Find the minimum diameter of shaft required to transmit a torque of 29820 Nm if the maximum shear stress is not to exceed 45 N/mm^2.

14. Find the torque which a shaft of 50 mm diameter can transmit safely, if the allowable shear stress is 75 N/mm^2.

15. Differentiate open coiled helical spring from the close coiled helical spring and state the type of stress induced in each spring due to an axial load.

16. What is spring index (C)?