



B.Tech III Semester Supplementary Examinations, July 2022
STRENGTH OF MATERIALS-I
(Civil Department)

Maximum Marks: 70

Date:23.07.2022 Duration: 3 hours

PART – A

Answer all the questions

(2 X 10 = 20 Marks)

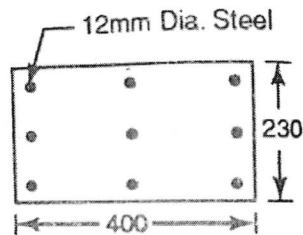
1. Define factor of safety
2. Define strain.
3. List the properties of BMD
4. Define bending moment diagram.
5. What is meant by Neutral axis of the beam?
6. What is meant by transverse loading of beam?
7. Define deflection.
8. State the boundary conditions that can be used for finding out the values of the constants of integration in case fixed end beams.
9. What is principal stress?
10. List out various types of theories of failures.

PART – B

Answer all the questions

(5 X 10 = 50 Marks)

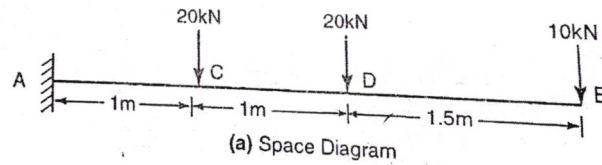
11. A reinforced concrete column of size 230 x 400 mm has 8 steel bars of 12 mm diameter as shown in figure. If the column is subjected to an axial compression of 600 kN, find the stresses developed in steel and concrete.



OR

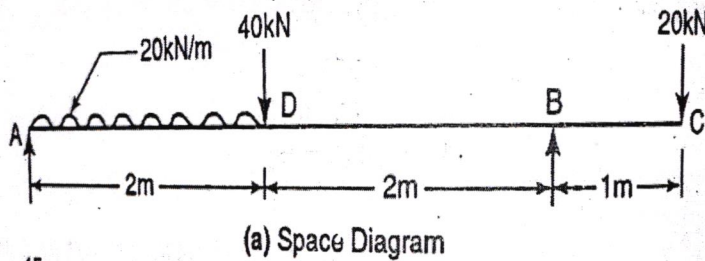
12. A circular rod of 100 mm diameter and 500 mm long is subjected to a tensile force of 1000 kN. Determine modulus of rigidity, bulk modulus and change in volume if Poisson's ratio is 0.3 and Young's modulus $E = 2 \times 10^5 \text{ N/mm}^2$.

13. Draw the shear force and bending moment diagram for the cantilever beam as shown in the figure.



OR

14. Draw the SFD and BMD of overhanging beam as shown in the figure.

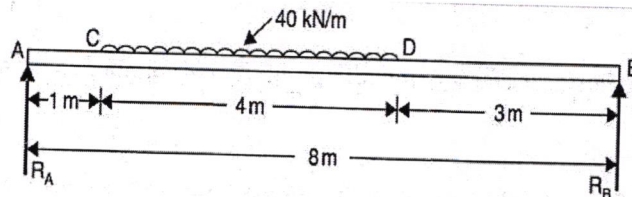


15. A timber beam of rectangular section is simply supported at the ends and carries a point load at the centre of the beam. The maximum bending stress is 12 N/mm^2 and maximum shearing stress is 1 N/mm^2 , find the ratio of span to depth.

OR

16. A square beam $20\text{mm} \times 20\text{mm}$ in section and 2m long is supported at the ends. The beam fails when a point load of 400N is applied at the centre of the beam. What uniformly distributed load per meter length will break a cantilever of same material 40mm wide, 60mm deep and 3m long?

17. A beam of length 8m is simply supported at its ends. It carries a uniformly distributed load of 40kN/m as shown in figure below. Determine the deflection of the beam at its midpoint and also the position of maximum deflection and maximum deflection. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 4.3 \times 10^8 \text{ mm}^4$.



OR

18. Determine the diameter of a bolt which is subjected to an axial pull of 12 kN together with a transverse shear force of 6kN , when the elastic limit in tension is 300 N/mm^2 , factor of safety = 3 and $\mu = 0.3$ using

- (i) Maximum principal stress theory
- (ii) Maximum principal strain theory

19. A hollow steel tube is to be used to carry an axial compressive load of 140 kN. The yield stress for steel is 250 N/mm^2 . A factor of safety of 1.75 is to be used in the design. The following three class of tubes of external diameter 101.6 mm are available.

Class	Thickness
Light	3.65 mm
Medium	4.05 mm
Heavy	4.85 mm

Which section do you recommend?

OR

20. A point in a strained material is subjected to the stresses as shown in figure. Locate the principal planes, and evaluate the principal stresses.

