

FACULTY OF ENGINEERING

B.E. 2/4 (Civil) I Semester (New) (Main) Examination, December 2011

STRENGTH OF MATERIALS – I

Time: 3 Hours]

[Max. Marks: 75

Note : Answer all questions from Part A, Answer any five questions from Part B.

Assume suitable data, if required.

PART – A



(25 Marks)

- | | |
|---|---|
| 1. Define Poisson's ratio. | 2 |
| 2. What are 'flitched beams' ? | 2 |
| 3. Explain the term "core of a section". | 2 |
| 4. Write the formulae for finding the stresses in a spherical shell. | 2 |
| 5. Write the relation between the no. of joints and the no. of members in a determinate pin-jointed truss. | 2 |
| 6. Give an example of a statically indeterminate problem in tension/compression. Explain. | 3 |
| 7. What is "moment of resistance" of a beam ? | 3 |
| 8. How do you find the stresses in a section subjected to a load eccentric about both x and y axes ? | 3 |
| 9. What are compound cylinders ? When are they used ? | 3 |
| 10. Illustrate the procedure of finding the resultant of a number of concurrent, coplanar forces graphically. | 3 |

PART – B

(5×10=50 Marks)

11. A steel rod 20 mm dia. passes centrally through a steel tube 30 mm internal dia. and 40 mm external dia. The tube is 800 mm long and is closed by rigid washers which are fastened by nuts threaded on the rod. The nuts are tightened until the compressive load on the tube is 10 kN. Calculate the stresses in the tube and the rod. Take $E = 200 \text{ GPa}$.

12. Obtain the S.F. and B.M. diagrams for the beam loaded as shown in Fig. 1 analytically

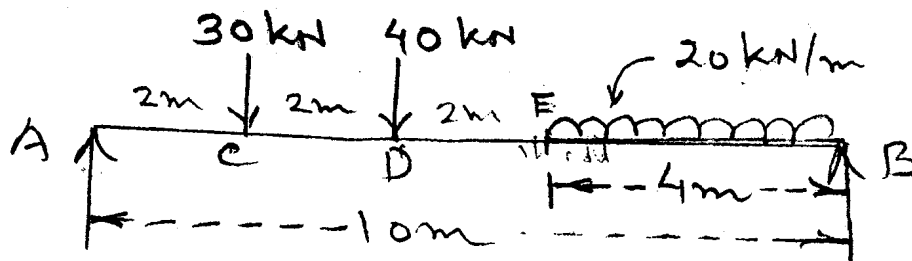


Fig. 1

13. Find out the forces in all the members of the pin-jointed, plane truss loaded as shown in Fig. 2, analytically or graphically.

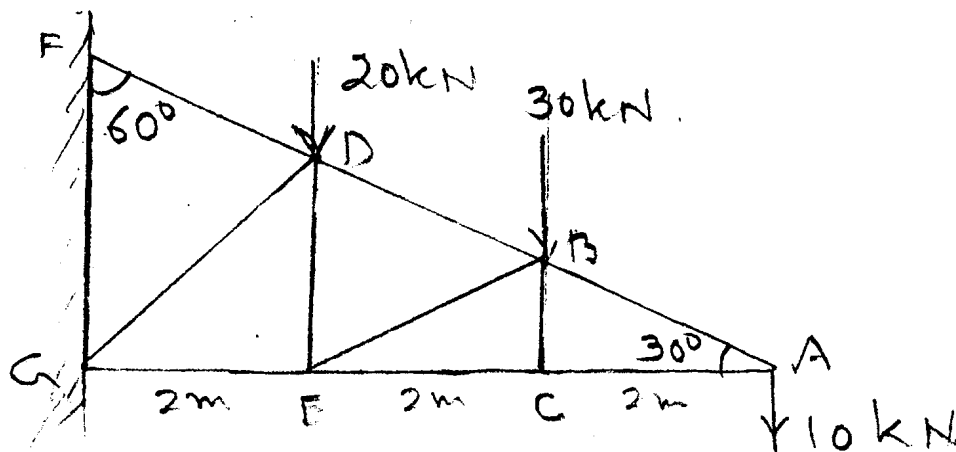


Fig. 2

14. Obtain the shear stress distribution for a circular section of radius "r", subjected to S.F. = F. Sketch it. Find the ratio of max shear stress to mean shear stress.
15. A cylindrical shell, 3m long, 1m in internal dia. is subjected to an internal pressure of 20 N/mm^2 . Calculate the thickness of metal required if the permissible stress is not to exceed 650 N/mm^2 . Calculate the changes in dimensions of the shell if $E = 2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio = 0.25.
16. A short hollow column having outer sides (2m x 2m) and inner sides (1.5 m x 1.5 m) supports a vertical load of 100 kN on the inner diagonal, at a distance of 0.5 m from the vertical axis of the column passing through centre O. Find the stresses developed at the 4 corners of column top face.
17. A spherical shell, 400 mm in radius, thickness of metal 10 mm is completely filled with water at atmospheric pressure. How much additional fluid can be pumped till the pressure increases by 50 N/mm^2 if $E = 2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio = 0.25.