285

024

April 2016

Time – Three hours
(Maximum Marks: 75)

[N.B: (1) Answer any fifteen questions in PART – A and division (A) or division (B) of each question in PART – B.

(2) Each question carries 1 (one) mark in PART – A and 12 (twelve) marks in PART – B.]

PART – A

1. Name any two mechanical properties of materials.
2. Define the term bulk modulus.
3. What do you mean by limit of proportionality?
4. Mention the significance of percentage of reduction in area of cross-section.
5. Sketch a roller support with its reaction components.
6. What are determinate beams?
7. Define the term bending moment.
8. Write down the relationship between intensity of load, SF and BM.
9. Sketch any one unsymmetrical section and mark its centroidal position.
10. Write down the general expression for locating the centroid of an irregular section.
11. State the equation of parallel axis theorem.
12. Write down the expression for section modulus of an hollow circular section.
13. Write down the theory of simple bending equation.
14. Define the term flexural rigidity.
15. State any one assumption made in theory of pure torsion.
16. Write down the formula for power transmitted by a shaft.
17. Mention any two common types of truss.
18. Sketch any one method of designating a force.

[Turn over.....

19. State different methods of analysis of frames.

20. What is the purpose of using Bow's notation?

PART – B

Marks

21. (A) A bar of 30mm diameter under a pull of 60kN elongates 0.10mm on a gauge length of 200mm. If the decrease in diameter is 0.004mm, calculate Poisson's ratio, Young's modulus, bulk modulus and modulus of rigidity. 12

(Or)

(B) The following data refer to a tension test conducted on a mild steel bar of 16mm diameter with a gauge length of 200mm: 12

Elongation at a load of 30kN	=	0.144m
Diameter of bar at fracture	=	10.20mm
Final length of the bar	=	253mm
Load at yield point	=	70kN
Ultimate load	=	130kN
Breaking load	=	110kN

Calculate (1) Young's modulus, (2) Yield stress, (3) Ultimate stress, (4) Breaking stress (Nominal), (5) Breaking stress (Actual),and (6) Percentage of elongation and percentage reduction in area.

22. (A) Draw the SFD and BMD for the cantilever beam shown in figure-1. 12

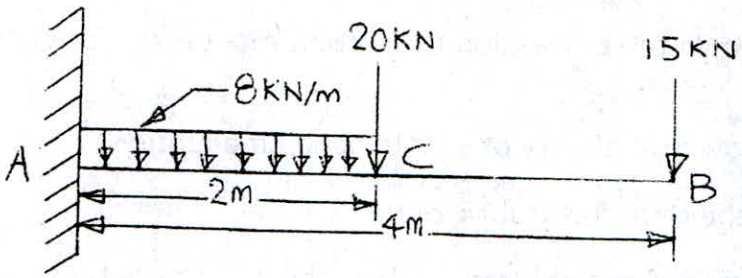

FIGURE-1

(Or)

Marks

(B) Draw the SFD and BMD for the overhanging beam shown in figure-2. 12

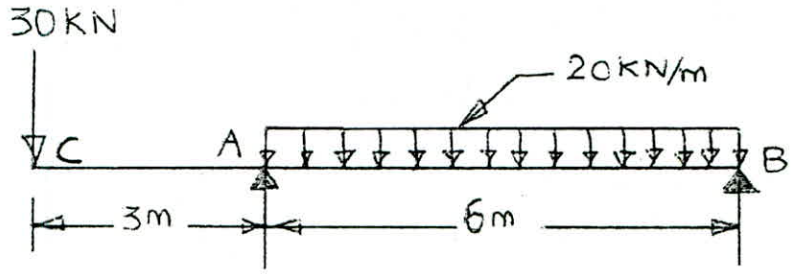

FIGURE-2

23. (A) (i) State and prove perpendicular axis theorem. 6

(ii) A channel section is 150mmx75mm overall (150mm vertical). The thickness of flanges and web are 9mm and 6mm respectively. Find the centroidal position ($\bar{x}$ and $\bar{Y}$)of the channel section. 6

(Or)

(B) A T-section has a flange width of 250mm and thickness of 20mm. The overall depth of the section is 450mm and thickness of web is 20mm. Locate the centroidal position and determine the moment of inertia about XX and YY axes. 12

24. (A) Determine the magnitude and nature of forces in the members of truss shown in figure-3 by method of joints. Tabulate the results. 12

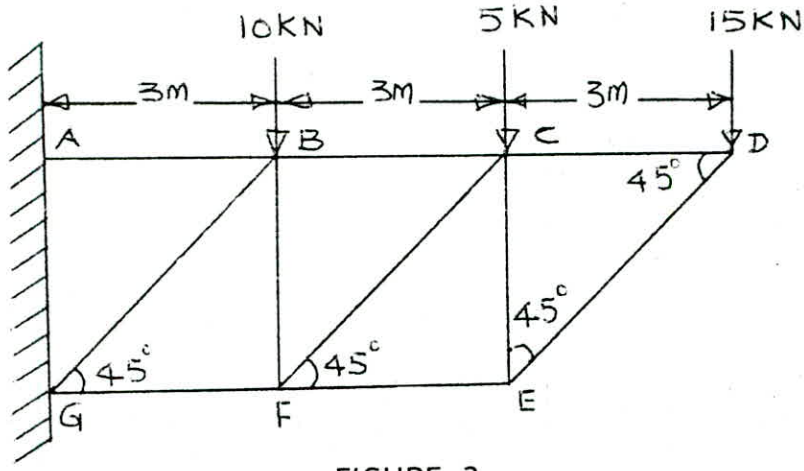

FIGURE-3

(Or)

[Turn over.....

Marks

(B) Determine the magnitude and nature of forces in the members of truss shown in figure-4 by graphical method. Tabulate the results. 12

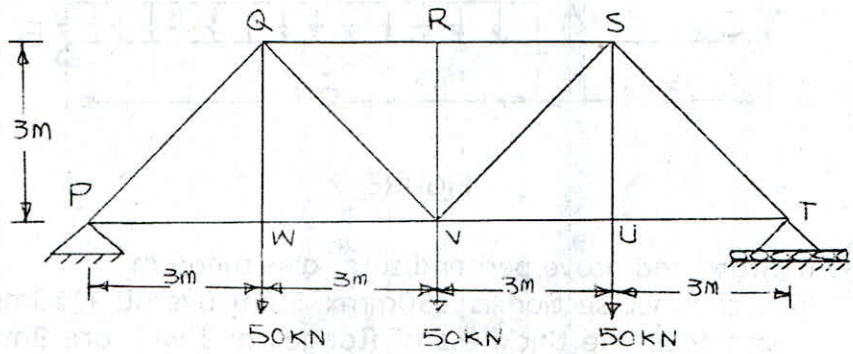

FIGURE-4

25. (A) A simply supported beam of rectangular section 250mmx500mm is 6m long. It carries an udl of 15kN/m over the entire span and a concentrated load of 10kN each at 2.5m from both supports. Determine the maximum bending stress in the beam. Sketch the bending stress diagram over the depth of the beam. 12

(Or)

(B) A solid circular shaft transmits 100kW at 160rpm. The maximum shear stress is limited to 60N/mm^2 and G=8x10^{4}N/mm^2. Determine the following (i) Torque produced by the shaft (ii) Diameter of the shaft and (iii) Length of the shaft. 12
