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C16–C–105

5016

BOARD DIPLOMA EXAMINATION, (C–16)

MARCH/APRIL—2018

DCE—FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

Time : 3 hours] [*Total Marks* : 80

PART—A 2×15=30

Instructions : (1) Answer *any* **fifteen** questions.

(2) Each question carries **two** marks.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define the following terms :

(a) Base units

(b) Derived units

2. Give the SI units of force and velocity.

3. A body is acted upon by an upward force of 200 N and a horizontal force of 400 N. Find the magnitude of their resultant.

4. Define coplanar and non-coplanar forces.

5. State triangle law of forces.

6. Write any two properties of couple.

7. Define centre of gravity.

8. Locate the position of centroid with neat diagram of the following :

(a) Rectangle

(b) Triangle

9. What is meant by axis of symmetry?

10. Find the moment of inertia of a triangle about its base having height = h m and base width = b m.

11. State the parallel axis theorem.

12. Find the radius of gyration of circle having diameter d.

13. Find the moment of inertia of circular section whose external diameter is 60 mm and internal diameter is 50 mm about its centroidal axis.

14. Define moment of inertia.

15. Define modulus of rigidity.

16. Define the following terms :

(a) Stress

(b) Poisson's ratio

17. State Hook's law.

18. The bulk modulus of material is 125 GPa and Young's modulus is 200 GPa. What is its Poisson's ratio?

19. Define roof resilience and modulus of resilience.

20. A wooden tie of 50 mm × 100 mm size is 2 m long. It is subjected to an axial pull of 20 kN. Find out the elongation of the tie if the modulus of elasticity wood is 1 10^4 N / mm^2.

PART—B

10×5=50

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

21. Determine the magnitude and direction of the resultant for the system of coplanar concurrent forces given in Fig. 1 :

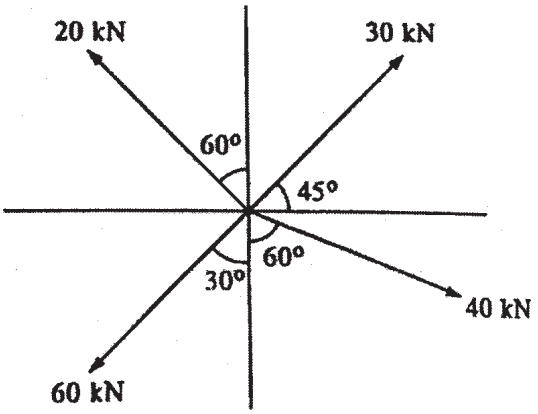

Fig. 1

22. Determine the reactions that supports the beam shown in Fig. 2 :

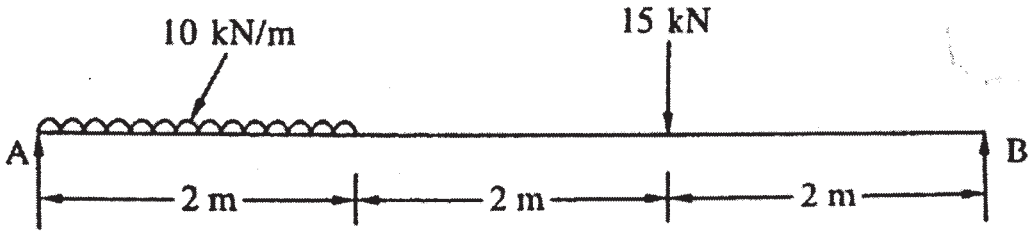

Fig. 2

23. Find the centroid of an unequal angle 200 mm × 150 mm × 12 mm with its longer leg vertically downwards.

24. From the following, calculate the MI of an unsymmetrical I-section :

Top flange—100 mm × 20 mm
Web—10 mm × 120 mm
Bottom flange—80 mm × 20 mm

25. Find the moment of inertia of a T-section having flange 250 mm × 50 mm and web 200 mm × 50 mm.

26. A bar ABCD 40 mm in diameter is subjected to axial forces as shown in Fig. 3. The material is the same throughout the bar. Find the deformation of bar under the applied loads.

Take, E as 1 05 10^5 N / mm^2.

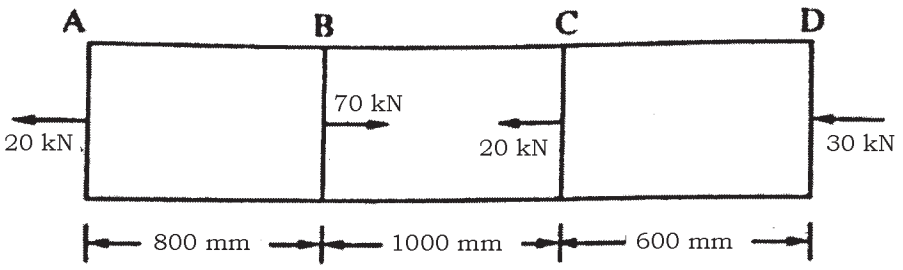

Fig. 3

27. A mild steel bar 25 mm diameter and 400 mm long is encased in a brass tube whose external diameter is 50 mm and 8 mm thick. The composite bar is heated through 55 °C. Calculate the stresses induced in each metal.

[Take, $_s$ 12 10^{-6} C, $_b$ 19 10^{-6} C, E_s 200 GPa and E_b 100 GPa]

28. A weight of 3 kN falls through a height of 15 mm on a collar rigidly attached to the lower end of a vertical bar, 3 m long and area of cross-section 800 mm^2. Find the—

(a) maximum value of instantaneous stress;

(b) maximum instantaneous elongation;

(c) maximum resilience;

(d) static force to produce the maximum stress;

assuming E 200 GPa.

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