



c16-c-105

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**BOARD DIPLOMA EXAMINATION, (C-16)
MARCH/APRIL—2018
DCE—FIRST SEMESTER EXAMINATION**

ENGINEERING MECHANICS—I

Time : 3 hours]

[*Total Marks* : 80

PART—A

2×15=30

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

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

1. Define 'mechanics'. State the importance of study of engineering mechanics. 1+1=2
2. Write SI units for the following : ½×4=2
 - (a) Work
 - (b) Force
 - (c) Moment of force
 - (d) Pressure
3. Define 'force'. List any two characteristics of force. 1+1=2
4. Distinguish between scalar and vector quantities.
5. Determine the resultant of two coplanar concurrent forces 30 kN and 40 kN acting with an angle of 90° between them.

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6. State ^{*} 'triangle law of forces'.
7. Define 'equilibrium of forces' and 'equilibrant'.
8. If the collinear forces 50 N and 200 N are pulling a body to right and 100 N pulling to left, determine the resultant and the equilibrant.
9. Define 'moment of force'.
10. State any two conditions of equilibrium of a rigid body subjected to a number of coplanar forces.
11. Distinguish between like and unlike parallel forces.
12. List any four types of beams.
13. Define 'centre of gravity' of an object.
14. State the positions of centroid of the following :
 - (a) Parallelogram
 - (b) Trapezium
- ^{*} 15. Write the steps to calculate centroid of any composite section by the method of moments.
16. Find the position of centroid of a semicircle of dia 50 cm.
17. Find the centroid of a T-section with flange 150 mm 10 mm and with web 150 mm 10 mm from top.
18. A masonry dam is trapezoidal in section with one face vertical. Its bottom width is 8 m, top width is 4 m and height of dam is 10 m. Find the position of centroid from base.
19. Locate the centroid of an equal angle section of size 100 mm 100 mm 10 mm from base.

20. Find the centroid position of the shaded portion of given figure 1 from base :

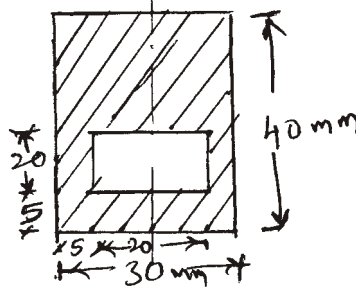


Fig. 1

PART—B

10×5=50

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

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

21. (a) State parallelogram law of forces. 3

- (b) If the two forces 300 N and 400 N act on a body at an angle of 60° with each other, determine the magnitude and direction of the resultant by using parallelogram law of forces.

300 N force being horizontal. 7

22. Determine the magnitude and direction of the resultant for the system of coplanar concurrent forces given in the figure 2 : 7+3

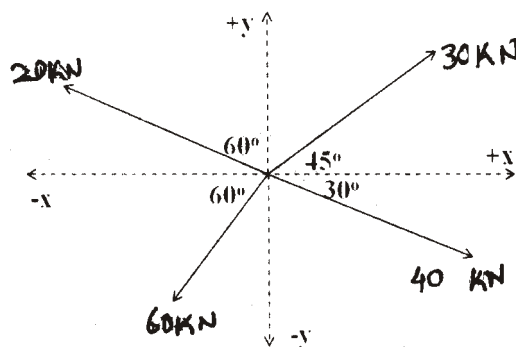


Fig. 2

23. (a) ^{*} State Lami's theorem and write the equation. 3
- (b) A weight of 25 N hangs from a point R by two strings PR and QR as in figure 3. Calculate the forces in the strings using Lami's theorem : 7

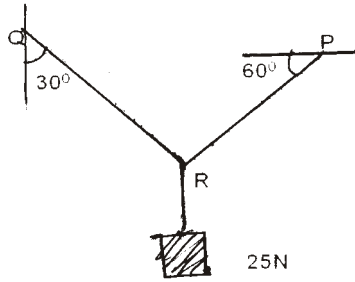


Fig. 3

24. (a) Define couple. State any four properties of a couple. 1+4
- (b) Two forces are involved in forming the moment of a couple of magnitude 250 N m. If the distance between these forces is 5 m, calculate the magnitude of each force. 5

25. ^{*} Determine the reactions at supports the beam shown in figure 4 : 10

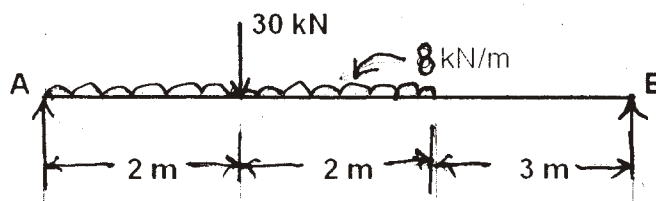


Fig. 4

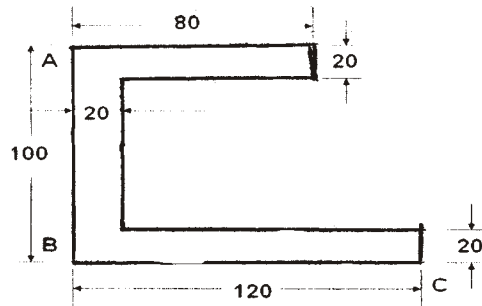
26. Find the position of centroid of an I-section from the bottom of the flange, when

Top flange : 200 mm 40 mm

Web : 40 mm 240 mm

Bottom flange : 300 mm 70 mm

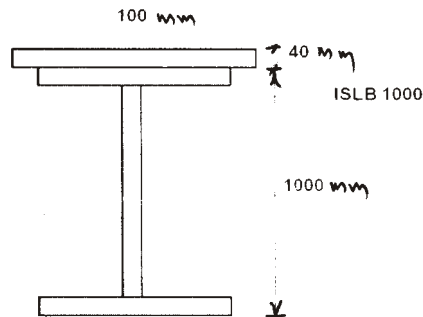
27. Determine the position of the centroid for the given channel section from reference lines *AB* and *BC* : 10



All dimensions are in mm

Fig. 5

28. Determine the position of centroid of an I-section ISLB 1000 having cross-section 1021 mm^2 with a plate 100 mm wide and 40 mm thickness welded to the top flange as shown in figure 6 : 10



All dimensions are in mm

Fig. 6
