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C14–C–105

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BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—2015

DCE—FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

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

PART—A 3×10=30

Instructions : (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define mechanics and engineering mechanics. 3

2. Define the terms force and moment. 1½+1½

3. Find the resultant and its distance from *A* for the parallel systems of forces as shown in Fig. 1 : 1½+1½

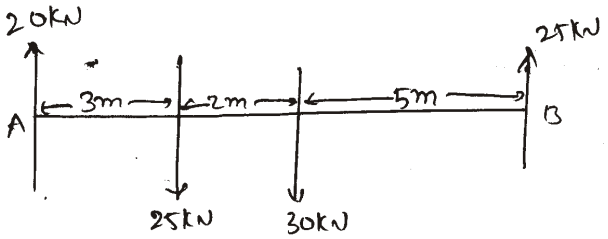

Fig. 1

4. A trapezoidal lamina has uniform batter on both sides. Its top width is 300 mm, bottom width is 400 mm and height is 800 mm. Determine the position of centroid from base. 3

5. Distinguish between centre of gravity and centroid. 1½+1½

6. Define the terms *(a)* moment of inertia and *(b)* radius of gyration. 1½+1½

7. Determine the polar moment of inertia of hollow circular section 340 mm external diameter and 50 mm thickness. 1+2

8. Define *(a)* ductility, *(b)* elasticity and *(c)* creep. 1+1+1

9. Draw the stress-strain diagram for a mild steel specimen subjected to a tensile force and indicate all the salient points. 2+1

10. A steel rod 30 mm diameter and 4000 mm long is subjected to an axial pull of 20 kN. Determine the elongation in the rod. E 2 10^5 N/mm^2. 1+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 criteria for valuation are the content but not the length of the answer.

11. Calculate the resultant and magnitude of the system of forces acting on a particle as shown in Fig. 2 :

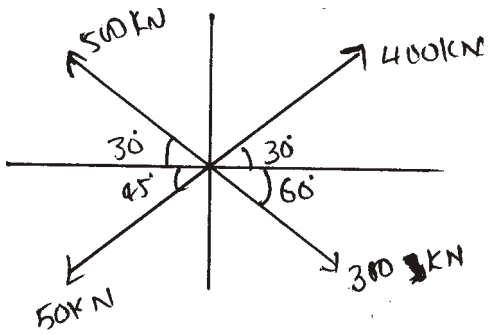

Fig. 2

12. Determine the reactions of the supports of the simply supported beam loaded as shown in Fig. 3 :

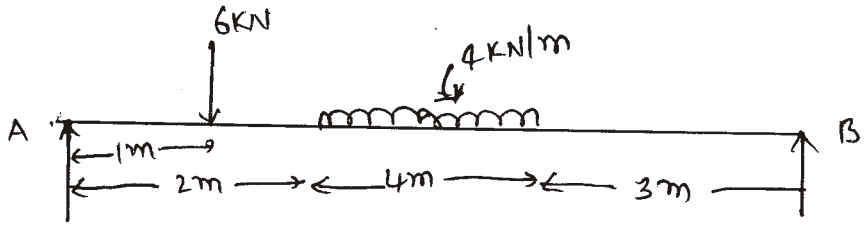

Fig. 3

13. Determine the centroid of the lamina above the base as shown in Fig. 4 :

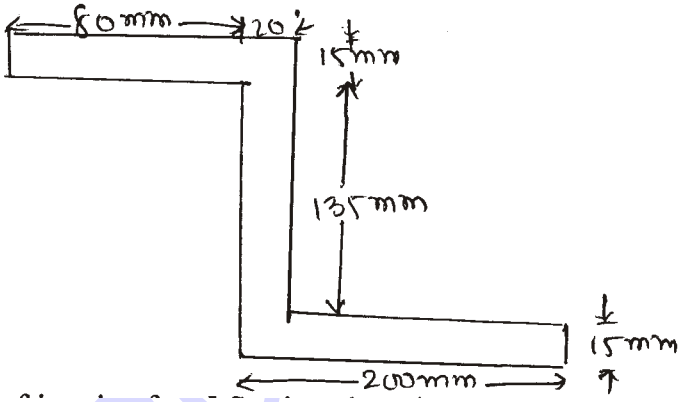

Fig. 4

14. Find the moment of inertia of an I-section about its centroidal *X-X* axis, with top flange 60 mm × 10 mm, bottom flange 120 mm × 10 mm, and web 80 mm × 10 mm, it has top cover plate of size 100 mm × 10 mm.

15. Two channels ISLC 400 are to be placed back to back so that I_{XX} and I_{YY} of sections are equal. Determine the clear distance between back of the channels. For each channels I_{XX} 1 4 10^8 mm^4, I_{YY} 4 6 10^6 mm^4, A = 5800 mm^2, C_{YY} 30 mm.

16. A load of 80 kN is suddenly applied on a bar 4 m long and 1000 mm^2 in cross-section. Calculate the maximum instantaneous stress produced and strain energy stored in the bar if E = 200 GPa.

17. A steel plate 120 mm wide, 14 mm thick and 5000 mm long carries an axial pull of 250 kN. Find the change in length, thickness and volume if $1/m = 0{\cdot}3$ and $E = 200$ GPa.

18. An RCC column 500 mm × 450 mm in section is provided with 6 nos. of 40 mm diameter bars. The column carries an axial load of 600 kN. Find the stresses in concrete and steel and also calculate the loads shared by concrete and steel if $m = 15$.

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