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C09–C–106

3016

BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2013

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.

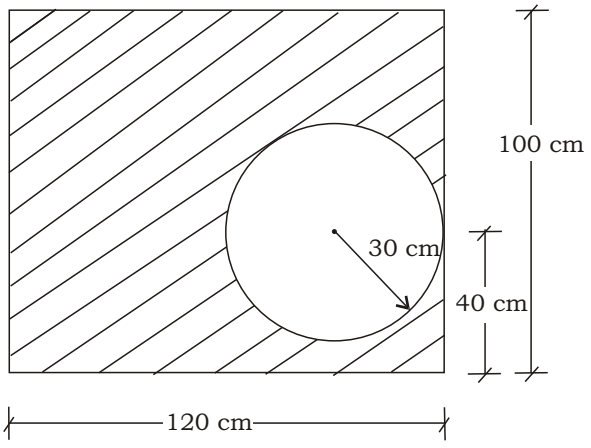
(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. *(a)* List the characteristics of a force.

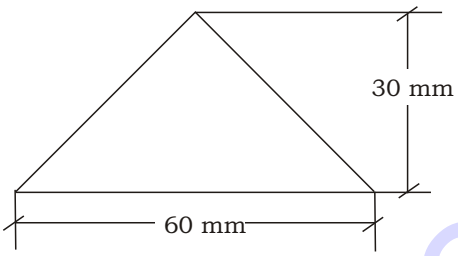
(b) State the triangle law of forces. 1½+1½

2. Two forces of 60 kN and 90 kN acting on a point are perpendicular to each other. Calculate the resultant and its direction. 1½+1½

3. Locate the centroid of the following plane figure : 3



4. Calculate the moments of inertia of the given triangle about the axis at a distance of 20 mm, below the base and parallel to the base : 3



5. Define the terms : 1½+1½

(a) Toughness

(b) Poisson's ratio

6. A steel rod of 25 mm diameter and 1 0 m long is subjected to an axial pull of 50 kN. If E 2 0 10^5 N / mm^2, calculate the stress and elongation in the rod. 1½+1½

7. A rod of 25 mm diameter and 1000 mm long is subjected to a gradual axial pull of 2 5 kN. Calculate the stress and strain and energy stored, if E 2 1 10^5 N / mm^2. 1+2

8. Define the terms : 1½+1½

(a) Shear force

(b) Bending moment and their relationship

9. A simply supported beam of 6 0 m length has a udl of 3 kN/m over a length of 3 m from left support and a point load of 6 0 kN at a distance of 2 0 m from right support. Find the support reactions. 1½+1½

10. List and sketch the three types of supports. 1+1+1

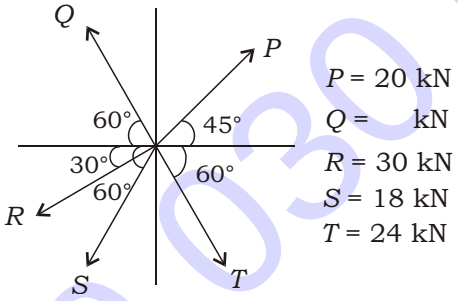
PART—B 10×5=50

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

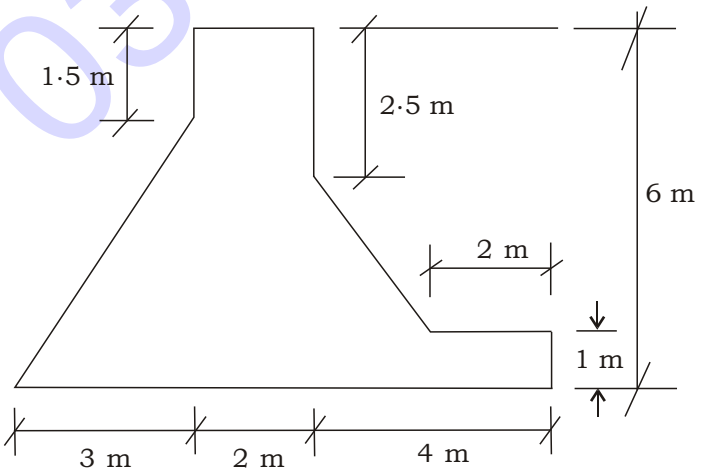
(2) Each question carries **ten** marks.

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

11. Find the magnitude and direction of the resultant of the following coplanar concurrent force system : 8+2

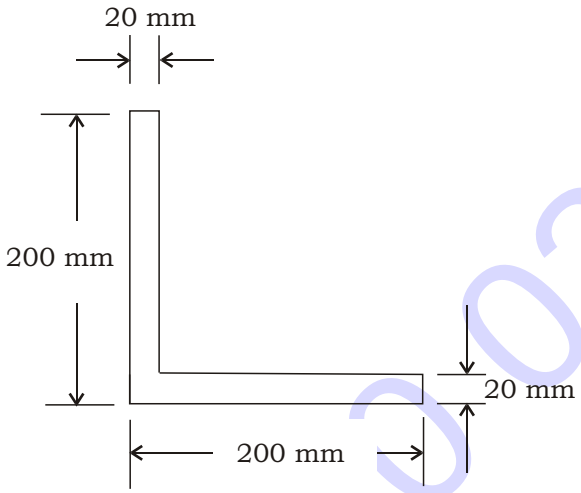


12. Determine the position of the centroid of the following figure : 5+5



13. Calculate the centroid and moment of inertia of the T-section with top flange 200 mm 20 mm and central web 20 mm 180 mm. 5+5

14. Calculate the moments of inertia I_{xx} and I_{yy} of the section given below : 4+3+3



15. A bar 12 mm 12 mm and 480 mm long is subjected to an axial pull of 10 kN. If linear elongation is 0 40 mm and lateral contraction is 0 0025 mm, determine Poisson's ratio, Young's modulus, modulus of rigidity and bulk modulus. 2½×4

16. A straight stepped square section has sides of 10 mm, 12 mm and 16 mm with axial lengths of 100 mm, 120 mm and 160 mm respectively. The bar is subjected to a tensile force of 4 0 kN. If E 2 0 10^5 N / mm^2 and Poisson's ratio 0 3, calculate the *(a)* total elongation and *(b)* change in the side of each square section. 5+5

17. A simply supported beam of 6 0 m length has a udl of 2 kN / m over a length of 1 5 m from left support and over a length of 3 0 m from right support. Also two point loads of 5 0 kN are placed at a distance of 1 5 m from both the supports. Draw the shear force and bending moment diagrams for the beam. 5+5

18. An overhang beam of 6 0 m overall length has two simple supports at a distance 4 0 m apart starting from the left end. A uniformly distributed load of 20 0 kN/m is applied throughout the length of the beam. Draw the shear force and bending moment diagrams. Locate the point of contraflexure and also calculate the maximum bending moment. 4+4+2

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