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C09–C–106

3016

BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2017

DCE—FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

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

PART—A 3×10=30

Instructions : (1) Answer **all** questions.

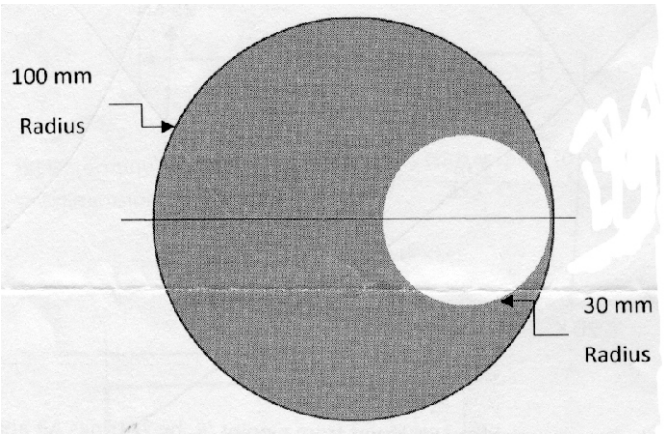
(2) Each question carries **three** marks.

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

1. Define *(a)* parallelogram law of forces and *(b)* State Lami's theorem. 1½+1½=3

2. Define couple. List any two properties of couples. 1+2=3

3. In a circular of 100 mm radius, a hole of 30 mm radius is made as shown in the figure. Determine the position of centroid of the remaining sheet. 3



4. State parallel axis theorem and mention the formula. 1½+1½=3

5. Define the following terms : 1+1+1=3

(a) Modulus elasticiy

(b) Modulus of rigidity

(c) Bulk modulus

6. Write the expressions for interrelationship between the three elastic constants of *E*, *N* (*G* or *C*), and *K* and explain the terms involved. 1+1+1=3

7. Young's modulus of material is 2 1 10^5 N/mm^2 and rigidity modulus is 0 84 10^5 N/mm^2. Find the Possion's ratio and Bulk modulus. 1½+1½=3

8. List the types of supports with neat sketches. 1+1+1=3

9. Draw the *SF* and *BM* diagrams of a cantilever of length 1 and which carries a point load *W* at the free end. 1½+1½=3

10. A simply supported beam *AB* of span 2·5 m is carrying two point loads of 2 kN and 4 kN respectively at 1 m and 1·5 m from LHS. Draw the *SF* and *BM* diagrams for the beam. 1½+1½=3

PART—B 10×5=50

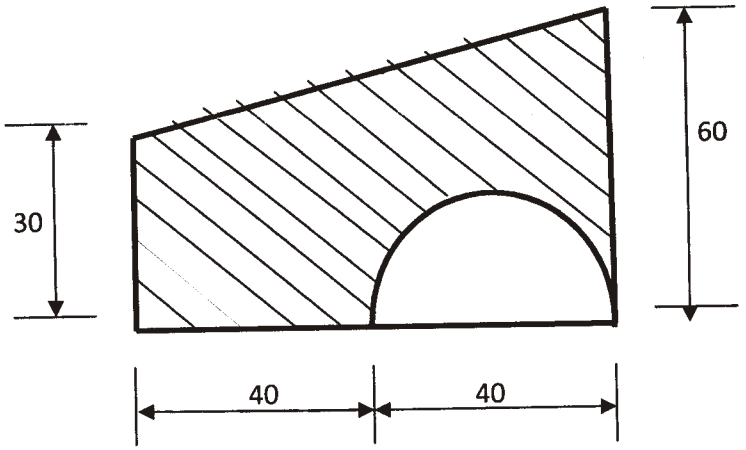
Instructions : (1) Answer *any* **five** questions.

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

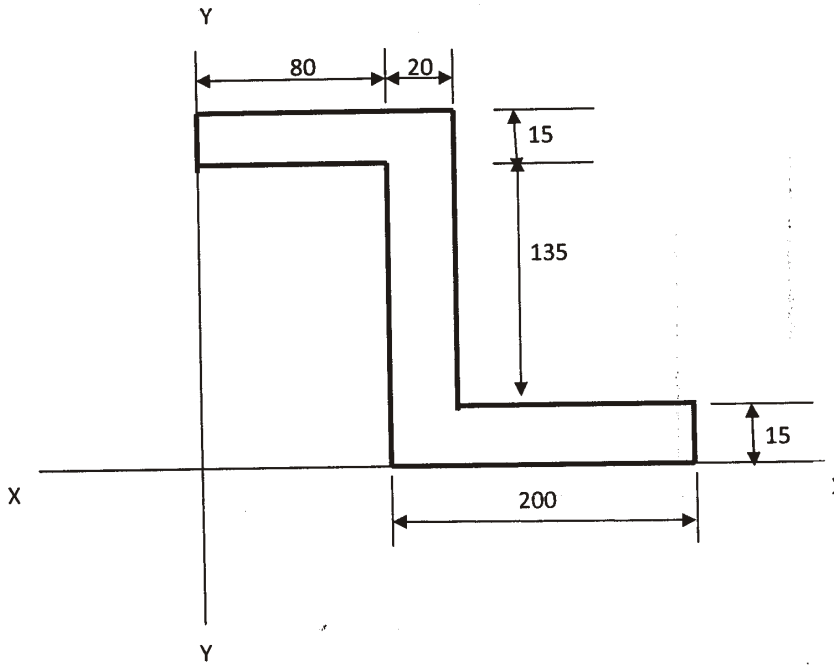
(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. Two forces of 100 N and 60 N act at a point and away from it. If the angle between the two forces is 60°, find the magnitude and direction of their resultant. 10

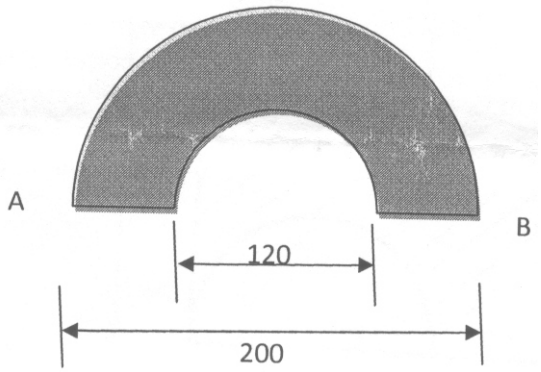
12. A semicircular area is remove from a trapezium as shown in the figure. Determine the centroid of the remaining area (shown hatched). 10



13. *(a)* Determine the centroid of the lamina with respect to *XX* and *YY* axes as shown in the figure. 5

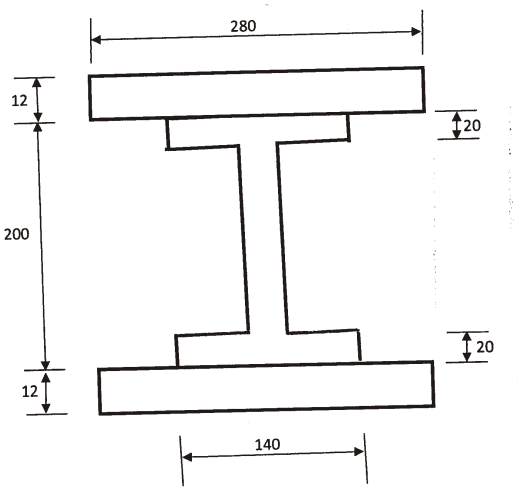


(b) A hollow semicircular section has its outer and inner diameters of 200 mm and 120 mm respectively as shown in the figure. What is the moment of inertia about the base *AB*? 5



14. A built-up section is formed by an I-section and two flange plates of size 280 × 12 mm are on each flange. Find the moment of inertia about centroidal axes *X-X* and *Y-Y* and the least radius of gyration. All dimensions in the Fig. are in mm.

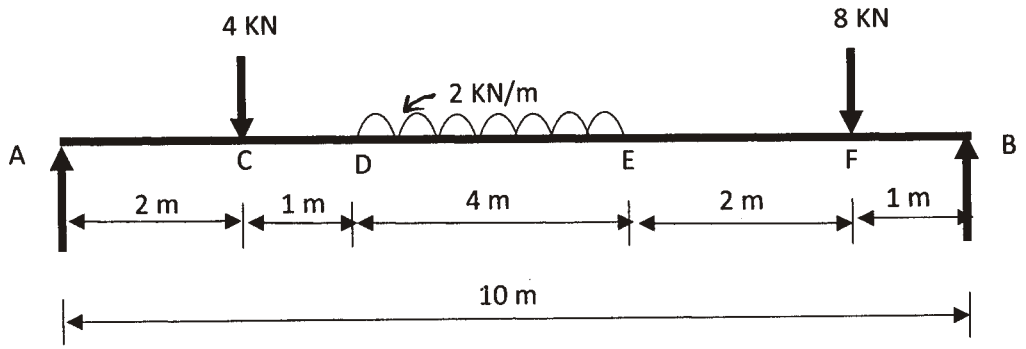
4+4+2=10



15. A solid cylinder of 80 mm diameter is inserted inside a hollow aluminum tube of 80 mm internal diameter and 120 mm external diameter and rigidly fixed at ends. This composite section is subjected to an axial compression of 170 kN. Determine the stresses induced in each material and change in length of the member is 2 meters. Take, E_S 2 1 10^5 N/mm^2; E_A 0 7 10^5 N/mm^2. 10

16. A reinforced concrete column 400 mm × 400 mm is reinforced with 4-steel bars of 28 mm dia each. Find the load shared by concrete and steel when the column is carrying a load of 900 kN. Take, E_s 2 10^5 N/mm^2; E_c 0 13 10^5 N/mm^2. 10

17. Draw the shear force and bending moment diagrams for the figure shown below mentioning the salient features. 10



18. A beam 6 m long rests on two supports 5 m apart. The right end is overhanging by 1 m. The beam carries a uniformly distributed load of 1·5 kN/m over the entire length of the beam. Draw SF and BM diagram and find the amount and position of maximum bending moment. 10

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