4019

C14–C–105

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BOARD DIPLOMA EXAMINATION, (C–14)

JUNE—2019

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 the following terms :

(a) Statics

(b) Dynamics

2. What is couple? List the properties of couple.

3. Differentiate tension and compression.

4. State *(a)* parallel axis theorem and *(b)* perpendicular axis theorem.

5. A masonry dam is 12 m height on the water face and is vertical. The top width is 4 m, and base width is 6 m. Find the centre of gravity of the dam.

6. Define the following terms :

(a) Moment of inertia

(b) Radius of gyration

7. The moment of inertia of triangular lamina about its base is 195×10^4 mm^4 units. Find moment of inertia of this triangle about an axis parallel to its base and passing through the cenroid.

8. Explain the following terms :

   (a) Modular ratio

   (b) Poisson's ratio

9. Write the relationship among the elastic constants.

10. Differentiate between *(a)* toughness and hardness, *(b)* brittleness and stiffness.

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. Four forces acting at a point are in equilibrium. Three of them are 300 N due South, 100 N due North-East, 400 N at 30° East of South. Calculate the magnitude and direction of fourth force.

12. A lighting fixture weighing 25 N hangs from a point *R* by two strings *PR* and *QR*. *PR* is inclined at 60° to the horizontal and *QR* at 30° to vertical as shown in the Fig. 1. Calculate the forces in the strings using Lami's theorem.

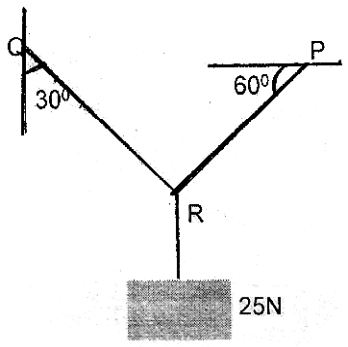

Fig. 1

Determine the position of centroid of the channel section given in the Fig. 2.

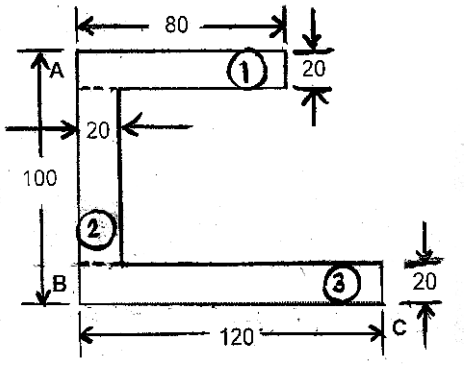

Fig. 2

13. Find the moment of inertia about horizontal and vertical axes passing through centroid for a rolled steel T-section, whose size of flanges 240 mm × 40 mm and size of Web is 20 mm × 200 mm.

14. Determine the moment of inertia of an angle section 120 mm × 100 mm × 12 mm about *xx* and *yy* axis passing through it CG. Take 120 mm as base.

15. A steel bar 25 mm diameter is acted upon by forces as shown in the Fig. 3. Find the total elongation in the bar take $E = 2 \times 10^5 \text{ N / mm}^2$.

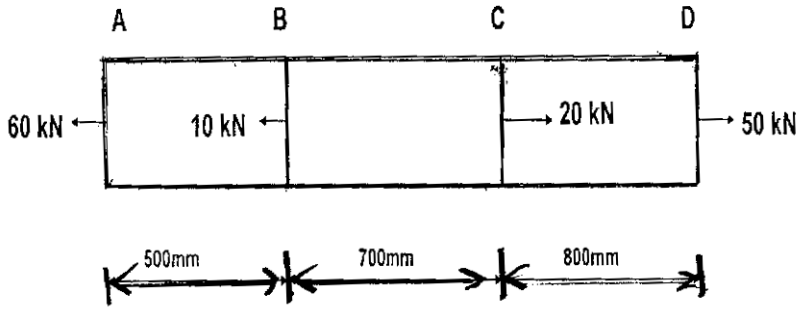

Fig. 3

16. A copper bar 40 mm diameter is rigidly attached at both ends to the inside of steel tube of 50 mm external diameter and 5 mm thick. find the stress in each metal of composite section length of 1000 mm, when it is subjected to an axial load of 200 kN. Take $E_s = 200$ GPa and $E_c = 100$ GPa.

17. An axial pull of 150 kN is suddenly applied to a steel rod 50 mm in diameter and 2 m long. Find *(a)* work done, *(b)* maximum instantaneous elongation and *(c)* also calculate the strain energy stored. Take $E = 2{\cdot}1 \times 10^5$ N / mm^2.

18. Two parallel plates placed 3 m apart are joined by a steel rod of 30 mm diameter at a temperature of 120 °C passing through washers and nuts at each end. Calculate the stress induced in the rod when it has cooled to 80 °C. If *(a)* the end do not yield and *(b)* when the end yield by 0·25 mm $E = 1{\cdot}8 \times 10^5$ N / mm^2, and $@ = 2 \times 10^{-6}$ °C.

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