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C09–C–106

3016

BOARD DIPLOMA EXAMINATION, (C–09)

APRIL/MAY—2015

DCE—FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

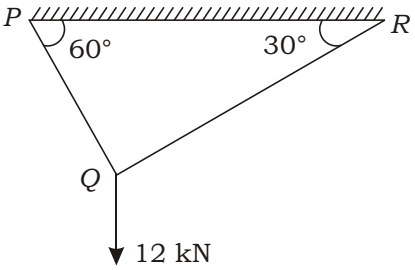
Time : 3 hours] [*Total Marks* : 80

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 *(a)* Parallelogram law of forces and *(b)* Varignon's theorem. 1½+1½

2. State Lami's theorem and calculate the forces in members *PQ* and *QR* of the frame below. 1+1+1



3. Determine the position of the centroid of a dam section whose top and bottom widths are 4 m and 10 m respectively with a vertical side of height 8 m. 3

4. Calculate the radii of gyration of a rectangular lamina of 30 cm wide and 40 cm long. 1½+1½

5. Define the terms *(a)* 'ductility' and *(b)* 'proof resilience'. 1½+1½

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

7. A square bar of 40 mm side and 2·0 m long is subjected to axial pull of 350 N. If the resulting linear contraction is 0·5 mm, calculate the modulus of elasticity of the material and lateral strain when Poisson's ratio is 0·3. 1½+1½

8. Explain the term 'point of contraflexure' with a suitable example (sketch). 1½+1½

9. List and sketch 3 types of beam based on their support conditions. 1+1+1

10. Sketch the shear force and bending moment diagrams of a cantilever beam of length l with uniformly distributed load of w over half of its length from the free end. 1½+1½

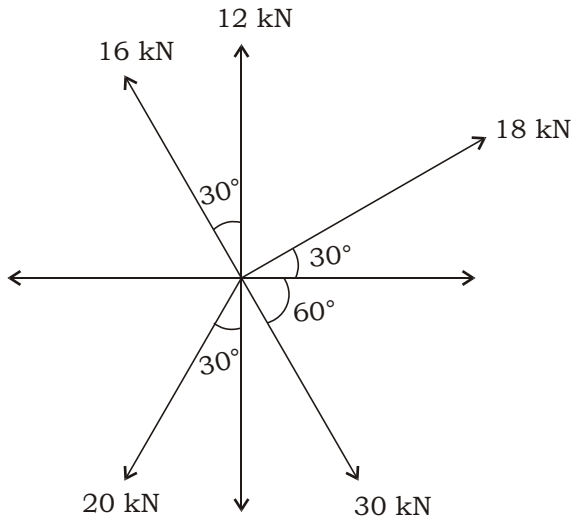
PART—B 10×5=50

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

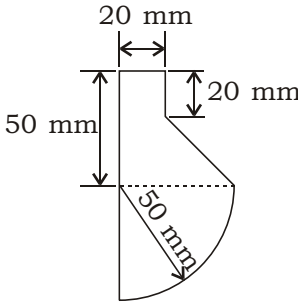
(2) Each question carries **ten** marks.

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

11. Determine magnitude and direction of the resultant of the coplanar concurrent force system. 7+3



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



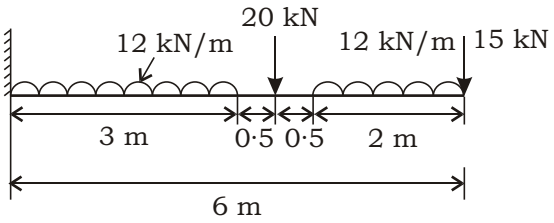
13. Calculate the centroid and moments of inertia of the unequal angle of 20 mm thick and lengths of vertical and horizontal legs of 120 mm and 90 mm respectively. 2½+2½+2½+2½

14. Find the moments of inertia of an I-section about its centroidal axis. The dimensions are : top flange 180 mm 20 mm, central web 30 mm 300 mm and bottom flange 240 mm 20 mm. 5+5

15. A copper rod of 25 mm diameter and 1 m long is subjected to an axial pull of 26 kN. If E 110 GPa and Poisson ratio 0·25, calculate the *(a)* axial stress, *(b)* linear strain and change in length, and *(c)* lateral strain and change in diameter. 5+5

16. A square RCC column of 40 cm 40 cm has four bars of 25 mm diameter each. Calculate the safe load that the column can resist, if the permissible stress in concrete is 5·2 N/mm^2 and the modular ratio m 18. 10

17. Draw the shear force and bending moment diagrams for the cantilever beam shown below : 5+5



18. An overhang beam of 9 m overall length has two simple supports at a distance 6 m apart starting from the left end. A uniformly distributed load of 6 kN/m is placed between the supports and a point load of 8 kN is applied at the far right end. Draw the shear force and bending moment diagrams, locate the point of contraflexure and calculate the maximum bending moment. 4+4+1+1

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