C09-C-106

3016

BOARD DIPLOMA EXAMINATION, (C–09)
MARCH/APRIL—2014
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. State law of parallelogram of forces.

2. Write any three properties of a couple.

3. Show the position of centroid for figure trapezium.

4. State perpendicular axis theorem.

5. Distinguish between longitudinal and lateral strains.

6. Define proof resilience and modulus of resilience.

7. What is ductility? Give an example for ductile material.

8. Write the relationships among rate of loading, SF and BM.

9. Sketch simple support, roller support and fixed support.

10. Draw SF and BM diagrams for a simply supporting beam carrying udl throughout the span.

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

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

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

11. Find the magnitude and direction of the resultant of forces shown in figure below : 8+2
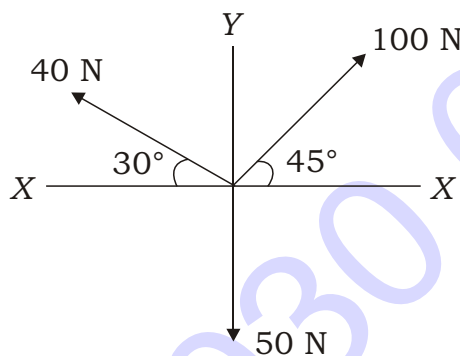
12. Determine the position of centroid of the channel section given below : 2+8
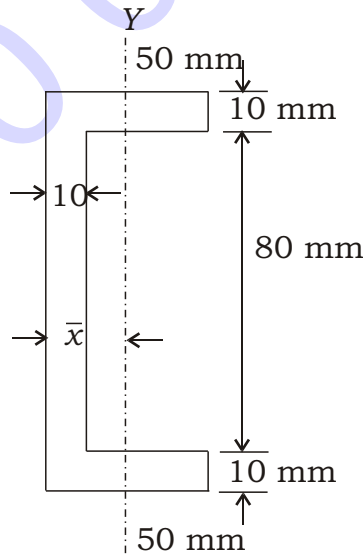
13. *(a)* Determine the position of centroid of an inverted T-section with top flange 300 mm 100 mm and web 200 mm 100 mm. 5

(b) Calculate the polar moment of inertia of a hollow circular section with external diameter 50 mm and internal diameter 40 mm. 5

14. Find the moment of inertia of an I-section with top flange 50 mm × 10 mm, bottom flange 100 mm × 10 mm and web 80 mm × 10 mm about its centroidal *X-X* axis. 4+6

15. A bar 10 mm × 10 mm in cross-section and 400 mm long is subjected to an axial pull of 12 kN. The elongation in length and contraction in lateral dimensions are found to be 0·4 mm and 0·0025 mm respectively. Determine the Poisson's ratio, Young's modulus, rigidity modulus and bulk modulus of the material. 3+3+2+2

16. A circular RCC column 250 mm in diameter is reinforced with 6 numbers of 25 mm diameter steel bars. Permissible compressive stress in concrete is $5 \, \text{N} / \text{mm}^2$. Find the load carrying capacity of the column. Ratio of Young's modulus of steel to Young's modulus of concrete is 13·33. 10

17. A beam 9 m long is simply supported at left end and at 6 m from left end. It carries a udl of 5 kN/m over the supported length and a point load of 10 kN at the right extreme end. Draw SF and BM diagrams and find the value of maximum bending moment. 5+5

18. A simply supported beam 6 m span is carrying a udl of 4 kN/m over its left half of its span and a point load of 10 kN at 5 m from its left-hand support. Draw SF and BM diagrams and find the value of maximum bending moment. 4+4+2

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