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C16-C–106

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BOARD DIPLOMA EXAMINATION, (C-16)

JANUARY/FEBRUARY—2022

DCE - FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

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

PART—A

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 Lami's theorem. 3

2. Distinguish between centroid and centre of gravity. 3

3. Find the centroid of triangle of base 100 mm and height 150 mm from the apex. 3

4. Find the radius of gyration of a triangle whose base is 50 mm and height is 80 mm about an axis passing through CG and parallel to base. 3

5. 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 Poisson's ratio and Bulk modulus. 3

6. State *(a)* Hooke's law and *(b)* Limit of proportionality. 1½+1½=3

7. Define *(a)* Bulk modulus and *(b)* Poisson's ratio. 1½+1½=3

8. Define the term 'point of contra flexure' with a suitable example. 3

9. A simply supported beam of span 8 m carries a UDL of 25 kN/m over its entire length. Draw the SF diagram. 3

10. Draw the sketches of the following :

(a) Continuous beam

(b) Overhanging beam

(c) Simply supported beam 1+1+1=3

PART—B

10×5=50

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

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

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

11. The magnitude and direction of resultant force of the following coplanar concurrent forces acting at a point :

(a) 100 kN due to North

(b) 50 kN at 45° in the direction of North of East

(c) 60 kN at 45° in the direction of South of West

(d) 45 kN at 45° in the direction of North of West

(e) 80 kN at 45° in the direction of South of East. 10

12. Determine the position of the centroid of a channel section with top flange – 100 × 30 mm, web – 30 × 200 mm and bottom flange – 250 × 30 mm. 10

13. Find the moment of inertia of an I-section about its centroidal *x*-axis, with top flange 70 mm × 12 mm, bottom flange 130 mm × 12 mm and web 12 mm × 90 mm. It has a top cover plate of size 110 mm × 12 mm. 10

14. Determine the moment of inertia and radius of gyration for a T-section with top flange – 300 mm × 10 mm and web –200 mm × 100 mm. 10

15. A rectangular bar 50 mm wide and 20 mm thick is 3 m long. It is subjected to an axial pull of 50 kN. If the change in length is 1·5 mm and decrease in thickness is 0·0014 mm. Determine the four elastic constants. 10

16. A circular RCC column 250 mm in diameter is reinforced with 6 numbers of 20 mm diameter steel bars. Permissible stress in concrete is 5.2 N /mm^2. Ratio of Young's modulus of steel to Young's modulus of concrete is 13·33. Find the load carrying capacity of the column. 10

17. A uniform beam of 8 m length is supported at its left hand end and at 2 m from its right hand end. Three point loads of 180 kN, 50 kN and 30 kN are carried by the beam at 2 m, 4 m and 8 m from its left support respectively. Draw SF and BM diagrams and show the values at salient points. 10

18. A cantilever beam of span 4 m carries a u.d.l. of 10 kN/m up to 3 m from fixed end and also carries two concentrated loads, 18 kN at free end and 22 kN at a distance of 1 m from free end. Draw SF and BM diagrams. 10

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