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C16–C–106

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BOARD DIPLOMA EXAMINATION, (C–16)

MARCH/APRIL—2018

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 force and moment. 1½+1½

2. Distinguish centre of gravity and centroid.

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

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.

5. The bulk modulus of a material is 125 GPa and Young's modulus is 200 GPa. What is its Poisson's ratio?

6. Define proof resilience and modulus of resilience.

7. A wooden tie of 50 mm×100 mm size is 2 m long. It is subjected to an axial pull of 30 kN. Find out the elongation of the tie if the modulus of elasticity of wood 1×10^4 N/mm^2.

8. Define the term point of contraflexure.

9. A simply supported beam carries a point load at centre. Draw SFD and BMD.

10. State the relationship among rate of loading, shear force and bending moment.

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. 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

12. A masonry dam of trapezoidal section with one face is vertical. Top width of dam is 4 m, bottom width of dam is 7 m and height of dam is 9 m. Find the position of centroid.

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.

14. *(a)* The moment of inertia of a square about its base is 400 mm^4. Find the values of I_{xx}, I_{yy} and I_{zz} for the square.

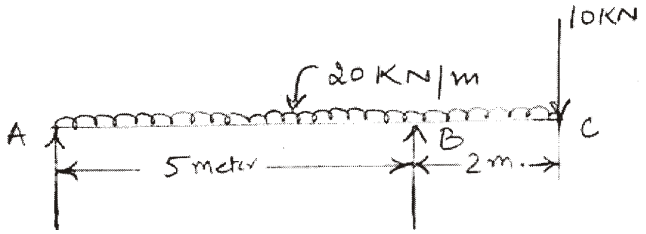
(b) Find the moment of inertia of a square of side 100 mm about one of its diagonals.

15. Draw stress-strain diagram for a mild steel specimen subjected to a tensile force and explain all salient points.

16. A mild steel of 30 mm diameter and 500 mm long is encased in a brass tube whose external diameter is 50 mm and 8 mm thick. The composite bar is heated through 55 °C. Calculate the stresses induced in each metal. Take $_c$ 12 10^{-6}/°C, $_b$ 19 10^{-6}/°C and E_s 2 10^5 MPa, E_b 1 10^5 MPa.

17. 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.

18. Draw the BM and SF diagrams for the overhanging beam carrying loads as shown in the figure below. Locate the point of contraflexure and determine the position and magnitude of maximum bending moment :



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