C14-C–105

4019

BOARD DIPLOMA EXAMINATION, (C–14)
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 the following terms and give examples:

(a) Base units

(b) Derived units.

2. State and explain Lami's theorem.

3. Find the magnitude and direction of the resultants of the two forces 2000 N and 1200 N acting at mutually perpendicular direction.

4. Define centroid and show the position of centroid for a figure triangle.

5. Find the position of centroid of an angle 200 mm×200 mm×20 mm from base.

6. Distinguish between moment of inertia and polar moment of inertia, and write the relationship between them.

7. Find the moment of inertia of a rectangular section 160 mm width and 380 mm depth about the base.

8. Draw the stress-strain diagram for a mild steel speciment subjected to a tensile force and indicate all the salient points.

9. Define the following terms.

(a) Working stress

(b) Factor of safety

10. Explain the following properties:

(a) Plasticity

(b) Ductility

(c) Brittleness

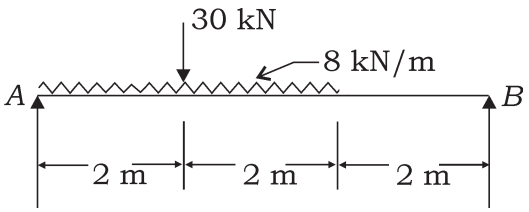
PART—B

10×5=50

Instructions : (1) Answer *any* **five** questions.
(2) Each question carries **ten** marks.
(3) Answers should be comprehensive and the criteria for evaluation is the content but not the length of the answer.

11. Five forces 20 kN, 15 kN, 25 kN, 30 kN and 10 kN act from one of the angular point of a regular hexagon towards the other angular points in an anticlockwise direction. Find the magnitude and direction of the resultant force.

12. Determine the reactions at supports the beam shown in the figure below.

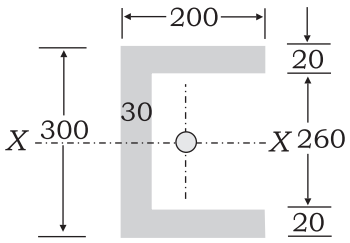


13. Find the centroid of the I—section from edge of bottom flange. Given

Top flange =100 mm × 20 mm
Web = 20 mm × 240 mm
Bottom flange = 200 mm × 40 mm

14. Find the moment of inertia about horizontal and vertical axes passing through centroid for a rolled stell T—section, whose flange 200 mm × 50 mm and web is 50 mm × 150 mm.

15. Find the least radius of gyration of the channel section as shown in figure below:



16. A bar 400 mm long is 60 mm square in section for 160 mm of its length, 30 mm diameter for 100 mm length and 50 mm diameter for the remaining length. If a tensile force of 150 kN is applied to the bar, calculate the maximum and minimum stresses produced in it, and the total elongation. Assume uniform distribution of load over the cross-section E=200 kN/mm^2.

17. A cylindrical bar is 20 mm diameter of 1.2 m long. During a tensile test it is found that the linear strain is 4 times the lateral strain. Calculate the shear modulus, if the bar is elongation by 0.05 mm under axial tensile load of 45 kN.

18. A steel bar 50 mm diameter is completely encased in a brass tube of 80 mm outside diameter. The length of the composite bar is 400 mm. If this assembly is subjected to a compressive force of 89kN, determine—

(a) stresses in steel bar and brass tube;

(b) change in length of the assembly.

Given E_s=208 kN/mm^2 and E_b =104 kN/mm^2.

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