

6022

BOARD DIPLOMA EXAMINATION, (C-16)

MAY/JUNE—2023

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 the “Law of parallelogram of forces”.
2. Write the position of centroid of the following section :
  - (a) Rectangle
  - (b) Right angle triangle
  - (c) Hollow circle
3. A trapezoidal lamina has slope on one side. Its top width is 6 m, bottom width is 9 m and height is 12 m. Determine the position of centroid from vertical face.
4. Find MI of a rectangular section 200 mm width and 450 mm depth about the base.

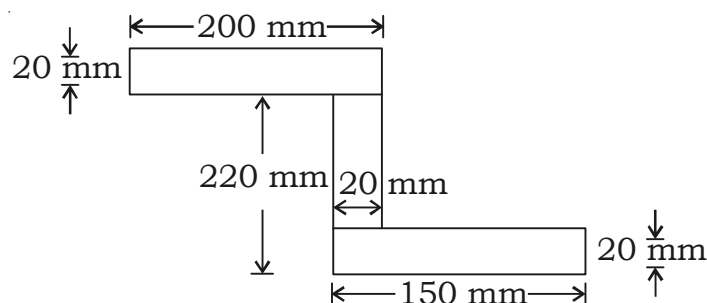
5. Write any three relationships among elastic constants.
6. State any six different mechanical properties of materials.
7. A steel bar 5 m long, 25 mm in diameter is stretched by 3 mm by a tensile load of 80 kN. Determine modulus of elasticity of the bar.
8. List any three different types of beams with sketches.
9. Draw the SFD and BMD of a cantilever of span  $l$  with a point load of  $W$  kN at its free end showing the values at fixed end.
10. Calculate the maximum SF and Maximum BM of a simply supported beam of span 6 m subjected to a uniformly distributed load of 10 kN/m acting throughout the span.

### 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.

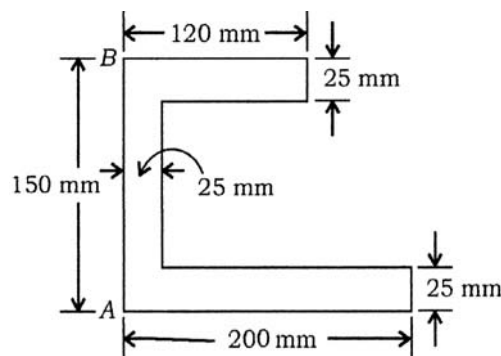
11. Five forces 20 kN, 30 kN, 40 kN, 50 kN and 60 kN are acting on one of the angular points of a regular hexagon towards the other five angular points taken in order. Find the magnitude and direction of the resultant force. 10
12. Determine the position of centroid of the Z-section shown in below figure. 10



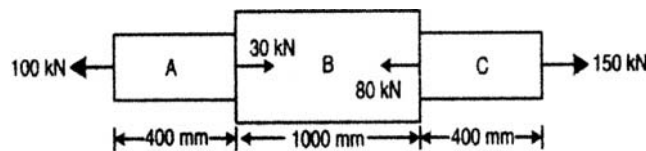
13. (a) State perpendicular axis theorem. 3

(b) Find  $I_{xx}$  and  $I_{yy}$  for a T-section having flange 100 mm × 20 mm and web 20 mm × 80 mm. 7

14. Calculate the moment of inertia of channel section shown in below figure. 10



15. A steel bar 1.8 m long is acted upon by forces as shown in the figure below. Find the elongation of the bar. Given  $E = 200$  GPa. 10

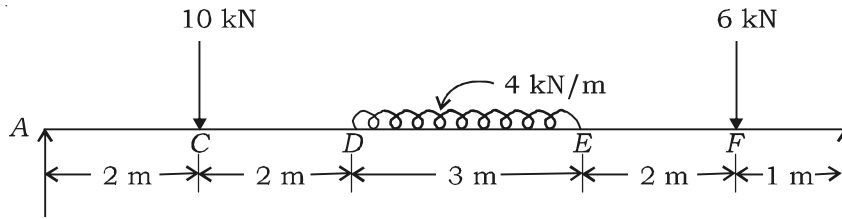


\* 16. A square RCC column of 400 mm × 400 mm is reinforced with 04 No's of 25 mm dia. of steel bars. Calculate the safe load that the column can resist, if the permissible stress in concrete is 5.2 N/mm<sup>2</sup> and the modular ratio,  $m = 18$ . 10

17. A cantilever beam of span 5 meters is loaded with a udl of 6 kN/m in a length of 3 m from the fixed end and also a point load of 5 kN placed at its free end. Draw the shear force and bending moment diagrams indicating the values at salient points. 10

18. Draw the BM and SF diagrams for a simply supported beam carrying loads as shown in the figure below.

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