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C20-C–105

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BOARD DIPLOMA EXAMINATION, (C-20)

JANUARY—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. Define the following terms :

   (a) Statics

   (b) Dynamics

2. Determine the magnitude and direction of the resultant of the two forces 40 N and 60 N acting at a point, with an included angle of 40° between them. The 60 N force is horizontal.

3. State Lami's theorem with a neat sketch.

4. Distinguish centre of gravity and centroid.

5. Find the moment of inertia of a rectangular section 200 mm width and 400 mm depth about the base.

6. Define Stress, Strain and Poisson's ratio.

7. Define the terms *(a)* linear strain and *(b)* lateral strain.

8. State and define any two mechanical properties of materials.

9. Define the terms *(a)* shear force and *(b)* bending moment.

10. State any two types of end supports with neat sketches.

PART—B

8×5=40

Instructions : (1) Answer either *(a)* or *(b)* from each question.

(2) Each question carries eight marks.

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

11. *(a)* Calculate the forces in the ropes *AB* and *AC* for the following arrangement as shown in Fig. A.

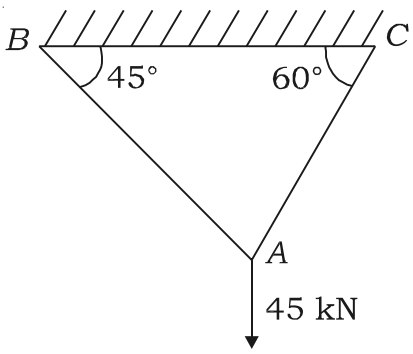

Fig. A

* (OR)

(b) Find the magnitude and direction of the resultant of forces as shown in Fig. B below.

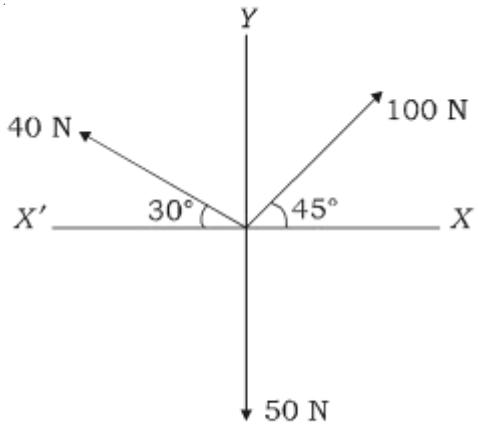

Fig. B

12. *(a)* Find the centroid for a given channel – section with dimensions 100 mm × 50 mm × 15 mm.

(OR)

(b) Locate the position of centre of gravity of an I-section with the following dimensions from its top.

Top flange = 200 mm × 20 mm

Bottom flange = 300 mm × 10 mm

Web = 400 mm × 10 mm

13. *(a)* Determine moment of inertia and least radius of gyration of I-section given below in Fig. C.

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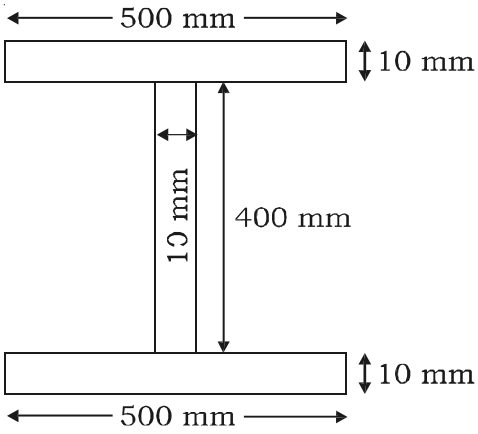

Fig. C

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(OR)

(b) Find the moment of inertia of a T-section having flange 150 mm × 50 mm and web 50 mm × 150 mm about *XX* and *YY* axes through the centre of gravity of the section.

14. *(a)* A circular RCC column of 250 mm diameter is reinforced with 6 numbers of 25 mm dia steel rods. The permissible compressive stress in concrete is 5 N/mm^2. Find the capacity of the column. Take modular ratio $m = 13{\cdot}33$.

(OR)

(b) A material has Young's modulus of $1{\cdot}25 \times 10^5$ N/mm^2 and Poisson's ratio of 0·25. Calculate modulus of rigidity and Bulk modulus.

15. *(a)* Calculate the support reactions for the beam given in Fig. D.

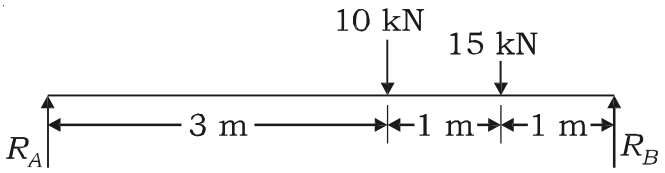

Fig. D

(OR)

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(b) A cantilever BEAM *AB* is 8 m long and is fixed at *A*. It carries point loads of 20 kN, 16 kN and 24 kN at 2 m, 7 m and 8 m respectively from the fixed end. Draw shear force diagram and bending moment diagram.

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* PART—C 10×1=1

Instructions : (1) Answer the following question.

(2) The question carries ten marks.

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

16. Draw shear force and bending moment diagram for a simply supported beam loaded as shown in Fig. E. Find the position and value of maximum bending moment that will occur in the beam.

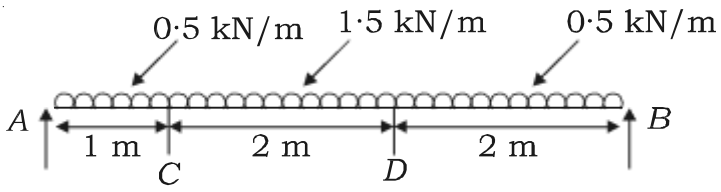

Fig. E

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