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c20-c-105

7021

BOARD DIPLOMA EXAMINATION, (C-20)

FEBRUARY/MARCH —2022

DCE - FIRST YEAR EXAMINATION

ENGINEERING MECHANICS - I

Time : 3 hours]

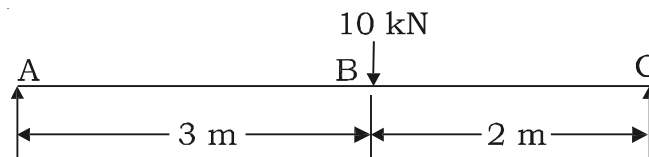
[Total Marks : 80

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 terms statics, dynamics, kinematics.
2. State Varignon's theorem and give expression for it.
3. Calculate the support reaction for the given beam :



4. Define centroid, centre of gravity and axis of symmetry.
5. Define moment of inertia and radius of gyration and give expressions for them.
6. Define modulus of elasticity, Poisson's ratio and factor of safety.

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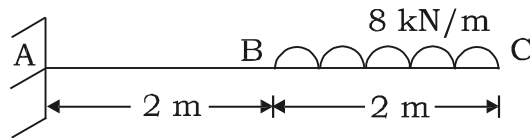
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7. Calculate the elongation (in mm) for a steel rod having 30 mm dia and 600 mm long, subjected to an axial pull of 60 kN. Take $E = 2 \times 10^5 \text{ N/mm}^2$.
8. Calculate the thermal stress induced in a bar due to temperature rise at 90°C . Take $E = 70 \text{ kPa}$ and $\alpha_b = 23.1 \times 10^{-6}/^\circ\text{C}$.
9. Define shear force, bending moment and point of contra flexure.
10. Calculate maximum shear force and bending moment for a given beam :



PART—B

8×5=40

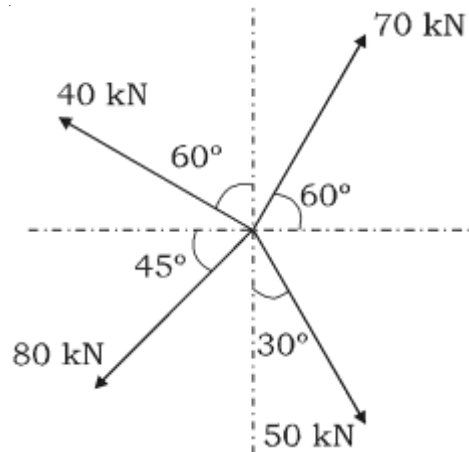
- Instructions :** (1) Answer **all** questions.
(2) Each question carries **eight** marks.
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

- * **11.** (a) Find the magnitude and direction of the resultant force for the following forces acting at a point :
- (i) 90 kN due North
 - (ii) 40 kN due Northeast
 - (iii) 60 kN inclined 30° East to South
 - (iv) 80 kN inclined 60° South of West
 - (v) 60 kN due West

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(OR)

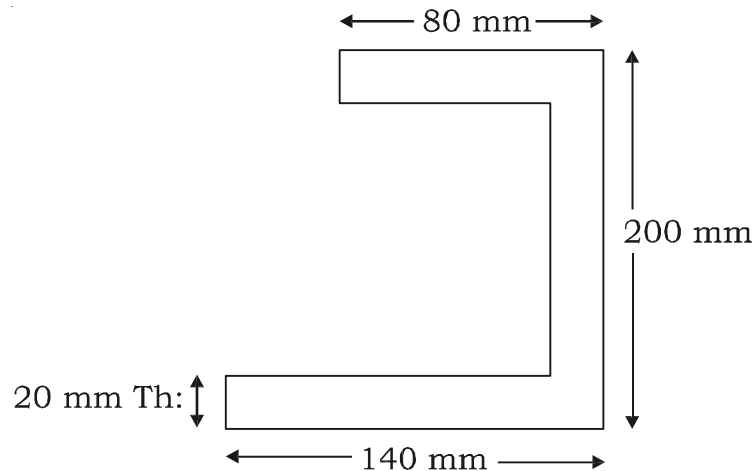
- (b) Find the magnitude and direction of the resultant for the given system.



12. (a) Calculate the centroid for an inverted T-beam having flange dimensions as 200×20 mm and web as 200×20 mm.

(OR)

- (b) Calculate the centroid for a channel section having overall thickness 20 mm.

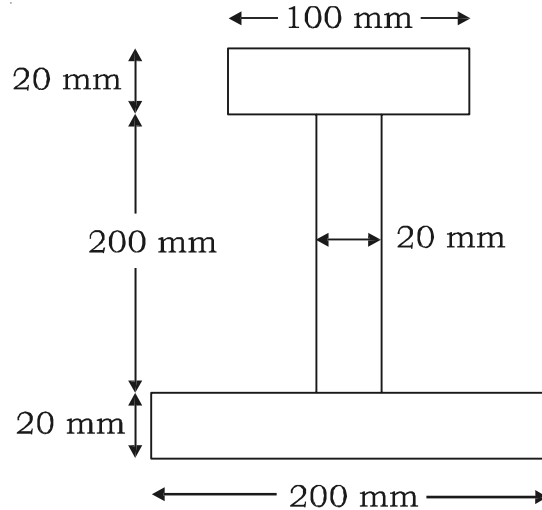


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13. (a) Calculate the moment of inertia for given I-section about centroidal axis :



(OR)

- (b) Find the moment of inertia of an unequal angle $150 \times 120 \times 20$ mm with longer leg vertical.

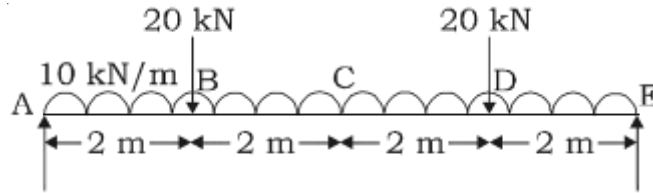
14. (a) A reinforced concrete column 400 mm dia is provided with 8 bars of 20 mm dia steel. The column carries an axial load of 1000 kN. Find the stresses in concrete and steel. Take modular ratio = 15.

(OR)

- (b) A rectangular steel bar 60 mm wide and 10 mm thick, 3 m long is subjected to an axial pull of 80 kN if the increase in length is 2 mm and decrease in thickness is 0.0022 mm. Determine three elastic constants and Poisson's ratio of the material.

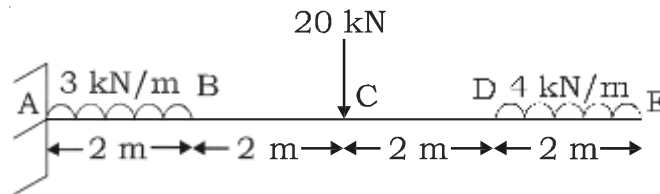
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15. (a) Calculate maximum shear force and bending moment and draw the shear force and bending moment diagram for the given beam :



(OR)

- (b) Calculate maximum shear force and bending moment and draw the shear force and bending moment diagram for the given beam.

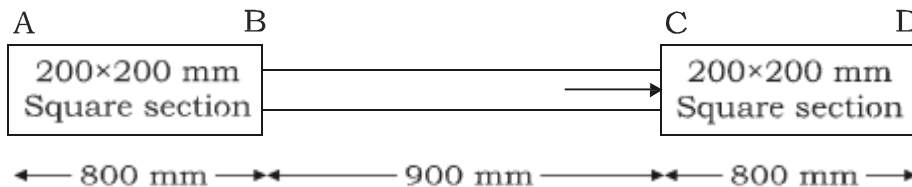


PART—C

10×1=10

- Instructions :** (1) Answer the following question.
 (2) The question carries **ten** marks.

- * 16. A composite bar of length 2.5 m is acted upon by forces shown in figure. Find the total elongation of the bar. Take $E = 2 \times 10^5 \text{ N/mm}^2$.
 Block AB and CD = Square section (200 × 200 mm)
 Block BC = Circular section (30 mm dia)



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