



c-14-c-105

4019

BOARD DIPLOMA EXAMINATION, (C-14)

APRIL/MAY—2015

DCE—FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

Time : 3 hours]

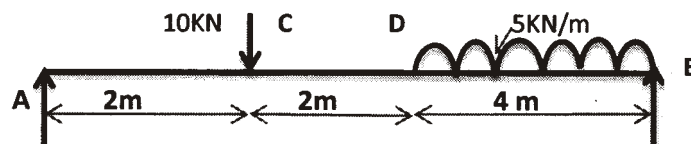
[Total Marks : 80

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 terms (a) Statics, (b) Dynamics and (c) Kinematics. 3
2. Define couple and state any two properties of a couple. 1+2
3. Calculate the support reactions for the beam given below : 3

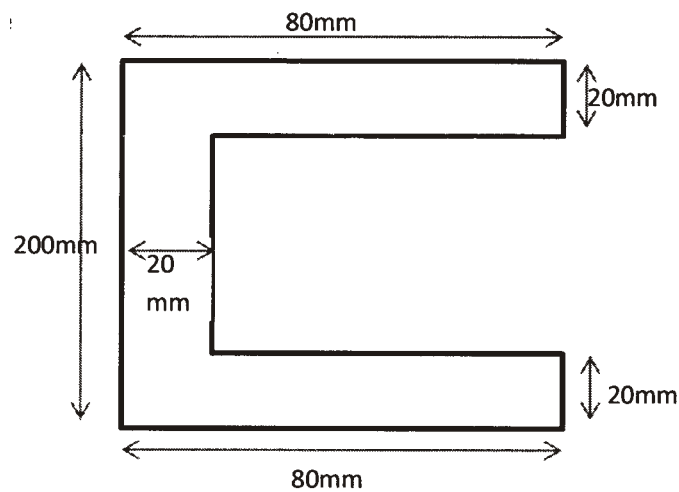


4. Differentiate between centre of gravity and centroid. 1½+1½

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5. Find centroid of channel section given below :

3



6. State parallel axis theorem and perpendicular axis theorem.

1½+1½

7. Calculate the moment of inertia and minimum radius of gyration of a rectangular section having dimensions 300 × 600 mm.

2+1

8. Define the terms (a) Poisson's ratio, (b) Factor of safety and (c) Modulus of resilience.

3

9. A steel rod of 30 mm in diameter and 600 mm long has a permissible stress 116 N/mm². Calculate (a) the pull required in kN and (b) elongation in mm if $E = 2 \times 10^5 \text{ N/mm}^2$.

1½+1½

10. A steel bar of length 2.5 m and 20 mm dia subjected to a pull of 65 kN. Calculate (a) stress in bar if load is applied suddenly and (b) strain energy in bar. $E = 200 \text{ kN/mm}^2$.

1½+1½

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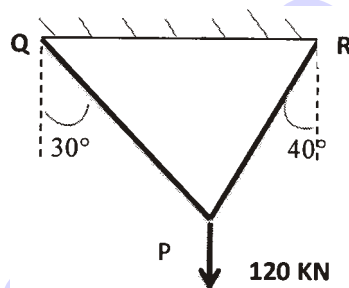
PART—B

10×5=50

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

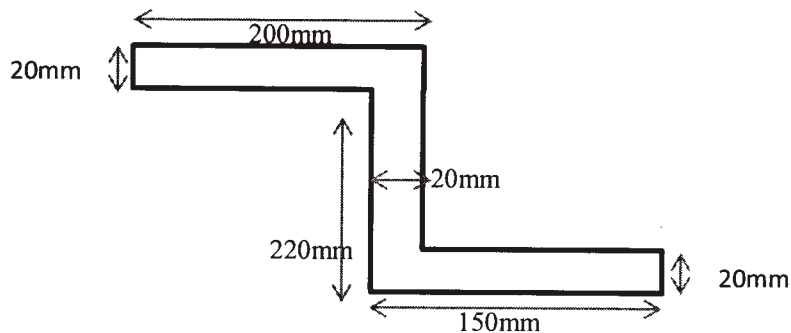
11. (a) State the law of polygon of forces and State Lami's theorem with neat sketch. 2+2

(b) Calculate the forces in cables PQ and PR shown in the figure below : 6

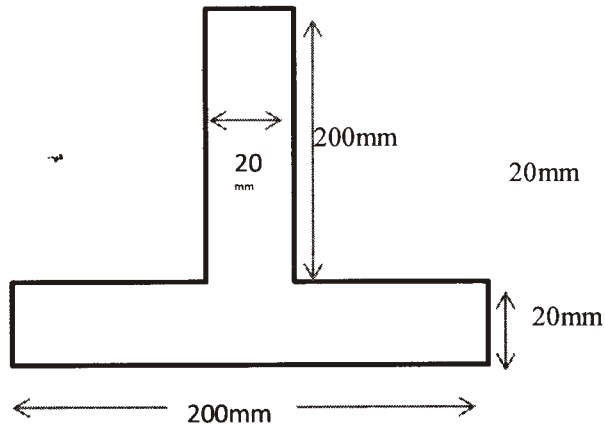


12. Four forces of magnitude 300 kN, 500 kN, 400 kN and 600 kN are acting at a point in North 30° East, Due South East, South 30° West and North 30° West. Find the magnitude and direction of resultant force. Also show resultant force in quadrant system. 10

13. Find the centroid for Z-section shown below : 10



- * **14.** (a) Define Polar moment of inertia of a plane area. 2
- (b) Calculate moment of inertia and polar moment of inertia of the given section below : 8



- 15.** Find moment of inertia of an unequal angle $150 \times 120 \times 20$ mm about centroidal axes. 4+6
- 16.** Define the terms (a) stiffness, (b) hardness, (c) toughness, (d) creep and (e) fatigue with two examples. 2×5
- 17.** A bar of 25 mm diameter and 600 mm long is subjected to a pull of 50 kN. The change in diameter and length was observed to be 4×10^{-3} mm and 0.30 mm. Calculate (a) Young's modulus, (b) Poisson's ratio, (c) Modulus of rigidity and (d) Factor of safety if ultimate stress = 204 N/mm^2 . 2½×4
- * **18.** A composite bar 30 mm diameter and 600 mm long made of steel is enclosed in a brass tube having external diameter 60 mm and 8 mm thick. If temperature is raised to 80°C , then calculate the stresses induced in each material.
 Take $\alpha_s = 12 \times 10^{-6} /^\circ\text{C}$, $\alpha_b = 19 \times 10^{-6} /^\circ\text{C}$ and $E_s = 200 \text{ GPa}$,
 $m = \frac{1}{2}$ 5+5
