# 3016

**BOARD DIPLOMA EXAMINATION, (C–09)**

**MARCH/APRIL—2017**

**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 triangle law of forces.

2. Define couple. List any two properties of couple.

3. Define centroid. Show the position of centroid of a right-angled triangle with one side vertical.

4. State perpendicular axis theorem.

5. State Hooke's law.

6. A steel bar of 25 mm diameter and 5 m long is stretched by 2 mm by applying an axial pull of 80 kN. Determine the modulus of elasticity of the bar.

7. Define the terms *(a)* 'hardness', *(b)* 'brittleness' and *(c)* 'stiffness'.

**8.** List any three types of beams.

**9.** A cantilever of span 5 m carries a uniformly distributed load of 4 kN/m on whole span. Determine the maximum shear force and maximum bending moment.

**10.** A simply supported beam of span 8 m carries a uniformly distributed load of 15 kN/m over the entire span. Find the maximum shear force and maximum bending moment.

## PART—B

10×5=50

*Instructions* : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

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

**11.** Find the magnitude and direction of the resultant of the system of coplanar forces as shown in the figure below :
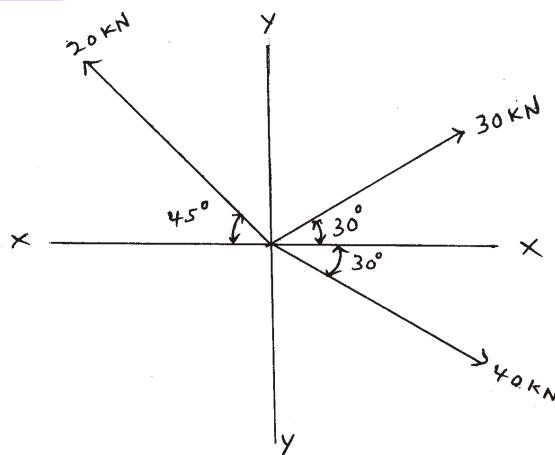
**12.** Find the position of centroid for the angle section shown below :
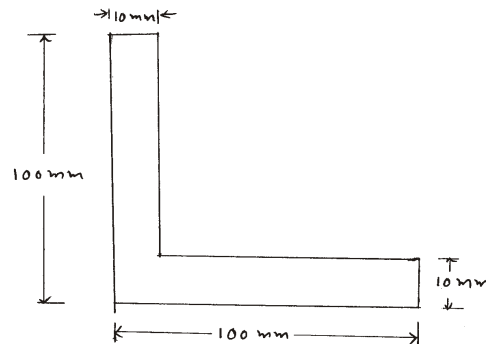


**13.** *(a)* Find the centroid of *T*-section whose flange is 100 mm × 20 mm and web is 20 mm × 100 mm.     5

*(b)* A hollow circular shaft has an internal diameter of 30 mm and thickness of 6 mm. Determine the moment of inertia and radius of gyration about its diameter.     5

**14.** An *I*-section has top flange 200 mm × 25 mm, bottom flange 200 mm × 25 mm and web 25 mm × 400 mm. Determine the moment of inertia of the *I*-section about its centroidal *XX*-axis and *YY*-axis.

**15.** A steel bar of 1·8 m long is acted upon by forces as shown in the figure below. Find the total elongation of the bar. Given $E$  200 GPa :
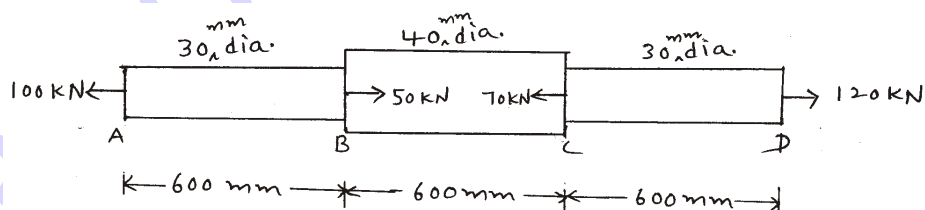


**16.** An RCC column of 200 mm × 400 mm size is reinforced with 4 no. of 20 mm dia. steel rods. It is subjected to an axial load of 750 kN. Determine the stresses developed in the steel and concrete. Take $E_s$  200 GPa and $E_c$  20 GPa.

**17.** A simply supported beam of 6 m span carries a central point load of 10 kN in addition to uniformly distributed load of 4 kN/m over the entire span. Draw shear force diagram and bending moment diagram and indicate the values at salient points.

**18.** A cantilever of span 5 m carries a point load of 20 kN at the free and uniformly distributed load of 10 kN/m over a length of 3 m from the fixed end. Draw shear force diagram and bending moment diagram and indicate the values at salient points.

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