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C16–C–106

6022

BOARD DIPLOMA EXAMINATION, (C–16)

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. Define couple and state the value of moment of a couple.

2. Differentiate between centroid and centre of gravity.

3. At what height the centroid lies for a right angled triangle of base 100 mm and altitude 120 mm from its base?

4. Determine the radius of gyration of a solid circular section of diameter 100 mm.

5. *(a)* State Hookes law.

(b) Define modulus of elasticity.

6. Define 'strain energy' and give the equation for the same in terms of stress ( ) and Young's modulus (E).

7. Define *(a)* ductility and *(b)* malleability.

8. *(a)* Define bending moment.

(b) State the maximum value of shear force for a simply supported beam of span L with a central point load of W.

9. Draw the SFD and BMD of a cantilever of span l with a point load of W at its free end showing the values at fixed end.

10. State any three types of beams with the help of neat sketches.

PART—B

10×5=50

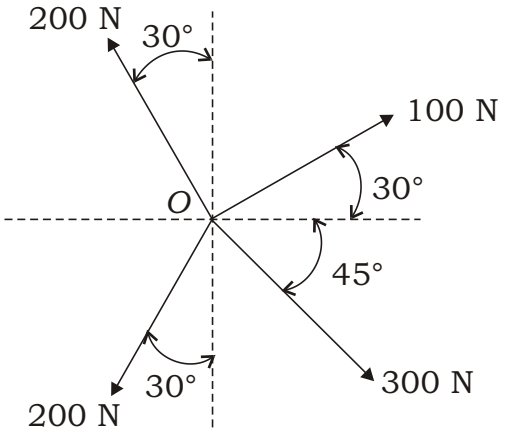
Instructions : (1) Answer *any* **five** questions.

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

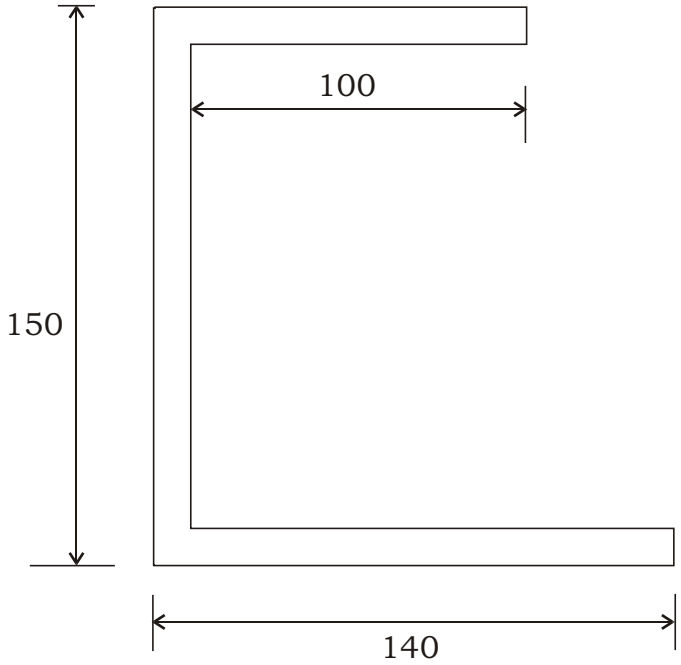
(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. *(a)* Define Lami's theorem. 2

(b) A point is acted upon by a system of four forces as shown in the figure below. Find the magnitude and direction of the resultant of the force system. 8



12. Locate the position of centroid of a channel section shown in figure below. Thickness = 20 mm throughout. All dimensions are in mm.



13. *(a)* State *(i)* perpendicular axis theorem and *(ii)* parallel axis theorem.

(b) Determine the moment of inertia about the centroidal axes and polar moment of inertia of a hollow circular section of external and internal diameters of 120 mm and 80 mm.

14. A built-up section is made up of one ISHB 450 250 and a flat plate of 300 mm 20 mm connected one at top and one at bottom flange. Find I_{XX} and I_{YY} of the built-up section. Given, area of ISHB = 11789 mm^2; I_{XX} 40350 10^4 mm^4 and I_{YY} 3045 10^4 mm^4.

15. A circular RCC column 250 mm in diameter is reinforced with 6 numbers of 20 mm diameter steel bars. Permissible stress in concrete is 5 N / mm^2. Ratio of Young's modulus of steel to Young's modulus of concrete is 13·33. Find the load carrying capacity of the column.

16. A steel flat 150 mm wide, 16 mm thick and 6000 mm long carries an axial pull of 30 kN. Find the extension in length, contraction in width and thickness under the pull. The Poisson's ratio is 0 3 and E 200 GPa.

17. A cantilever of length 4 m carries a point load of 5 kN at its free end and a u.d.l. of 2 kN/m over a length of 2 m from the fixed end. Draw the SF and BM diagrams indicating their maximum values.

18. A uniform beam of 8 m length is supported at its left hand end and at 2 m from its right hand end. Three point loads of 180 kN, 50 kN and 30 kN are carried by the beam at 2 m, 4 m and 8 m from its left support respectively. Draw SF and BM diagrams and show the values at salient points.

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