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C14–C–105

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BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—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. Mention the various base quantities and their units in SI system.

2. Define the terms *(a)* force, *(b)* moment and *(c)* equilibrant.

3. Draw neat sketches of any three types of supports.

4. Define the terms 'centroid' and 'centre of gravity'.

5. Determine the coordinates of the centroid for an equal angle of size 100 mm × 100 mm × 10 mm.

6. Find the moment of inertia of a circle of radius 40 mm about any tangent to the circle.

7. Determine the values of the I_{xx} and I_{yy} of a rectangular lamina of size 200 mm × 120 mm.

8. Define the terms *(a)* modulus of elasticity, *(b)* modulus of rigidity and *(c)* modulus of resilience.

9. The modulus of rigidity of a material is 0 8 10^5 N/mm^2 and Young's modulus is 2 10^5 N/mm^2. Find its bulk modulus.

10. Define the terms *(a)* plasticity, *(b)* malleability and *(c)* toughness.

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 wheel has eight spokes which are equispaced. The forces acting in six consecutive spokes are 400, 600, 800, 400, 600 and 800 N respectively. Find the forces acting in the other two spokes for the wheel to be in equilibrium.

12. Find the support reactions for a simply supported beam of span 10 m and is loaded with a udl of 5 kN/m in a length of 4 m from the left support. In addition it also carries a point load of 20 kN placed at 3 m from the right support.

13. Find the position of centroid of an I section from the base when,

Top flange	= 200 mm × 40 mm
Web	= 40 mm × 240 mm
Bottom flange	= 300 mm × 70 mm

14. *(a)* State *(i)* parallel axis theorem and *(ii)* perpendicular axis theorem. 4

(b) Find I_{xx} and I_{yy} for a T section having flange 100 mm × 20 mm and web 80 mm × 20 mm. 6

15. A built-up section is made up of one ISHB 250 mm × 450 mm and a flat plate 300 mm × 20 mm one at top and one at bottom of the flange. Determine the radius of gyration of the section about the horizontal and vertical centroidal axes :

For each RSJ,

A 11789 mm^2

I_{xx} 403 5 10^6 mm^4

I_{yy} 30 45 10^6 mm^4

Flange width = 250 mm

16. A steel rod 20 mm in diameter, 200 mm long is heated through 100 °K and at the same time subjected to a pull P kN. If the total extension of the rod is 0·3 mm, what should be the magnitude of P. Take for steel 12 10^{-6} / K and E 215 kN / mm^2.

17. A circular RC column of 300 mm dia and 4 m length is reinforced with 6 numbers of 16 mm dia bars. The permissible stress in concrete is 4 MPa. Assuming the perfect bond between concrete and steel, find out the maximum load-carrying capacity of the column. Modular ratio of the material is 18·7.

18. A 40 mm diameter metal bar carrying a load of 200 kN extended by 0·34 mm on a gauge length of 150 mm. The contraction in diameter was 0·022 mm. Calculate the values of the four elastic constants of the material.

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