* 4019 *

C14–C–105

4019

BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—2018

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 fundamental and derived units with examples.

2. State Lami's theorem.

3. State any three properties of a couple.

4. Define the terms *(a)* centroidal axis and *(b)* centre of mass.

5. Give one example each (with sketches) for sections symmetrical about *(a)* both *X* and *Y* axis, *(b) X* axis only and *(c) Y* axis only.

6. Define the terms *(a)* moment of inertia and *(b)* radius of gyration.

7. Find the polar moment of inertia of a hollow circular section having external and internal diameters as 80 mm and 60 mm respectively.

8. Define the terms *(a)* linear strain and *(b)* lateral strain.

9. List the elastic constants and state the relation among them.

10. Define the terms *(a)* Poisson's ratio and *(b)* modular ratio.

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.

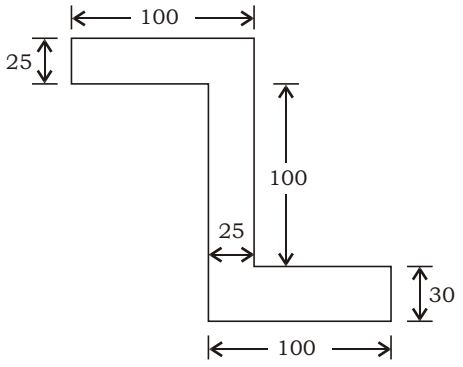
11. *(a)* State parallelogram law of forces and write the formula for the magnitude and direction of the resultant as per the parallelogram law of forces.

(b) A pole is supported by a wire which exerts a pull of 500 kN at the top of pole. If the wire makes an angle of 40° with the pole, find the horizontal and vertical components of the pull.

12. A wheel has 5 spokes which are equispaced. The forces acting in the three consecutive spokes are 12 kN, 15 kN and 10 kN. Find the forces in the other two spokes for equilibrium.

13. Find the position of centroid of a 'channel' section of web size 300 mm × 20 mm and top flange size 100 mm × 20 mm and bottom flange size 120 mm × 20 mm. Overall depth of section is 340 mm.

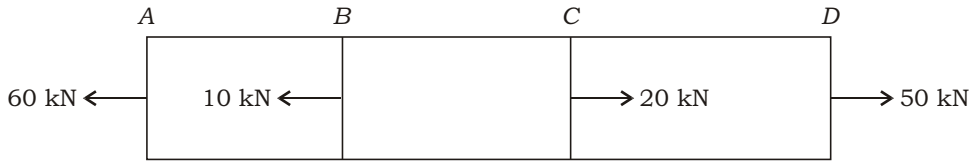
14. Find the moment of inertia about both horizontal and vertical centroidal axes (I_{XX} and I_{YY}) of the Z-section shown in the figure below :



15. Find the moment of inertia about both horizontal and vertical centroidal axes (I_{XX} and I_{YY}) of an I-section with top flange 100 mm × 10 mm, web 200 mm × 10 mm and bottom flange 160 mm × 10 mm.

16. A steel flat 150 mm wide 19 mm thick and 6 m long carries a tensile load of 280 kN. Calculate the changes in length, width and thickness. The Poisson's ratio is 0·3 and E = 200 kN/mm^2. Calculate also change in volume.

17. A rod AD of diameter is subjected to axial forces as shown in the figure below :



Find the change in length of the bar. E = 200 kN/mm^2, AB = 600 mm, BC = 700 mm and CD = 800 mm.

18. A solid steel cylinder of 80 mm diameter is inserted inside a hollow aluminum tube of 80 mm internal diameter and 120 mm external diameter and rigidly fixed at ends. The composite section is subjected to an axial compression of 170 kN. Determine the stresses induced in each material. Es = 210 kN/mm^2, Ec = 70 kN/mm^2.

★ ★ ★