* 3 0 1 6 *

C09–C–106

3016

BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2014

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 term force and state its characteristics. 1½+1½

2. Two forces 30 kN and 40 kN act at an angle of 60°. Determine the magnitude and direction of resultant force. 1½+1½

3. A trapezoidal lamina has uniform batter on both sides. Its top width is 200 mm and bottom width is 300 mm, height is 600 mm. Determine the position of centroid from base. 3

4. Find the moment of inertia of a rectangle of 60 mm wide and 120 mm deep about its centroidal axis and least radius of gyration. 1½+1½

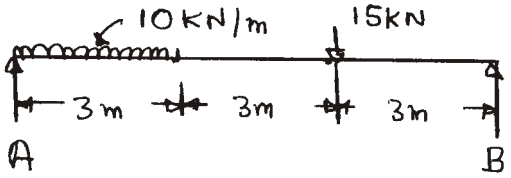
5. State Hooke's law and explain the terms *(a)* working stress and *(b)* factor of safety. 1+1+1

6. How much pull is required to enlarge 2 mm in 1·5 m length of square rod of 20 mm side, if its Youngs modulus of elasticity is 200 kN/mm^2?

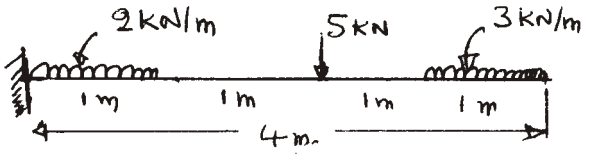
7. A material has Young's modulus of elasticity 1 25 10^5 N/mm^2 and Poisson's ratio of 0·25. Calculate modulus of rigidity and bulk modulus. 1½+1½

8. Define the terms *(a)* shear force and *(b)* bending moment. 1½+1½

9. Determine the reactions at *A* and *B* for the beam given below : 1½+1½



10. Draw the SF diagram for the cantilever shown below : 3



PART—B 10×5=50

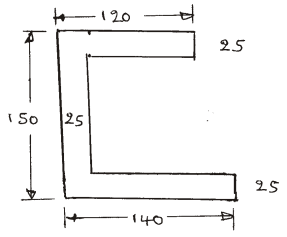
Instructions : (1) Answer *any* **five** questions.
(2) Each question carries **ten** marks.
(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

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

(b) Find the magnitude and direction of resultant force of the following force acting at a point : 8

(i) 80 kN due north
(ii) 20 kN at 45° in the direction of north of east
(iii) 40 kN due east
(iv) 60 kN at 60° in the direction of south of east
(v) 70 kN at 60° in the direction of south of west

12. Find the position of centroid of a channel section of the figure shown below : 10



13. *(a)* Define centre of gravity and centroid with two differences. 2½+2½

(b) A hollow shaft has an outside diameter 150 mm and inside diameter 120 mm. Determine the moment of inertia and radius of gyration about its diameter. 2½+2½

14. Find the moment of inertia about horizontal and vertical axis passing through centroid for a rolled steel T-section whose size of flange is 250 mm 50 mm and size of web is 200 mm 50 mm. 5+5

15. A bar of diameter 40 mm carrying an axial pull of 210 kN, gave an extension of 0·3 mm over a gauge length of 150 mm. The reduction in diameter was 0·02 mm. Calculate the following : 2½×4=10

(a) Young's modulus

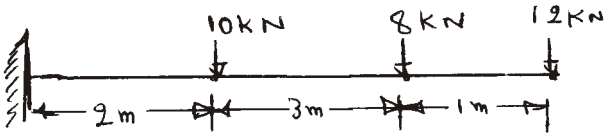
(b) Poisson's ratio

(c) Shear modulus

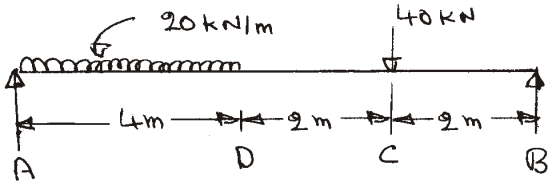
(d) Bulk modulus

16. A steel flat 150 mm wide, 16 mm thick and 6000 mm long carries an axial pull of 300 kN. Find the changes in length, breadth, thickness if Poisson's ratio is 0·3 and E 200 GPa. Also calculate strain energy stored in the material. 2½×4=10

17. A cantilever beam of 6 m long is loaded as shown in figure below. Draw shear force and bending moment diagram : 5+5



18. A simply supported beam of span of 8 m is loaded as shown in figure below. Draw shear force and bending moment diagram : 5+5



★ ★ ★