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C09–C–106

3016

BOARD DIPLOMA EXAMINATION, (C–09)

MARCH/APRIL—2016

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. Write the characteristics of force.

2. List any three properties of a couple.

3. State the formulae for $\bar{x}$ and $\bar{y}$ for any section, i.e., centroid.

4. Write the practical applications of determination of moment of inertia.

5. Define *(a)* strain energy and *(b)* resilience.

6. Define *(a)* modular ratio and *(b)* Young's modulus.

7. A steel rod 20 mm in diameter and 500 mm long is subjected to an axial pull of 30 kN. Determine *(a)* the intensity of stress and *(b)* the strain. Take $E \quad 2 \quad 10^5$ N / mm^2.

8. Draw the sketches of *(a)* continuous beam, *(b)* cantilever beam and *(c)* simply supported beam.

9. A simply supported beam of span 6 m carries a central point load of 20 kN in addition to the UDL of 5 kN/m over its entire span. Draw the SF diagram.

10. Draw the sketches of *(a)* roller support, *(b)* hinged support and *(c)* fixed support showing the reactions.

PART—B

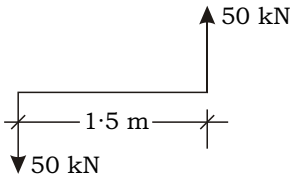
10×5=50

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

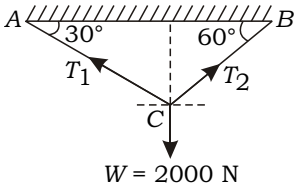
(2) Each question carries **ten** marks.

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

11. *(a)* For the couple shown below, find the moment. Also give the stabilizing moment for the given couple :



(b) A weight of 2000 N is supported by two chains *AC* and *BC* as shown in the figure below. Determine the tension in each chain :



12. Determine the position of the centroid of a composite section with a plate of 100 mm width and 40 mm thickness welded to the top flange. Area of I-section is 1021 m^2. Take top of plate as reference.

13. *(a)* What do you mean by polar moment of inertia of a section?

(b) Determine the moment of inertia of a circular section of 100 mm diameter about its centroidal axes by using parallel axes theorem.

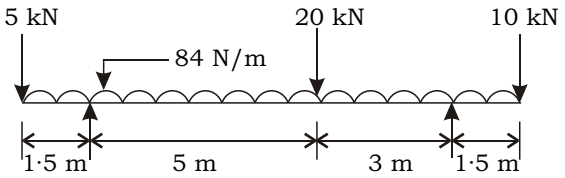
14. *(a)* Define the three elastic constants.

(b) In a tensile test on a steel tube of external diameter 18 mm, 12 mm bore, an axial load of 1·7 kN produced an elongation of 0·0045 mm in a length of 75 mm, while the outer diameter suffered a compression of 0·0032 mm. Calculate the values of Poisson's ratio, Young's modulus E and shear modulus G.

15. Find the final dimensions of a steel flat of original length 400 mm, width 200 mm and thickness 8 mm, subjected to an axial pull of 160 kN. Take E for steel as 200 kN / mm^2 and Poisson's ratio as 0·3.

16. A beam of 8 m length is simply supported at its ends and carries two point loads of 20 kN and 30 kN at 2 m and 5 m from RHS. It also carries a UDL of 2·5 kN/m throughout. Draw SF and BM diagrams for the beam, giving the location and magnitude of max. BM.

17. Draw the SF and BM diagrams for the beam shown below :



18. *(a)* Find the centroid of an inverted T-section from bottom with flange 60 × 10 and web 50 × 10.

(b) The moment of inertia of a triangular lamina about its base is 162 10^6 mm^4. Find MI of this triangle about an axis parallel to its base and passing through the centroid.

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