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C14–C–302

# 4226

## BOARD DIPLOMA EXAMINATION, (C–14)

## OCT/NOV—2015

## DCE—THIRD SEMESTER EXAMINATION

MECHANICS OF SOLIDS

*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 down the relationship among loading, shear force and bending moment.

**2.** A cantilever 1·75 m length is subjected to two point loads of 2 kN and 3 kN at 0·75 m and 1·5 m from the free end. Calculate the values of maximum shear force and maximum bending moment.

**3.** Two point loads of 2 kN each acts at 1/3rd span points on a SS beam of 6 m span. Sketch the BMD and state the position of the beam where the bending moment is constant and maximum.

**4.** State any three assumptions made in theory of simple bending.

**5.** To what radius an aluminium strip 100 mm wide and 20 mm thick can be bent if the maximum stress in the strip is not to exceed 50 MPa?

6. Sketch the shear stress distribution for a homogeneous beam of *(a)* rectangular section and *(b)* symmetrical I-section.

7. Draw the elastic curves following beams loaded symmetrically :
   *(a)* Cantilever beam
   *(b)* Simply supported beam
   *(c)* Double overhanging beam

8. Find the maximum slope and deflection of a cantilever beam of length $L$ subjected to a u.d.l. $w$/unit length over the entire span.

9. An SS beam of span 4·5 m carries an u.d.l. of 230 kN over its entire span. If the value of EI is 3 $10^{13}$ N-mm$^2$, calculate the maximum deflection.

10. A cantilever beam is carrying an u.d.l. of $w$/unit length throughout the length and is propped at free end. Calculate the reaction of prop.

**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. Calculate maximum shear force and bending moment for a cantilever beam of span 3 m and carries an u.d.l. of 2 kN/m over a length of 1 m from free end and a point load of 10 kN is acting at a distance of 1 m from fixed end.

12. A horizontal beam of 12 m long simply supported at its ends, is subjected to vertical loads of 10 kN, 20 kN and 25 kN at 3 m, 7 m and 10 m from left support respectively. Draw shear force and bending moment diagrams indicating values at salient points.

13. Find the size of the strongest beam which can be cut out of a circular section of dia $D$.

**14.** An I section has flanges 80 mm × 15 mm and web 100 mm × 15 mm. This section is subjected to a shearing force of 10 kN. Find the values of maximum and average shear stresses induced in the section.

**15.** A rectangular beam of 200 mm wide and 300 mm deep is simply supported over a span of 6 m and carries an u.d.l. of 5 kN/m over a length of 2 m from right hand support. Find the position and magnitude of maximum deflection. $E$ 10 kN / mm$^2$. Use Macaulay's method.

**16.** A cantilever 6 m span carries two point loads of each 20 kN at 2 m and 4 m from free end. Find the maximum slope and deflection using Mohr's theorem if $EI$ 8400 kN / m$^2$.

**17.** A cylindrical thin shell 750 mm in diameter and 3 m long is having 10 mm metal thickness. If the shell is subjected to an internal pressure of 2·5 N/mm$^2$, find *(a)* change in dia, *(b)* change in length and *(c)* change in volume.

Given $E$ 2 $10^5$ N/mm$^2$, $\frac{1}{m}$ 0 25

**18.** Two solid shafts $A$ and $B$ are made of the same material. Each shaft transmits the same power, shaft $A$ running at 200 r.p.m. while the shaft $B$ running at 20000 r.p.m. Find the ratio of diameters of the two shafts, if the maximum shear stress developed is same in each shaft.

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