* 4253 *

C14–M–305

4253

BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—2016

DME—THIRD SEMESTER EXAMINATION

STRENGTH OF MATERIALS

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 *(a)* strain and *(b)* Young's modulus.

2. Define *(a)* ductility and *(b)* malleability.

3. An unknown weight falls by 30 mm on to a collar, rigidly attached to the lower end of a vertical bar 4 meter long and 1000 mm^2 cross-sectional area. If the maximum instantaneous extension is found to be 3·66 mm, find the corresponding stress and the value of the unknown weight. Take, E 2 10^5 N/mm^2.

4. What is meant by a 'beam'? Write any three types of beam.

5. Draw shear force diagram for a cantilever of length L and subjected to UDL of W N/m length.

6. Find the section modulus of a hollow circular cross-section of external diameter 250 mm and thickness 30 mm.

7. A cantilever of length 6 m is carrying a UDL of 16 kN/m. Calculate the deflection at the free end if I 95 10^7 mm^4. Take E 2 10^5 N/mm^2.

WWW.MANARESULTS.CO.IN

8. A hollow shaft of external diameter 140 mm and internal diameter 100 mm is 1·5 meter long. Find the maximum torque required to produce a twist of 0·5 degree over the length of the shaft. Take, $G \quad 8 \quad 10^4$ N/mm^2.

9. A helical spring is made of 12 mm diameter steel wire by winding it on a 120 mm diameter mandrel. If there are 10 active turns, what is the spring constant? Take, $G \quad 8 \; 2 \quad 10^4$ N / mm^2.

10. A 900 mm diameter pipe contains a fluid at a pressure of 35 N / mm^2. If the safe stress in tension is 100 N/mm^2, find the minimum thickness of the pipe.

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 steel tube having 30 mm external diameter and 25 mm internal diameter encloses a copper rod of 20 mm diameter to which it is rigidly fastened at each end. If there is no stress at 15 °C, find the stresses in the copper rod and steel tube when the temperature is raised to 130 °C. Take, $E_S \quad 200$ GN / m^2, $E_{CU} \quad 90$ GN / m^2, $_s \quad 12 \quad 10^{\,6}$ per °C, $_{cu} \quad 17 \quad 10^{\,6}$ per °C.

12. A mild steel specimen of 25 mm diameter extends 0·06 mm over a 60 mm gauge length under an axial load of 40 kN. Calculate the strain energy at this point. If the load at elastic limit is 60 kN, calculate the proof resilience.

13. A simply supported beam of 8 m length consists of a UDL of 2 kN/m for a length of 2 m from left end and point loads of 4 kN, 2 kN at a distance of 3 m and 1 m respectively from right end. Draw the shear force and bending moment diagram.

WWW.MANARESULTS.CO.IN

14. A timber beam of rectangular cross section 120 mm wide × 230 mm depth is simply supported at its ends and has a span of 6 meter. The maximum allowable bending stress is 8 2 N/mm^2. Find the maximum safe UDL which the beam can carry.

15. Derive torsion equation and state the assumptions in deriving it.

16. A thin cylindrical shell has a thickness of 18 mm. The diameter of shell is 400 mm and its length is 1·75 meter. Determine the maximum internal pressure that can be applied if the longitudinal stress is limited to 26 N/mm^2, and circumferential stress is not to exceed 40 N/mm^2.

17. *(a)* A closed-coil helical spring of 120 mm mean diameter is made of 12 mm diameter rod and has 20 turns. The spring carries an axial load of 210 N. Determine *(i)* shear stress and *(ii)* deflection when carrying this load. Take, G 0 8 10^5 N/mm^2.

(b) A timber beam of rectangular section 100 mm wide and 250 mm deep supports over a span of 5 m. Find the magnitude of central point load it can carry if the maximum permissible deflection is 6 mm. Take, E 1 10^4 N/mm^2.

18. *(a)* A hole of 20 mm diameter is to be pierced in a plate of 10 mm thick. If the ultimate shear stress of the plate is 400 N/mm^2, what is the force exerted by the punch?

(b) A simply supported beam of length 5 m carries a UDL of 2 kN/m over entire span. Draw SFD and BMD.

★ ★ ★

WWW.MANARESULTS.CO.IN