4253

C14–M–305

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BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—2018

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. A rod 300 mm long and of diameter 30 mm is subjected to an axial pull of 60 kN. If the extension of the rod is equal to 0.4 mm, find the Young's modulus of the rod.

2. Define (a) hardness, and (b) ductility.

3. A tensile load of 60 kN is gradually applied to a circular bar of 40 mm diameter and 5 m long. If the value of E 2 $10^5 N/mm^2$ determine the strain energy absorbed by the rod.

4. Differentiate between a cantilever and a simply supported beam.

5. Draw shear force and bending moment diagrams for cantilever with uniformly distributed load on its entire span.

6. Define the following :
(a) Bending stress
(b) Neutral axis.

7. A cantilever beam of length 7 m is carrying a UDL of 16 kN. Calculate the deflection at the free end if moment of inertia, I 85 $10^7 mm^4$ and E 2 $10^5 N/mm^2$.

8. A solid circular shaft of diameter 40 mm transmits 1500 N-m torque. Find the maximum shear stress induced in it.

9. Define :

(a) Spring index

(b) Spring stiffness.

10. Derive an expression for longitudinal stress in this cylinder subjected to internal pressure.

PART—B 10×5=50

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

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

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

11. The following results are obtained from a tensile test on an M.S. specimen :

Diameter of the rod = 30 mm
Gauge length = 200 mm
Load at yield point = 250 kN
Extension at a load of 150 kN = 0.21 mm
Maximum load = 380 kN
Total extension = 60 mm
Diameter of neck = 22.5 mm

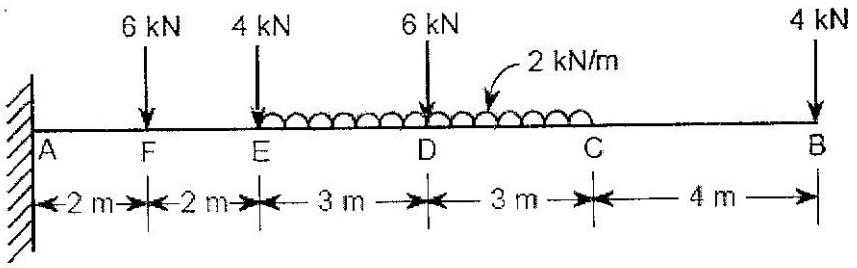
Calculate (a) Young's modulus of elasticity, (b) stress at yield point, (c) ultimate stress, (d) working stress taking factor of safety as 3, (e) percentage elongation, and (f) percentage reduction in area.

12. *(a)* A steel bar of 200 mm long is placed between two supports with an end clearance of 0.3 mm and its temperature is then raised by 200°C. What will be the stress in the bar? For steel E_s 200 GN / m^2 and 12 10 ^{6} per °C.

(b) A simply supported beam of length 6 m carries two point loads 6 kN and 3 kN at distances of 2 m and 4 m from the left end support. Draw shear force and bending moment diagrams.

13. A bar of 4 m long and 50 mm diameter changes vertically and has a collar securely attached to the lower end. Find the maximum stress induced when (a) a body of weight 3000 N falls from 200 mm onto the collar (b) a body of weight 30000N falls from 20 mm onto the collar. Take E 2 10^{5}N / mm^2.

14. A cantilever beam is loaded with point loads and U.D.L as shown in the figure below:



Draw SF and BM diagrams.

15. A simply supported beam of span 4 m is carrying a uniformly distributed load of 2 kN/m over the entire span. Find the maximum slope and deflection of the beam. Take E 0.1 10^{5}N / mm^2 and I 8 10^{6}mm^4.

16. *(a)* State any five assumptions in the theory of simple bending.

(b) A closed coiled helical spring with the coil diameter 110 mm and wire diameter 12 mm consists of 16 coils. The spring carries an axial load of 400 N. Determine the deflection due to axial load. Take G 0.84 10^{5}N / mm^2.

17. Find the diameter of a solid circular shaft to transmit 100 kW power at 160 r.p.m. The maximum torque is 20% greater than mean torque. The allowable shear stress should not exceed 70 N / mm^2 and the angle of twist should not be more than one degree in a length of 3m. Take $G \quad 0.82 \quad 10^5 N / mm^2$.

18. A cylindrical boiler shell of diameter 1.25 m is subjected to an internal pressure of 1.6 N / mm^2. If the steam boiler is made up of 20 mm thick plates, calculate the circumferential and longitudinal stresses. The efficiency of circumferential and longitudinal joints are 75% and 60% respectively.

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