



C09-M-403

3503

BOARD DIPLOMA EXAMINATION, (C-09)

MARCH/APRIL—2016

DME—FOURTH 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.

1. Define the following terms : 1½+1½
 - (a) Stress
 - (b) Strain
2. A punch operates with a force of 12 kN to produce 50 mm diameter blanks from a material of 15 mm thick. Estimate (a) the shear stress in the plate and (b) the compressive stress in the punch. 1½+1½
3. Define the following terms : 1½+1½
 - (a) Resilience
 - (b) Modulus of resilience
4. List out different types of beams depending upon the end conditions.
5. A cantilever beam of 3 m long carries a point load of 4 kN at free end. Draw shear force and bending moment diagrams. 1½+1½
6. State any three assumptions made in theory of simple bending. 1+1+1

7. Define the following terms : 1½+1½
 (a) Neutral axis
 (b) Moment of resistance
8. A solid shaft is to transmit 350 kW at 110 r.p.m. If the maximum shear stress induced in the shaft must not exceed 90 N/mm², find the diameter of the shaft.
9. State any three applications of springs. 1+1+1
10. (a) Define a thin cylindrical shell. 1½
 (b) Name the stresses setup in a thin cylindrical shell subjected to internal fluid pressure. 1½

PART—B

10×5=50

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

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

11. The following results are obtained from a tensile test on a m.s. specimen :

Diameter of specimen = 16 mm

Gauge length = 80 mm

Extension at a load of 75 kN = 0.15 mm

Load at yield point = 90 kN

Maximum load = 130 kN

Length at fracture = 106 mm

Diameter at neck = 9.8 mm

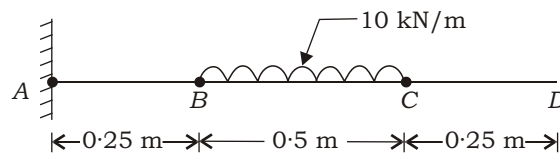
Calculate (a) Young's modulus of elasticity, (b) stress at yield point, (c) ultimate stress, (d) working stress taking factor of safety as 3, (e) percentage elongation and (f) percentage reduction in area.

12. A bar of 25 mm diameter is subjected to an axial pull of 62.5 kN. The extension over a gauge length of 200 mm is 0.4 mm and decrease in diameter is 0.013 mm. Calculate (a) modulus of elasticity, (b) modulus of rigidity, (c) bulk modulus and (d) Poisson's ratio.

13. An MS bar of length 2 m and has a diameter of 50 mm, hangs vertically. A load of 20 kN falls on a collar attached to the lower end. Find the maximum stress, when (a) height of fall is 150 mm, (b) load is applied suddenly without impact and (c) the load is applied gradually.

Assume modulus of elasticity of mild steel, $E = 2 \times 10^5 \text{ N/mm}^2$

14. Draw shear force and bending moment diagrams for the cantilever beam loaded as shown in the figure below :



15. A simply supported beam of length 5 m carries a uniformly distributed load of 2 kN/m over entire span and a point load of 25 kN at a distance of 2 m from left end support. Draw shear force and bending moment diagrams.

16. A cantilever 2 m long is loaded with a point load of 800 N at the free end and a uniformly distributed load of 3 kN/m over 1.2 m from the fixed end. If the section is rectangular 75 mm \times 150 mm deep, calculate the slope and deflection at the free end.

Take $E = 1.1 \times 10^5 \text{ N/mm}^2$

17. A solid steel shaft 100 mm diameter transmits 75 kW at 150 r.p.m. Calculate (a) torque on the shaft, (b) the maximum shear stress induced, (c) the angle of twist in a length of 600 mm and (d) the shear stress at a radius of 30 mm.

Take modulus of rigidity, $G = 0.8 \times 10^5 \text{ N/mm}^2$

18. (a) A close coiled helical spring of 100 mm mean diameter is made of 10 mm diameter rod and has 18 turns. The spring carries an axial load of 190 N. Determine (i) shear stress and (ii) deflection, when carrying this load. Assume $G = 0.8 \times 10^5 \text{ N/mm}^2$

- (b) A boiler shell is to be made of 12 mm thick plate having limiting tensile stress of 100 N/mm^2 . If the efficiencies of longitudinal and circumferential joints are 75% and 35% respectively, determine the maximum permissible diameter of the shell to withstand a steam pressure of 1.2 N/mm^2 .
