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C14–M–305

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BOARD DIPLOMA EXAMINATION, (C–14)

MARCH/APRIL—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.

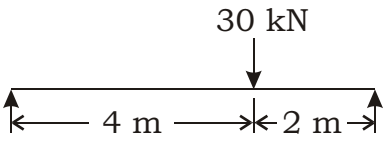
1. A steel rod of 20 mm diameter and 600 mm long is subjected to an axial pull of 40 kN. Determine the elongation of rod. E 2 10^5 N/mm^2.

2. A rod of 2 m long rigidly fixed at a temperature of 30 °C. Find the stress induced in the rod, if temperature raised at 120 °C.

Take E 2 10^5 N/mm^2 and 16 10 ^{6} per °C.

3. An axial pull of 50 kN is suddenly applied to steel rod of 2 m long and 30 mm diameter. Calculate the strain energy that can be absorbed. E 200 kN / mm^2.

4. Draw shear force and bending moment diagram for simply supported beam :



5. Define the terms *(a)* reactions and *(b)* point of contra flexure.

6. A rectangular beam of 80 mm × 40 mm is 3 m long and simply supported at its end and it carries a load of 2 kN at midpoint. Calculate the maximum bending stress induced in the beam.

7. Define the terms *(a)* bending stress and *(b)* neutral axis.

8. List out any three applications of springs.

9. A solid circular shaft running at 500 r.p.m. transmit power of 350 kW. Calculate suitable diameter of the shaft, if the maximum shear stress is 100 N/mm^2.

10. A gas cylinder of internal diameter 1·5 m is 30 mm thick. Find the safe pressure of gas in the cylinder, if the tensile stress in the cylinder is not to exceed 100 N/mm^2.

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. The following results are obtained from a tensile test on mild steel specimen :

Diameter of specimen 16 mm
Guage length 80 mm
Extension at a load of 75 kN is 0·15 mm
Load at yield point 90 kN
Maximum load 130 kN
Length at fracture 106 mm
Diameter of neck 9·8 mm

Calculate—

(a) young's modulus of elasticity;

(b) ultimate stress;

(c) working stress, if factor of safety is 3;

(d) percentage of elongation and percentage of reduction area.

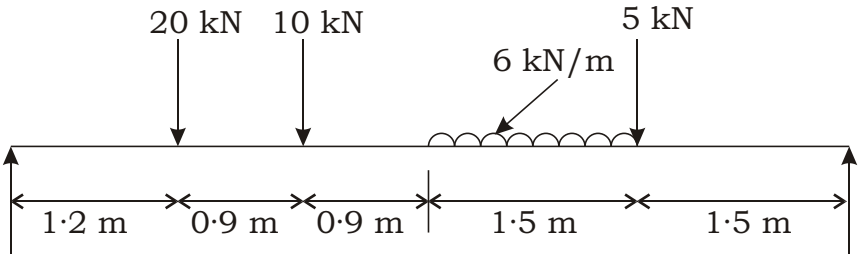
12. A steel bar of 22 mm diameter and 1·25 m long is freely suspended from a roof and is provided with collar at other end. The maximum permissible stress is 300 N/mm^2. Find—

(a) maximum load which can fall from a height of 50 mm;

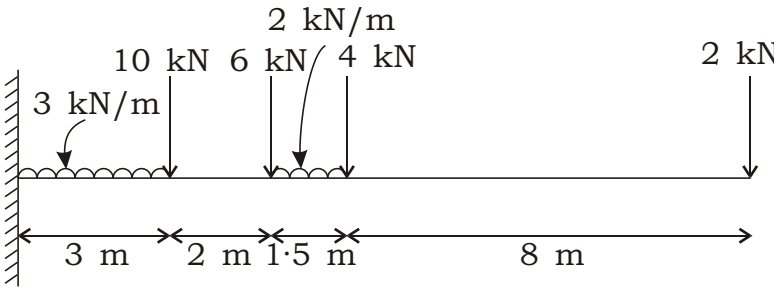
(b) maximum height from which a 600 N load can fall on collar. E 2 10^5 N/mm^2

13. In a tensile test on a steel tube of external diameter 18 mm, 12 mm bore, an axial load of 1·7 kW produced an elongation of 0·0045 mm in a length of 75 mm, while the outer diameter suffered a compression of 0·00032 mm. Calculate the values of $\frac{1}{m}$, E, G and K.

14. Draw shear force and bending moment diagram of given simply supported beam :



15. Draw shear force and bending moment diagram of given cantilever beam :



16. *(a)* Derive an equation $\frac{M}{I} \quad \frac{}{y} \quad \frac{E}{R}$.

(b) Steel strip of thickness 5 mm is coiled on a drum of 1·5 mm diameter. Calculate the maximum stress produced by the coiling. E 2 10^5 N/mm^2.

17. A hollow shaft is to have outside diameter D and inside diameter is $D / 2$. Calculate the minimum value of D, if it transmits 147·2 kW at 150 RPM with working shear stress of 42 N/mm^2. The maximum torque is 35% greater than mean torque. Calculate the angle of twist in a length of 10 times that of external diameter. G 0 8 10^5 N/mm^2.

18. A boiler shell is to be made of 10 mm thick plate having limiting tensile stress of 105 N/mm^2. If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively, determine the permissible intensity of internal pressure when the shell diameter is 1·5 m.

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