# 4252

## BOARD DIPLOMA EXAMINATION, (C-14)

MARCH / APRIL - 2019

### DME - III SEMESTER EXAMINATION

### STRENGTH OF MATERIALS

Time : **3** Hours]                                    [Total Marks : **80**

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**PART - A**                                    **3×10=30**

***Instructions :***     (1)   *Answer **ALL** questions.*

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

(3)   *Answer should be brief and straight to the point and shall not exceed five simple sentences.*

1    Define Thermal Stress. Write formula for thermal stress with units.

2    Define Modulus of Elasticity and Bulk Modulus.

3    Define :

(i)    Proof Resilience

(ii)   Modulus of Resilience

4    Define the following terms:

(a)   Shear force

(b)   Bending Moment

5    Draw a shear force and Bending Moment diagram for the following beam :
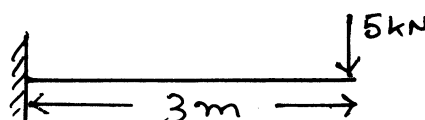
**6**  State the Bending Equation and mention the units of terms.

**7**  A cantilever 1.25 m long of section 100 mm wide × 160 mm deep carries a concentrated load of 60 kN at free end. Find the deflection at free end. Take $E = 2 \times 10^5$ N/mm$^2$.

**8**  Find the power transmitted by a circular shaft 50 mm diameter at 120 RPM. The maximum shear stress in the shaft is not to exceed 60 N/mm$^2$.

**9**  A closely coiled helical spring of 20 coils has a wire diameter of 6 mm and mean coil diameter of 30 mm. Find the stiffness of spring. Take $G = 8.4 \times 10^4$ N/mm$^2$.

**10**  Calculate the minimum wall thickness of a thin cylinder, 1.2 m in diameter, if subjected to an internal pressure of 2 N/mm$^2$. The Hoop stress should not exceed 30 N/mm$^2$

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**PART - B**                    **10×5=50**

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

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

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

**11**  A steel bar $6 \times 10^3$ mm$^2$ cross sectional area is rigidly fixed with a copper bar $4 \times 10^3$ mm$^2$ sectional area. Both the bars are of 1.5m length. Calculate the stresses in steel and copper if the compound bar is heated from 15° C to 215° C. Take $E_s = 2 \times 10^5$ N/mm$^2$, $\alpha_s = 12 \times 10^{-6}/°$C, $E_c = 1.2 \times 10^5$ N/mm$^2$ $\alpha_c = 18 \times 10^{-6}/°$C.

12 (a) A bar of varying section is loaded as shown in fig. Determine the total elongation.
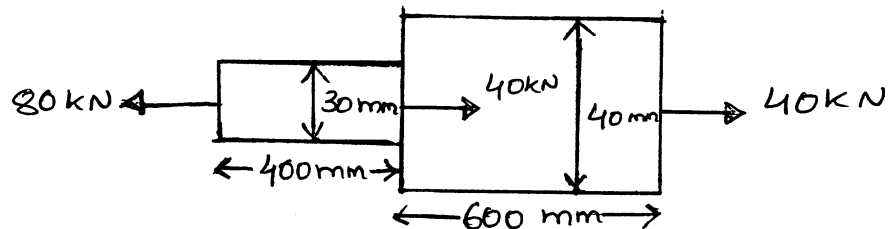


(b) Write about types of beams.

13 Draw shear force and bending moment for the simply supported beam as shown in figure below :
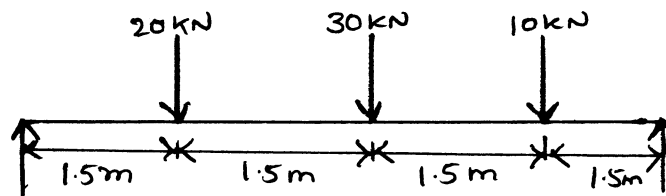


14 A bar of 3 m long and 500 mm diameter hangs vertically and has a collar securely attached at the lower ends. Find the maximum instantaneous stress induced, when (i) weight of 2500 N falls through a height of 130 mm on to the collar. (ii) Weight of 25000 N falls through a height of 13 mm on to the collar.

Take $E_s = 2 \times 10^5$ N/mm$^2$.

15 A timber beam of rectangular section 120 mm wide $\times$ 230 mm deep is simply supported at its ends. and has a span of 6 m. The maximum allowable bending stress is 8.2 N/mm$^2$ . Find the maximum safe u.d.l. which the beam can carry.

16 Select a suitable diameter of solid shaft to transmit 110 kW power at 240 rpm. If the allowable shear Stress is not to exceed 75 N/mm$^2$ and the twist is not to exceed 1° in a length of 3m.

Take $G = 0.8 \times 10^5$ N/mm$^2$.

17  (a)  A close coiled helical spring made 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 the load Take $G = 0.8 \times 10^5$ N/mm$^2$.

(b)  A cantilever of length 6 m is carrying a uniformly distributed load of 16 kN/m. calculate the deflection at the free end, if $I = 95 \times 10^5$ N/mm$^4$, $E = 2 \times 10^5$ N/mm$^2$.

18  A cylindrical shell 2.5 m long, 1 m in diameter and metal thickness 10 mm is subjected to an Internal pressure of 1.2 N/mm$^2$. Calculate the Maximum intensity of shear stress induced and also change in dimensions of the shell. Given $E = 2 \times 10^5$ N/mm$^2$ and $\dfrac{1}{m} = 0.3$.

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