

INDIAN MARITIME UNIVERSITY
Time Bound Assignment September/October 2020
B Tech (ME) Arrear Examinations
Strength of Materials – I
UG11T2204

Date: 26/09/2020
Time: 3 Hrs

Maximum Marks: 70
Pass Marks: 35

Part – A (compulsory)

Answer the following (10x2=20 Marks)

1. Define strain and its type.
2. Define working stress and factor of safety.
3. Define the term resilience and proof resilience.
4. Define the term shear force and bending moment.
5. Write the Bending stress equation and name the terms used in it?
6. Write the formula of the modulus of section for Rectangular section.
7. Which are the stresses developed in thin cylinder.
8. What are the advantages of welded joints?
9. Write the formula of Wahl's correction factor.
10. What are the assumptions made in deriving the torsional formulas?

Part – B

Answer any 5 out of 7 questions (5 x 10= 50 marks)

11. A metallic bar 300 mm X 100 mm X 40mm is subjected to a force of 5 KN (tensile), 6KN (tensile) and 4KN (tensile) along x,y, and z directions respectively. Determine the change in the volume of the block. Take $E=2 \times 10^5 \text{N/mm}^2$ and Poisson's ratio=0.25 **(10 Marks)**

- 12. a)** A steel rod 15 m long at temperature of 15°C. Find the free expansion of the length when the temperature is raised through 65°C. Find the temperature stress produced when the expansion of the rod is prevented. Take: $E_c = 200 \text{ GN/m}^2$, $\alpha_s = 12 \times 10^{-6}/^\circ\text{C}$ **(6 Marks)**

b) Draw stress-strain diagram for a ductile material under tension and show all the important points on it. **(4 Marks)**

- 13. a)** A steel wire 2.5 mm diameter is firmly held in clamp from which it hangs vertically. An anvil the weight of which may be neglected is secured to the wire 1.8 m below clamp. The wire is to be tested allowing a weight bored to slide over the wire to drop freely from 1 m above the anvil. Calculate the weight required to stress the wire to 1000 MN/m^2 assuming the wire to be elastic upto this stress. Take : $E = 210 \text{ GN/m}^2$. **(05 Marks)**

b) A plate 100 mm wide and 10 mm thick is to be welded to another plate by means of double parallel fillets. The plates are subjected to a static load of 80 kN. Find the length of weld if the permissible shear stress in the weld does not exceed 55 N/mm^2 . **(05 Marks)**

- 14.** The beam is supported & loaded as shown in figure 1. Draw Shear Force & Bending Moment diagrams indicating all important values. Locate the point of contraflexure, if any

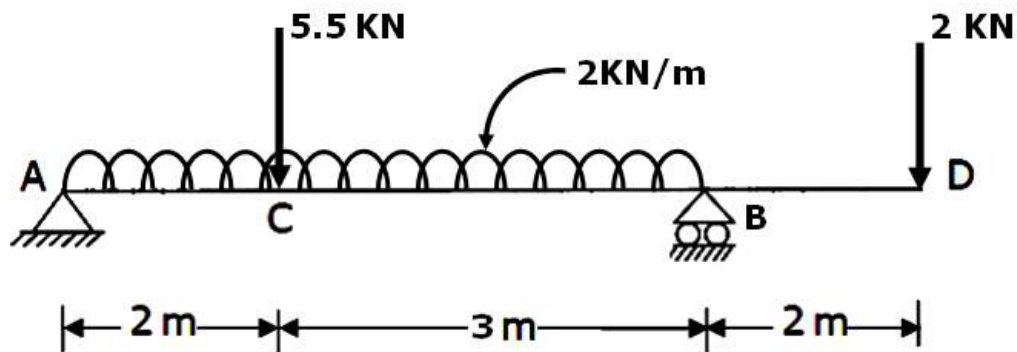


Figure: 1

(10 Marks)

- 15.** A symmetrical section with 200 mm, deep has a moment of inertia of $2.26 \times 10^{-5} \text{ m}^4$ about its neutral axis. Find the longest span over which, when simply supported the beam would carry a uniformly distributed load 4 kN/m run without the stress due to bending exceeding 125 MN/m^2 . **(10 Marks)**

16. A cylindrical air drum is 2.25 m in diameter with plates 1.2 cm thick. The efficiencies of the longitudinal and circumferential joints are respectively 75% and 40%. If the tensile stress in the plating is to be limited to 120 MN/m^2 , find the maximum safe air pressure.

(10 Marks)

17. a) A solid steel shaft has to transmit 75 kW at 200 rpm. Taking allowable shear stress as 70 MN/m^2 , find suitable diameter for the shaft, if the maximum torque transmitted on each revolution exceeds the mean by 30%.

(5 Marks)

b) For close-coiled helical spring subjected to an axial load of 300 N having 12 coils of wire diameter of 16 mm and made with the coil diameter of 250 mm, find maximum torsional shear stress in the wire and maximum shear stress using Wahl's correction factor.

Take $G = 80 \text{ GN/m}^2$.

(5 Marks)

* * * * *