1096

Code : 15AR31T

Register Number | | | | | | | |

III Semester Diploma Examination, April/May-2018

MECHANICS OF STRUCTURES

Time : 3 Hours] **[Max. Marks : 100**

Note : (i) Answer any **six** full questions from Part – **A**.
(ii) Answer any **seven** full questions from Part – **B**.

PART – A

1. State Law of triangle of forces. Justify the statement with a supporting sketch. **5**

2. State Lami's theorem with supporting proof and sketch. **5**

3. (a) Define centre of Gravity. **2**
   (b) Give formulae for locating centre of gravity for a semicircle, trapezium and Triangle. **3**

4. (a) Define moment of Inertia. **2**
   (b) Give formulae for moment of Inertia of the following figures on their own centroidal axis.
   (i) Circle, (ii) Triangle, (iii) Rectangle **3**

5. (a) State Hook's law. **2**
   (b) Define the following terms :
   (i) Modulus of elasticity, (ii) Tensile strain, (iii) Compressive strain **3**

6. (a) Define thermal stress and strain. **2**
   (b) Give formulae for thermal stress **3**
   (i) When ends do not yield
   (ii) When ends yield

[Turn over

7. Explain different types of loads considered on beams with neat sketches. 5

8. Explain following terms :

   (a) Bending moment, (b) Shear force, (c) Point of contraflexure 5

9. State assumptions made in Euler's column theory. 5

PART – B

10. Determine magnitude and direction of the resultant of two forces 50 kN and 75 kN acting at point 'O' and subtending an angle of 30°. Assume both forces to act away from the point 'O'. 10

11. Determine support reactions for a loaded beam shown in Fig. 1 10

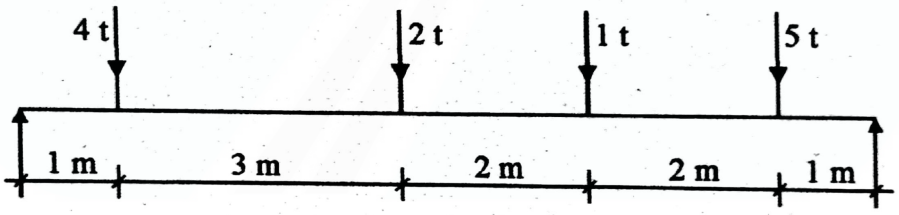

Fig. 1

12. Determine the centre of gravity of an angular section 120 mm × 90 mm × 150 mm. 10

13. Determine moment of Inertia of a 'T' section with its flange measuring 120 mm × 20 mm and web 90 mm × 20 mm on its centroidal axis parallel to X-X axis. 10

14. A rod of 120 cm long and 2.5 cm × 2 cm in cross section is subjected to a pulley of 2000 kN force. If the modulus of elasticity of the material is 2×10^6 kg/cm^2. Determine (i) stress, (ii) strain, (iii) elongation. 10

15. A member formed by connecting a steel bar to an aluminium bar is shown in Fig. 2- Assuming the bars are prevented from buckling sidewise, calculate the magnitude of force 'P' that will cause the total length of the member to decrease by 0.30 mm the values of elastic modulus for steel and aluminium are 200 kN/mm^2 and 70 kN/mm^2 respectively. **10**

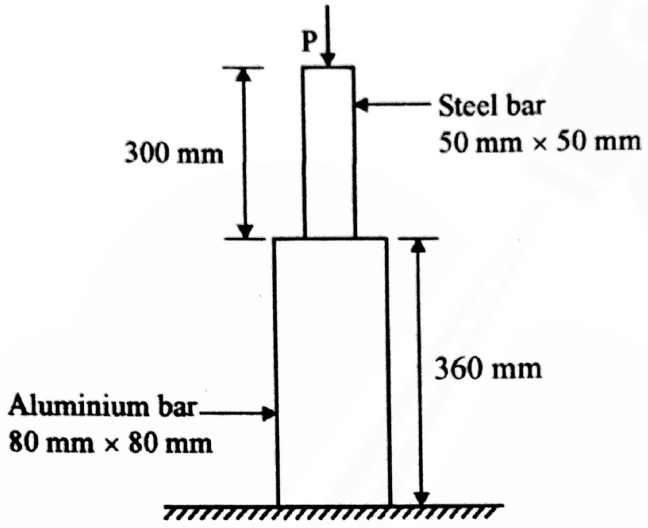

Fig. 2

16. A Rod of steel is 20 m long at a temperature of 25 °C is subjected to a rise in temperature to 80 °C. Find the expansion of the Rod. Also determine the temperature stress induced.

(a) When the expansion of the Rod is prevented.

(b) When the rod is permitted to expand by 5.6 mm.

Take, $E = 2 \times 10^6$ kN/cm^2 and $\alpha = 12 \times 10^{-6}$/°C. **10**

17. A cantilever beam 5 m span is loaded with a uniformly distributed load of 2.5 kN/m running over a length of 2.5 m from the fixed end. Two point loads 3 kN and 4 kN are placed at a distance of 2.5 m and 4 m from the fixed end respectively. Determine bending moment and shear force at salient points. Also plot BMD and SFD. **10**

18. Determine shear force and bending moment for a loaded beam shown in fig. 3 and also plot BMD and SFD. **10**

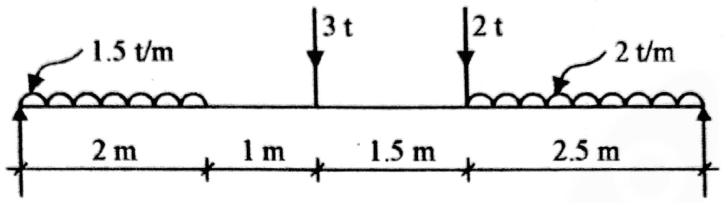

Fig-3

19. A steel rod of 5 m long and 4 cm in diameter is used as a column with one end fixed and other end free. Determine the crippling load by Euler's formula. Take E as 2×10^6 kN/cm^2. **10**
