C-18-AA/C-302C

6307

BOARD DIPLOMA EXAMINATION, (C-18)

NOVEMBER - 2019

DAA – III SEMESTER EXAMINATION

ENGINEERING MECHANICS

Time : 2 Hours] [Total Marks : 40

PART - A **08×01=08**

Instructions : *(1) Answer ALL questions.*
(2) Each question carries ONE mark.

1 Define Couple.

2 Sketch and Locate Centroid of a Triangle.

3 State Hooke's Law.

4 Define Polar Moment of Inertia.

5 Define Stress and state the units.

6 Define Strain.

7 Define Modular Ratio.

8 What is meant by Composite member?

PART - B

04×03=12

Instructions : *(1) Answer any **FOUR** questions.*
*(2) Each question carries **THREE** marks.*

9 (a) For a Cantilever beam of span 3m and carries an UDL of 2kN/m over a length of 1m from free end and a point load of 10kN is acting at a distance of 1m from fixed end. Find the reactions.

OR

(b) Explain the different types of Strains.

10 (a) Find the Centroid of a T-Section, with Top flange 60 × 20 mm and web is 20 × 100 mm.

OR

(b) Explain the Mechanical properties :
(a) Elasticity (b) Plasticity (c) Ductility.

11 (a) A wooden tie of 50 mm × 100 mm size is 2m long. It is subjected to an axial pull of 20 kN. Find the elongation of the tie, if the Young's modulus of wood is 10 kN/m^2.

OR

(b) What Pull elongates 2mm in 1.5m length of square rod of 20 mm side, if its E is 200kN/mm^2 ?

12 (a) A bar of length 2.5m is rigidly held between the ends and heated through 50° K. Calculate the temperature stress in the bar, if $E = 2 \times 10^5 \, N/mm^2$ and $\alpha = 11 \times 10^{-6}/K$.

OR

(b) A reinforced concrete column of 200×400 mm size is reinforced with 4 nos. of 20 mm dia. steel rods. It is subjected to an axial load of 750kN. Determine the stresses developed in steel and concrete. Take $E_S = 200$ GPa and $E_C = 20$ GPa.

[Contd...

PART - C

Instructions : *(1) Answer any FOUR questions.*
(2) Each question carries FIVE marks.

13 (a) Four forces acting at a point are in equilibrium. Three of them are 200 N due south, 400 N due North East, 500 N at 30° East of South. Find the magnitude and direction of fourth force.

OR

(b) A tie bar is to carry a pull of 14 kN not showing more than 0.12mm extension over gauge length of 200mm. The ultimate tensile strength of the material of the bar should not exceed 500 N/mm^2 with a factor of safety of 3.25, Young's modulus of the material of the bar is 210×10^3 N / mm^2. Determine the minimum area of cross section required to satisfy both conditions.

14 (a) An unsymmetrical I-section has top flange 100 × 20 mm, bottom flange 80 × 20 mm and web 10 × 120 mm. Overall depth of the section is 160mm. Calculate the I_{xx} and I_{yy}.

OR

(b) A solid steel cylinder of 80mm diameter is inserted inside a hollow aluminium tube of 80mm internal diameter and 120 mm external diameter and rigidly fixed at ends. This composite section is subjected to an axial compression of 170 kN. Determine the stress induced in each material. $E_s = 2.1 \times 10^5$ N / mm^2 and $E_a = 0.7 \times 10^5$ N / mm^2.

15 (a) In a tension test on a 10mm size square mild steel bar, the following observation were made :

Gauge length of bar tested	=	200 mm
Length of bar when load is 10kN	=	200.098mm.
Load at yield point	=	24.5 kN
Ultimate load	=	37.8 kN
Breaking load	=	28 kN
Final size of bar at neck	=	6.2 mm × 6.2 mm
Final length of bar	=	260 mm

Determine the (a) Young's Modulus (b) Yield Stress (c) Ultimate Stress (d) Percentage of Elongation (e) Percentage of reduction in area.

OR

(b) A load of 500 N is applied on a steel wire of diameter 2mm and length 1m.

(i) Calculate the strain energy stored in the material.

(ii) If the same load is suddenly applied calculate the strain energy absorbed. Take E for the material = 2×10^5 N /mm^2.

16 (a) A steel road has length of 5m. Its temperature is raised by 90°C, find,

(a) Temperature stress if expansion is prevented.

(b) Free expansion.

Take $E = 2 \times 10^5$ N / mm^2 and Coefficient of expansion is 12.5×10^{-6}/° C.

OR

(b) A steel rod, 20mm in diameter, 200mm long is heated through 100° K and at the same time subjected to a pull P. If the total extension of the rod is 0.3mm, what should be the magnitude of P ? Consider E for steel = 215GPa and $\alpha = 12 \times 10^{-6}$ /° K.