| | | | |
|---|---|---|---|
| | ***ADAMAS UNIVERSITY***<br>***END-SEMESTER EXAMINATION : JANUARY 2021***<br>***(Academic Session: 2020 – 21)*** | | |
| ***Name of the Program:*** | ***B. Tech.*** | ***Semester:*** | ***III*** |
| ***Paper Title :*** | ***Structural Mechanics-I*** | ***Paper Code:*** | ***ECE42107*** |
| ***Maximum Marks :*** | ***40*** | ***Time duration:*** | ***03 hrs.*** |
| ***Total No of questions:*** | ***08*** | ***Total No of Pages:*** | ***02*** |
| | | | |

***Answer all the Groups***

## Group A

*(Answer all the questions)*

$5 \times 1 = 5$

1. **a)** Enumerate the Shear force.
   **b)** What is Factor of safety?
   **c)** Depict the Compound Stress.
   **d)** What is Cripling load?
   **e)** Define the term 'Modulus of Elasticity'.

## Group B

*(Answer any three questions)*

$3 \times 5 = 15$

2. Derive the bending equation of beam by assuming all the notations as usual.

3. A cantilever beam AB of constant cross-section, free at A and fixed at B, having a span of 'L' is subjected to a concentrated vertical load 'W' at the free end A. If 'E' is the Young's modulus of the beam material and 'I' is the moment of inertia of the beam cross-section about the axis of bending, show that maximum deflection of this cantilever under the concentrated load will be given by $WL^3 / (3EI)$.

4. When a bar of certain material, 4cm x 4cm in cross-section, is subjected to a pull of 160 kN the extension on a gauge length of 20cm is 0.01cm and decrease in each side of the section is 0.0005cm. Calculate the Young's modulus of Elasticity "E", Poisson's ratio "μ", modulus of Rigidity "G", and bulk modulus of Elasticity "K" of the material.

5. A beam of circular cross-section of diameter "d" is simply supported on a span of 8m. A load of 2 kN is applied at a distance of 3m from one end. Determine the diameter of the section if maximum bending stress developed in the beam is 90.54 Mpa

## Group C

*(Answer any two questions)*

**$2 \times 10 = 20$**

**6.** A 1m long rectangular concrete short column, 250mm x 300mm cross-sectional overall dimensions, have four 20 mm diameter reinforcing steel bars placed symmerically near at four corners of the column. The column is compressed between two rigid parallel plates at an axial load P = 300 kN. (a) Calculate the compressive stress in each material and total shortening of the column if $E_s = 2 \times 10^5$ Mpa and $E_c = 2 \times 10^4$ Mpa. Assume both materials obey Hook's law. (b) If the permissible stresses in concrete & steel are 6 Mpa and 140 Mpa find the safe maximum compressive load that may be applied.

**7.** During testing on a sample of steel bar of 25 mm in diameter, it is found that a pull of 50 kN produces an extension of 0.095 mm on a gauge length of 200 mm, and a torque of 200 Nm applied to a similar bar produces an angle of twist of 0.9-degrees on a length of 250 mm. Find the values of Young's modulus E, modulus of rigidity G, Poission's ratio μ, and bulk modulus of elasticity K.

**8.** Draw SFD & BMD of the Beam given below.