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END SEMESTER EXAMINATION FOR (NEP)

November/December – 2025

Semester : 3rd (NEP)

Branch : Civil Engineering

Course Code : CEPC-303

Course Name : STRUCTURAL MECHANICS - I

Full Marks – 60

Pass Marks – 24

Time – Three hours

**The figures in the margin indicate full marks
for the questions.**

Instructions :

- (i) Questions 1, 2, and 3 are compulsory.**
- (ii) Answer any *five* questions from the rest.**

1. Fill in the blanks : $1 \times 5 = 5$

- (a) The negative bending moment is also known as _____ bending moment.**
- (b) 1 GPa = _____ kN/mm².**

[Turn over

(c) Bulk modulus is the ratio of normal stress to _____.

(d) On a bending of a beam, _____ is the layer which is neither elongated nor shortened.

(e) The load which is distributed over the length of a beam is known as _____.

2. Write True or False :

$1 \times 5 = 5$

(a) A beam which is provided with more than two supports is called continuous beam.

(b) Working stress is the maximum safe stress a material can carry.

(c) A cantilever loaded with udl throughout, the maximum shear force occurs at free end.

(d) The bending stress is inversely proportional to the distance of layer from the neutral layer.

(e) In composite section, deformation is same in both materials.

3. Choose the correct answers :

$1 \times 5 = 5$

(a) Strain in a direction at right angles to the direction of applied force is known as

(i) Lateral strain (ii) Shear strain
(iii) Volumetric strain (iv) Linear strain

(b) The ratio of largest load in a test to the original cross-sectional area of the test piece is called

(i) Yield stress (ii) Ultimate stress
(iii) Elastic limit (iv) Rupture stress

(c) The materials which have the same elastic properties in all directions are called

(i) Isotropic (ii) Brittle
(iii) Homogeneous (iv) Hard

(d) The Young's modulus of elasticity of a material is 2.5 times of its modulus of rigidity. The Poisson's ratio for the material will be

(i) 0.45 (ii) 0.70
(iii) 0.30 (iv) 0.25

(e) The breaking stress is _____ the ultimate stress.

(i) greater than (ii) equal to
(iii) less than (iv) None of these.

4. (a) Define Stress, Strain and Hooke's law. 3

(b) A concrete column of cross-sectional area 400 mm×400 mm is reinforced by four

longitudinal bars of 20 mm diameter placed at each corner. If the column carries a compressive load of 200 kN, determine the stresses produced in the steel and concrete bars. Given Young's modulus of steel is 15 times that of concrete. 6

5. (a) Define shear force, bending moment and point of contraflexure. 3

(b) A simply supported beam of 6 m span is loaded with a uniformly distributed load of 2 t/m over a length of 3m from the left end. Draw SF and BM diagram for the beam. 6

6. (a) Define Poisson's ratio. 2

(b) A steel rod of 6 m long and 20 mm diameter is subjected to an axial tensile load of 60 kN. Find the changes in length, diameter and volume of the bar. Take $E = 2 \times 10^5$ N/mm² and Poisson's ratio = 0.25. 2+2+3=7

7. (a) A timber beam is 120 mm wide and 200 mm deep is simply supported over a span of 4 meters. If the stress due to bending is not to exceed 7 N/mm², find the safe uniformly distributed load on the beam. 7

(b) Define Modulus of Section. 2

8. A cantilever of length 6 m carries two point loads of 2 kN and 3 kN at a distance of 1 m and 6 m from the fixed end respectively. In addition to this the beam also carries a udl of 1kN /m over a length of 2 m at a distance of 3 m from the fixed end. Draw S.F. and B.M. diagrams. 9

9. A timber beam of rectangular section is to support a total load of 3 tonnes uniformly distributed over a span of 4 m. If the depth of the section is to be twice the breadth and the stress in timber is not to exceed 70 kg/cm², find the dimensions of the section. 9

10. Answer the following questions :

(a) Derive the equation $\delta l = \frac{Pl}{AE}$ with usual notations. 3

(b) State any three assumptions made in the theory of simple bending. 3

(c) If the Young's modulus E is equal to bulk modulus K, then find the value of Poisson's ratio. 3

(NOT FOR STUDENT USE)
COURSE OUTCOME(CO)

Questions no.	CO
1	
a)	CO3
b)	CO3
c)	CO2
d)	CO4
e)	CO3
2.	
a)	CO3
b)	CO1
c)	CO3
d)	CO4
e)	CO1
3.	
a)	CO2
b)	CO1
c)	CO1
d)	CO2
e)	CO1
4. a)	CO1
b)	CO1

5. a)	CO3
b)	CO3
6.	CO2
7.	CO4
8.	CO3
9.	CO4
10.(a)	CO1
10.(b)	CO4
10(c)	CO2