Total No. of printed pages = 2

SUBJECT CODE: ARC 132206

Roll No. of candidate

2018

End Semester B. Arch Examination

2nd Semester

Theory of Structures II

Full Marks- 70   Pass Marks- 21   Time- 3 hours

The figures in the margin indicate full marks.

PART-A

Q.1. *Answer all questions:* (16x1=16)

a) Define and explain Elastic limit.

b) Find elongation of 15 metres long rope due to self-weight (weight density of steel wire =7.8cm², E=2×10⁰ kg/cm².)

c) Define volumetric strain.

d) Determine the change in breadth of a steel bar which is 4 metres long, 30mm wide and 20mm thick. when it is subjected to axial pull resulting in longitudinal strain of 0.00025.(Poisson's Ratio=0.3)

e) What is Bulk Modulus?

f) State the principle of shear stress.

g) Determine the Poisson's Ratio of a material, for which Young's Modulus is 1.2×10^5 N/mm² and Modulus of rigidity is 4.8×10^4 N/mm².

h) Define and explain the terms:
   i) Longitudinal strain.
   ii) Lateral strain.

i) Explain cantilever beams and simply supported beams.

j) What is the maximum Bending moment for a cantilever beam of span 1.5m?

k) Explain Uniformly Varying load with diagram.

l) Define: i) Bending moment ii) Shear Force.

m) Explain pure bending or simple bending.

n) Define neutral axis.

o) What is moment of resistance?

p) A steel plate of width 120mm and of thickness 20mm is bent into a circular arc of radius 10m. Determine maximum stress induced. (Take E=2×10⁵N/mm², I=8×10⁴mm⁴.)

PART-B

Q.2 *Answer the following questions:*   (7+7=14)

a) A load of 10KN is to be lifted with the help of steel wire of length 2metres. Find the minimum diameter of the steel wire if the permissible stress is limited to $100 \times 10^6 N/m^2$. Also determine the elongation of the steel wire when stressed to its permissible limit. E=200KN/mm^2.

b) A load of 50KN is suspended by a steel pipe of 50mm external diameter. If the ultimate tensile stress of steel is 500N/mm^2 and the factor of safety is 4. Determine
   i)   The thickness of the pipe.
   ii) Elongation of the pipe over a length of 200mm if stressed to its maximum permissible value.(Take E=200KN/mm^2.

PART-C

Answer any ONE option from the given questions. Each option carries 10 marks:

(4x10=40)

Q.3. Derive an expression for the deformation of a body due to its self-weight.

OR

A steel bar 20mm in diameter, 20 cm long was tested to destruction. During test, following observations were made; Load at elastic point 6.5 metric tonnes, extension at elastic limit 0.022cm, yield load of 7 metric tonnes, maximum load 13 metric tonnes, final length 25cm, final diameter 14mm. Find i) Modulus of elasticity ii) Yield stress iii) Ultimate stress.

Q.4. Derive a relationship between Modulus of Elasticity, Modulus of Rigidity and Poisson's Ratio.

OR

A bar of cross section 8mm x 8mm is subjected to an axial pull of 7000N. The lateral dimension of the bar is found to be changed to 7.9985mm x 7.9985mm. If the modulus of rigidity of the material is 0.8 x 10^5 N/mm^2, determine the Poissons's ratio and modulus of elasticity.

Q.5. Draw the Bending moment and Shear Force diagram for a cantilever with a uniformly distributed load of 1kN/m and span of 2m.

OR

A simply supported beam of length 6m, carries point load of 3kN and 6 kN at distances of 2m and 4m from the left end. Draw the shear force and bending moment diagrams for the beam.

Q.6. Derive the expression $\dfrac{M}{I} = \dfrac{\sigma}{y} = \dfrac{E}{R}$

OR

Explain the theory of simple bending with assumptions.