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ET-502(A)

B.Tech. Civil (Construction Management) /
B.Tech. Civil (Water Resources Engineering)

Term-End Examination, 2019

ET-502 (A) : STRENGTH OF MATERIALS

Time : Three Hours] **[Maximum Marks : 70**

Note : Attempt **any five** question. **All** questions **carry equal** marks. Use of scientific calculator is permitted. Assume any missing data suitably.

1. (a) Draw the stress-strain curve for a mild steel bar and label the salient points on the curve.[4+10]

(b) A rod 200 cm long and of diameter 3.0 cm is subjected to an axial pull of 30 kN. If the young's modulus of the material of the rod is 2×10^5 N/mm^2, determine.

(i) Stress,

(ii) Strain, and

(iii) The elongation of the rod

2. (a) What do you understand by "Poisson's ratio" ? Explain briefly. [4+10]

(b) A rod is 3 m long at a temperature of 15°C. Find the expansion of the rod, when the temperature is raised to 95°C. If this expansion is prevented find the stress induced in the material of the rod.

Take $E = 1 \times 10^5$ N/mm², and

$\alpha = 0.000012$ per degree centigrade.

3. (a) Write the assumptions of theory of Simple or Pure Bending. [4+10]

(b) The principal tensile stresses at a point across two mutually perpendicular planes are 100 N/mm² and 50 N/mm².

Determine the normal, tangential and resultant stresses on a plane inclined at 30° to the axis of the minor principal stress.

4. (a) Define the terms Principal stress and Principal Strain. [4+10]

(b) Calculate instantaneous stress produced in a bar 10 cm² in area and 3 m long by the sudden

application of a tensile load of unknown magnitude, if the extension of the bar due to suddenly applied load is 1.5mm. Also determine the suddenly applied load.

Take $E = 2\times10^5$ N/mm^2.

5. (a) Differentiate between section modulus and flexural rigidity. [4+10]

(b) Draw the S.F. and B.M. diagrams for the beam which is loaded as shown in figure-1. Determine the points of contra flexure within the span AB :

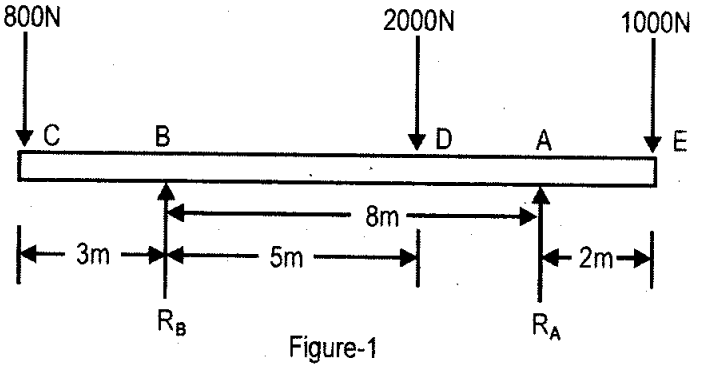

Figure-1

6. (a) Describe in brief the "Springs in series" and "Springs in parallel". [4+10]

(b) A steel plate of width 120 mm and of thickness 20 mm is bent into a circular arc of radius 10 m. Determine the maximum stress induced and the bending moment. Which will produce the maximum stress.

Take $E = 2 \times 10^5$ N/mm^2

7. (a) Compute the ratio of modulus of rigidity to modulus of elasticity for a Poisson's ratio of 0.25. [4+10]

(b) The shearing stress in a solid shaft is not to exceed 45 N/mm^2 when the torque transmitted is 40000 N-m. Determine the minimum diameter of the shaft.

8. (a) Prove that the maximum shear stress in a rectangular section (subject to shear force F) is 1.5 times the average shear stress. [4+10]

(b) A solid round bar 4 m long and 6 cm in diameter is used as a strut with both ends hinged. Determine the crippling load.

Take $E = 2 \times 10^5$ N/mm^2.

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