MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION
B.Tech. (Agril. Engg.)

Semester	: V (New)	Term	: I	Academic Year	: 2015-16
Course No.	: FS 353	Title	: Strength of Materials		
Credits	: 3(2+1)				
Day & Date	: Friday, 23.10.2015	Time	: 14.00 to 17.00	Total Marks	: 80

Note :
1. Solve **ANY EIGHT** questions from **SECTION "A"**.
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 a) A steel rod 1 m long and 20 mm x 20 mm in cross section is subjected to tensile force of 80 kN. Determine elongation of the rod if modules of elasticity for rod material is 200 GPa.

b) Derive an expression for deformation of a body due to force acting on it.

Q.2 a) A circular alloy bar 2 m long uniformly tapers from 40 mm diameter to 30 mm diameter. Calculate elongation of the rod under an axial force of 50 kN. Take E for the alloy as 140 GPa .

b) Derive an expression for deformation of bars of different section.

Q.3 a) A circular bar rigidly fixed at its both ends uniformly tapers form 90 mm at one end to 60 mm at the other end. Its temperature is raised through 26 K, what will be the maximum stress developed in the bar. Take E as 200 GPa and $\acute{\alpha}$ as a 12×10^{-6} /K for the bar material.

b) Derive an expression for thermal stresses in simple bar.

Q.4 a) A steel bar 2 m long, 40 mm wide and 20 mm thick is subjected to an axial pull of 160 kN in the direction of its length. Find the changes in length, width and thickness of the bar. Take E = 200 GPa and Poission's ratio = 0.3.

b) Derive an expression for volumetric strain, if a rectangular body is subjected to an axial force.

Q.5 a) An axial pull of 20 kN in suddenly applied on a steel rod 2.5 m long and 1000 mm^2 in cross section calculate the strain energy, which can be absorbed in the rod. Take E = 200 GPa.

b) Derive and expression for strain energy stored in body when load is gradually applied.

Q.6 a) A simply supported beam AB of span 2.5 m long is carrying 2 kN load at a distance of 1 m from support A and 4 kN at a distance of 1 m from support B. Draw the S.F. and B.M. diagrams.

b) Explain relation between loading, shear force and bending moment.

Q.7 a) Two plates 10 mm thick are joined by a double riveted lap joint. The pitch of each row of rivets is 50mm. The rivets are 20 mm diameter and the permissible tresses in sharing and bearing of rivets are 70 MPa and 160 MPa and permissible stress in tearing of plate is 100 MPa. Determine efficiency of the joint.

b) Write advantages and disadvantages of welded joints.

(P.T.O)

Q.8 a) A steel rod 5 m long and of 40 mm diameter is used as column with one end fixed and other free. Determine the crippling load by Euler's formula. Take E as a 200 GPa.

b) State any two types of end conditions of the column and also formula to calculate cripping load.

Q.9 a) A simply supported beam 3 m is subjected to central load of 10 kN. Find maximum slope and deflection of the beam. Take E as 200 Gpa and $I = 12 \times 10^6$ mm^4

b) State various methods to find slope and deflection of beam and explain any one.

Q.10 a) State the assumptions made in the theory of simple bending.

b) Explain in detail failure of riveted joints.

SECTION "B"

Q.11 Define the following terms.

1) Elasticity 2) Tensile stress 3) Bulk modulus

4) Volumetric strain 5) Poissons ratio 6) Leg of weld

7) Column 8) Neutral axis

Q.12 Choose correct objective.

1) If a force acts on body, it sets up some resistance to the deformation. This resistance is known as_____.

a) Stress b) Strain

c) Elasticity d) Modulus

2) A simply supported beam of span (l) is subjected to a uniformly distributed load of (w) per unit length over the whole span. The maximum deflections centre of the beam is _____.

a) $5wl^5 / 48\ EI$ b) $5wl^4 / 96\ EI$

c) $5wl^4 / 192\ EI$ d) $5wl^3 / 384\ EI$

3) The ratio of lateral strain to the linear strain is called _____.

a) Modules of elasticity b) Modulus of rigidity

c) Bulk modulus d) Poissons ratio

4) A composite section contains four different materials. The stress in all the different materials will be_____.

a) Zero b) Equal

c) Different d) In the ratio of their areas

5) The stress in a body if suddenly loaded is the stress induced when the same load is applied_____.

a) One-half b) Equal to

c) Twice d) Four times

6) Total strain energy stored in a body is known as _____.

a) Impact energy b) Resilience

c) Proof resilience d) Modulus of resilience

7) The bending moment at the free end of a cantilever beam carrying any type of load is _____.

a) Zero b) Minimum

c) Maximum d) Infinity

8) When shear force at a point is zero, then bending moment at the point will be ___

a) Zero b) Minimum

c) Maximum d) Infinity

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