MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

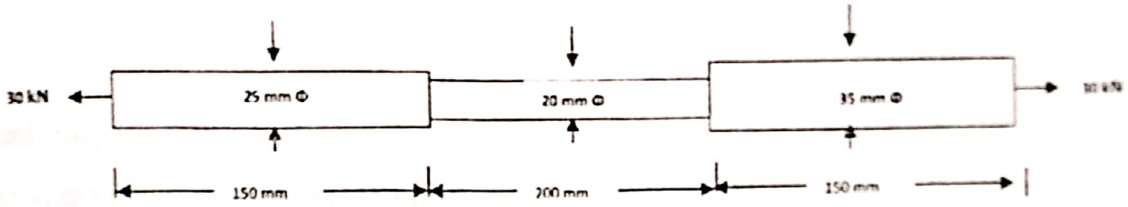
Semester	: V (New)	Term	: I	Academic Year	: 2014-15
Course No.	: FS 353	Title	: Strength of Materials		
Credits	: 3(2+1)				
Day & Date	: Saturday, 15.11.2014	Time	: 14.00 to 17.00	Total Marks	: 80

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) Enlist the types of bar of varying sections. Draw schematic diagrams of any two types.

b) A copper bar shown below is subjected to a tensile load of 30 KN. Determine elongation of the bar, if E = 100 GPa.



Q.2 a) Derive an expression for thermal stress $\sigma = \left(\alpha t - \frac{\delta}{l}\right) E$ where, $\sigma, \alpha, t, \delta, l$ and E denotes stress, coefficient of linear expansion, increase of temperature, yield of support, original length of body and modulus of elasticity of material.

b) A circular bar rigidity fixed at its both ends is 1.2 m long. It uniformly tapers from 100 mm at one end to 75 mm at the other. What is the maximum stress induced in the bar, when the temperature is raised through 25 K? Take E as 200 GPa and α as 12×10^{-6} /K.

Q.3 a) A steel rod 1.5 m long and 20 mm diameter is subjected to an axial pull of 100 kN. Find the change in length and diameter of the rod, if E=200 GPa and 1/m =0.32.

b) Establish the relation $K = \frac{mE}{3(m-2)}$ between modulus of rigidity and Young's modulus of elasticity.

Q.4 a) A steel rod of 28 mm diameter is 2.5 m long. Find the maximum instantaneous stress and work done at maximum elongation, when an axial load of 50 kN is suddenly applied to it. Also calculate the maximum dynamic force in the rod Take E as 20 GPa.

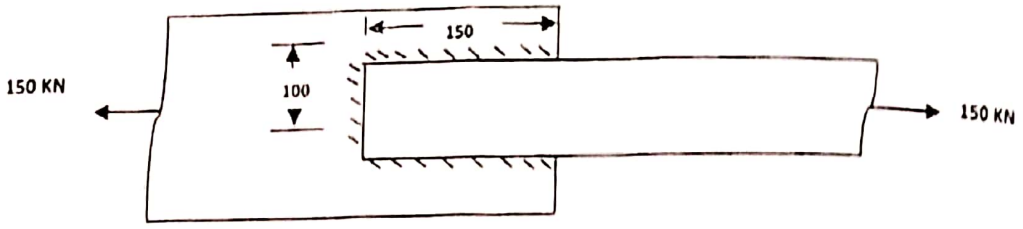
b) Derive an expression $U = \frac{\sigma^2}{2E} V$ for strain energy stored in a body, when the load is gradually applied on it.

(P.T.O.)

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

b) What assumptions are made in the Euler's column theory?

Q.6 a) A tie bar 100 mm x 10 mm is connected to another plate by fillet welds as shown below. Find the size of the weld, if the permissible stress in the weld is 100 MPa



b) Enlist types of welded joints.

Q.7 a) Describe the various types of riveted joints depending upon the ways in which i) the members are connected ii) the rivets are connected

b) Describe the different ways due to which a riveted joint may fail.

Q.8 a) A cantilever beam 120 mm wide and 150 mm deep is 1.8 m long. Determine the slope and deflection at the free end of the beam when it carries a point load of 20 kN at its free end. Take E for the cantilever as 200 GPa.

b) A simply supported beam of span 2.4 m is subjected to central point load of 15 kN. What is the maximum slope and deflection at the centre of the beam? Take EI for the beam as 6×10^{10} N-mm^2.

Q.9 a) A rectangular strut is 150 mm wide and 120 mm thick. It carries a load of 180 kN at an eccentricity of 10 mm in a plane bisecting the thickness. Find the maximum and minimum intensities of stress in the section.

b) A steel wire of 3 mm diameter is to be wound around a circular component. If the bending stress in the wire is limited to 80 MPa. Find the radius of the component. Take E as 200 GPa.

Q.10 Two wires, one of steel and the other of copper, are of the same length and are subjected to the same tension. If the diameter of the copper wire is 2 mm, find the diameter of the steel wire, if they are elongated by the same amount. Take E for steel as 200 GPa and that for copper as 100 GPa.

Match the following pairs.

SECTION "B"

"A"	"B"
1) Steel	a) $\frac{mE}{3(m-2)}$
2) Primary strain	b) $\frac{\sigma^2}{2E} \times V$
3) K	c) Sagging
4) Volumetric strain	d) Resist deflection of the beam
5) U	e) $12 \times 10^{-6}/^0C$
6) Positive bending moment	f) Linear strain
7) Strength criteria of beam design	g) $\varepsilon(1-\frac{2}{m})$
8) Stiffness criteria of beam design	h) Resist bending and shearing stresses

State True or False.

1) While determining slope and deflection at a section in a loaded beam double integration method is suitable for a single load.
2) Chain riveted joint is a joint in which every rivet is in the middle of the two rivets of the opposite row.
3) The efficiency of a riveted joint is the ratio of the strength of the joint, to the strength of the unriveted plate.
4) The fillet weld should not be used for connecting parts whose fusion faces makes an angle more than 60^0 and less than 120^0.
5) Euler's formula cannot be used in the case of short columns.
6) The shear force at the cross section of a beam may be defined as the balanced vertical forces to the right or left of the section.
7) Proof resilience is a term used for maximum strain energy, which can be stored in a body.
8) Thermal stresses are induced in a body when the body is allowed to expand or contract freely, with the rise or fall of the temperature.

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