

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

Semester : IV (Old)

Course No.: FS 242

Credits : 3(2+1)

Academic Year : 2012-13

Title : Strength of material

Date: 17-4-2013 Time: 14-0 to 17-0 Total Marks : 80

1. Solve ANY FIVE 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 bar of 5 cm dia and 400 cm long is acted upon by a load of 100 KN it is found to be extend by 10 cm find i] Stress ii] Strain iii] Young's Modulus iv] Work done
- b) Derive an expression for the volumetric strain of a rectangular body subjected to axial force.
- Q.2 a) A rectangular block 200mm X 150mm X 50mm is Subjected to axial load of 300KN (Compressive) in the direction of length, 500KN (tensile) in the direction of breadth and 200KN (tensile) in the direction of thickness find the change in volume if poissions ratio = 0.35 and $E=200\text{KN/m}^2$.
- b) Derive the Relation between bulk modulus & young's modulus.
- Q.3 a) Derive the equation of strain energy stored in a body when the load is suddenly applied.
- b) A solid steel rod of length one meter and diameter 20mm hangs vertically and has a collar attached at the lower end. Find the maximum stress induced when a weight of 200N fall on collar through a height of 150mm Take $E=2 \times 10^5 \text{ N/mm}^2$ also find modulus of resilience and maximum instantaneous elongation of the bar.
- Q.4 a) A Circular pipe of external diameter 100mm and Internal diameter 80mm respectively is used as a simply supported beam. The span of beam is 4m find the safe concentrated load the beam can carry at center if the permissible bending stress is 120 N/mm^2 .
- b) State Assumptions made in theory of simple bending.
- Q.5 a) An Symmetrical I section has top and bottom flange of 200mm X 20mm and web of 380mm X 20mm If it is subjected to shear force of 300KN. Draw the shear stress distribution across the section.

- b) A rectangular simply supported beam of span 3m is having cross section 200mm X 350mm carries a point load of 100KN at mid span. Find the maximum slope and deflection of the beam if $E=2 \times 10^5 \text{ N/mm}^2$.
- Q.6 a) What are the assumptions made in Euler's theory.
 b) A Rolled steel joist ISMB 300 is used a column of 3m length with both ends fixed. If factor of safety=3, $f_c = 320 \text{ N/mm}^2$ Rankin's const $\alpha = 1/7500$ find the safe load the column can carry. If $A=5026 \text{ mm}^2$ $I_{xx}=8.60 \times 10^7 \text{ mm}^4$ and $I_{yy}=4.539 \times 10^7 \text{ mm}^4$.
- Q.7 a) A solid circular shaft of 3m length and 200mm diameter is subjected to torque of 100 KN -m. find the relative rotation between the end cross-section of the shaft. Take $C=1 \times 10^5 \text{ N/mm}^2$.
 b) Enlist various types of springs & distinguish clearly between bending spring and torsion spring.

SECTION "B"

- Q.8 State True or False:
- 1) The resistance to per unit Area to deformation is known as volumetric stress.
 - 2) Ratio of lateral strain to linear strain is called as poisson's ratio.
 - 3) The proof resilience per unit volume of material is known as resilience.
 - 4) The positive Bending moment is called sagging moment.
 - 5) The moment of couple which resists the external Bending moment is known as moment of resistance.
 - 6) The spring which is subjected to bending only and the resilience is also due to it is known as torsion spring.
 - 7) For simply supported beam carrying U.D.L. the maximum slope at centre is always zero.
 - 8) For cantilever beam subjected to bending maximum tensile stress will occur at top.
 - 9) At neutral layer of any section stresses are always maximum.
 - 10) Plane at which no shear stress is known as principle plane.

Q.9 Fill in the blanks:

- 1) In _____ Loading average load is $P/2$
- 2) With in elastic limit ratio of shear stress to shear strain is known as _____
- 3) With in elastic limit the ratio of lateral strain to linear strain is known as _____
- 4) In torsion, Angle of twist is taken as _____.

- 5) The beam supported on more than two supports is known as _____ beam.
- 6) The unbalanced vertical force to the left or right of section is known as _____.
- 7) A _____ column fails due to crushing of material.
- 8) The negative Bending moment is called as _____.
- 9) Material within elastic limit obeys _____ law.
- 10) The plane which is not subjected to shear stress is called as _____.

10 Define:

- 1) Hook's law
- 2) Point of contraflexure
- 3) Buckling load
- 4) Resilience
- 5) Principle of superposition
- 6) Moment of Resistance
- 7) Thermal stresses and strains
- 8) Stiffness of spring
- 9) Types of Beams
- 10) Helical spring