II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2018
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Define Hooke's law
b) Write different Types of beams
c) Write the bending equation
d) Define shear centre
e) Define circumferential stresses
f) Write about radial stresses

PART -B

2. a) Draw stress - strain diagram for mild steel. Indicate salient points and define them.
b) Derive relation between three elastic moduli.

3. a) Explain the Concept of shear force and bending moment with neat sketches
b) A cantilever beam of length 2m carries an uniformly distributed load of 3KN/m over a length of 1.5m from its fixed end and a point load 5 KN at its free end. Draw the shear force and bending moment diagrams.

4. a) From First principles derive the expression for shear stress of any point in any cross-section of a beam which is subjected to a shear force F.
b) Draw SFD and BMD for overhanging beam with example

5. Define Neutral axis. Sketch the bending stress distribution across the cross section of a rectangular beam section 230 *x* 400 mm subjected to 60KNm moment.

6. a) What is moment area method? Explain the two Mohr's theorems, as applicable to the slope and deflection of a beam.
b) A cantilever of uniform cross-section of length l carries two point loads, W at the free end and 2W at a distance a from the free end. Find the maximum deflection due to this loading.

7. a) Compare the values of maximum and minimum hoop stresses for a cast steel cylindrical shell of 600mm external diameter and 400mm internal diameter subjected to a pressure of 30N/mm^2 applied internally and Externally.
b) Derive a formula for the difference of radii for shrinkage of a compound thick cylindrical shell
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PART –A

1. a) Define Lateral strain,
   b) Write briefly on Point of contra flexure
   c) Write section modulus formula for rectangular section
   d) Define Shear Stress
   e) Define longitudinal stress
   f) Write Lame's theory for thick cylinders

PART -B

2. a) A metallic rod of 1 cm diameter, when tested under an axial pull of 10 kN was found to reduce its diameter by 0.0003 cm. The modulus of rigidity for the rod is 51 kN/mm^2. Find the Poisson's ratio, modulus of elasticity and Bulk Modulus.
   b) Explain about impact and shock loadings

3. a) A simply supported beam 6 m long is carrying a uniformly distributed load of 5 kN/m over a length of 3 m from the right end. Draw shear force and bending moment diagrams for the beam and also calculate the maximum bending moment on the beam.
   b) Draw BMD and SFD for cantilever beam subjected to concentrated load at end

4. A T-beam having ange 200mm *x* 25mm and web 25mm *x* 220mm is simply supported over a span of 7m. It carries u.d.l of 6.8kN/m including self weight over its entire span together with a concentrated load of 45kN at mid span. Find the maximum tensile and compressive stresses occurring in the beam section and sketch across the section.

5. Circular beam of 120mm diameter is subjected to a shear force of 7KN. Calculate
   i. Average shear stress.
   ii. Maximum shear stress.
   Also sketch the variation of the shear stress along the depth of the beam.

6. A rectangular R.C simply supported beam of length 2m and cross section 100mmX200mm is carrying a uniformly distributed load of 10KN/m through its span. Find the maximum slope and deflection. Take $F = 2 \, x \, 10^4 N/mm^2$

7. A C.I pipe of 200mm internal dia. And thickness of metal 50mm carries water under a pressure of $7 N/mm^2$. Find the max. and minimum intensities of hoop stress, sketch the Variation of hoop stress and radial pressure across the section.
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PART –A

1. a) Define Poisson's ratio
   b) Draw S.F.D for cantilever Beam with UDL
   c) Write section modulus formula for circular section
   d) What is Moment of Inertia
   e) Define hoop stress
   f) Write bout Necessary difference of radii for shrinkage

PART -B

2. Prove that Poisson's ratio for the material of a body is 0.5, if its volume does not change when stressed. Prove also that Poisson's ratio is zero when there is no lateral deformation when a member is axially stressed.

3. a) A cantilever beam of 2 m long carries a uniformly distributed load of 1.5 kN/m over a length of 1.6 m from the free end. Draw shear force and bending moment diagrams for the beam.
   b) Draw BMD for simply suported beam subjected to concentrated load at end

4. a) Obtain the shear stress distribution for a rectangular cross section 230X40mm subjected to a shear force of 40KN. Calculate the maximum and average shear stress.
   b) Derive the Bending equation from first principle.

5. Prove that for a rectangular section the maximum shear stress is 1.5times the average stress. Sketch the variation of shear stress.

6. a) A beam 7m long carries a uniformly distributed load of 20 kN/m run throughout its length. The beam is supported over a span of 5m with overhang of 2m one side. Determine the slope and deflection at the cantilever end E = 200 GPa I= 802 mm^4.
   b) Determine Maximum deflection for simply supported beam under gradually increasing load

7. A boiler shell is made of 15 mm thick plate having a limiting tensile stress of 125 N/mm^2. If the longitudinal and circumferential efficiencies are 70% and 60% respectively, determine the maximum diameter of the shell. The allowable maximum pressure is 2.2 N/mm^2.
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PART –A

1. a) Define volumetric strain
   b) Draw S.F.D for Simply supported Beam with UDL
   c) Write section modulus formula for Hallow circular section
   d) Define young's modulus
   e) Write the difference between Thin And Thick Cylinders
   f) Write Lame's formulae

PART -B

2. a) A stepped bar consists of two portions of lengths 700mm and 900mm with area of cross sections 400mm^2 and 625mm^2 respectively. It is subjected to an axial pull of 100 KN. If E=200kn/mm^2.find the total elongation
   b) Write the simple bending assumptions

3. a) A simply supported beam of length 5m carries a uniformly increasing load of 800 N/m run at one end to 1600 N/m run at the other end. Draw the S.F. and B.M. diagrams for the beam.
   b) Draw BMD for simply supported beam subjected to concentrated load at centre

4. A beam of rectangular cross section 200mm deep and 100mm wide is subjected to a pure sagging bending moment of 500Knm. Determine the maximum bending stress in the beam. If the value of modulus of elasticity for the beam materials 200kn/mm^2, find the radius of curvature of that portion of the beam. Also calculate the value of bending stress at a distance of 25mm below the top surface of the beam

5. A beam of triangular cross-section with base b and height h, is used with the base horizontal. Calculate the intensity of max shear stress and plot the variation on shear stress intensity over the section.

6. A simply supported beam carries a central concentrated load P. The end quarters have flexural rigidity EI and the central half has flexural rigidity 2 EI. Determine the maximum deflection and maximum slope in the beam.

7. Derive the formula for the thickness of the thin cylindrical shell and solve the following problem. A thin cylindrical shell of 1 m diameter is subjected to an internal pressure of 1 N/mm^2. Calculate the suitable thickness of the shell, if the tensile strength of the plate is 400 N/mm^2 and factor of safety is 4.
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