Code No: R1621013 **R16** SET - 1

II B. Tech I Semester Regular Examinations, October/November - 2017
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 Poisson' Ratio. (2M)
   b) What are the different types of beams? Differentiate between a cantilever and a simply ported beam. (3M)
   c) Define bending stress in a beam. (2M)
   d) What do you mean by shear stresses in beams? (2M)
   e) What are the different methods of finding slope and deflection of a cantilever? (2M)
   f) Differentiate between Thin and Thick Cylinder. (3M)

PART -B

2. a) A straight circular rod tapering from diameter 'D' at one end to a diameter 'd' at the other end is subjected to an axial load 'P'. Obtain an expression for the elongation of the rod. (7M)
   b) Derive strain energy equation for gradual loading. (7M)

3. A simply supported beam of length 8 m rests on supports 6 m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 1500N/m over the entire length. Draw S.F. and B.M diagrams and find the point of contraflexure, if any. (14M)

4. a) What are the assumptions of simple bending? (4M)
   b) A timber cantilever 200 mm wide and 300 mm deep is 3 m long. It is loaded with a U.D.L of 3kN/m over the entire length. A point load of 2.7 kN is placed at the free end of the cantilever. Find the maximum bending stress produced. (10M)

5. Derive the stress distribution for circular section & plot shear stress distribution. (14M)

6. a) Find the expression for the slope and deflection of a cantilever of length L which carries a uniformly distributed load over a length 'a' from the fixed end by Moment area method. (8M)
   b) Prove that the relation that $M = EI\dfrac{d^2y}{dx^2}$ where M= Bending moment, E= young's modulus, I = M.O.I. (7M)

7. Derive Lame's formulae for thick cylinder. (14M)
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Code No: R1621013

R16

SET - 2

II B. Tech I Semester Regular Examinations, October/November - 2017
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) Derive volumetric strain. (2M)
b) What are the different types of loads acting on a beam? Differentiate between a point load and uniformly distributed load. (3M)
c) Define Neutral Axis. (2M)
d) Write shear stress equation (2M)
e) What are the important points in finding slope and deflection by Macaulay's Method? (2M)
f) What do you mean by thick compound cylinder? (3M)

PART -B

2. a) A rod, whose ends are fixed to rigid supports, is heated so that rise in temperature is T^0C.Prove that the thermal strain and thermal stresses set up in the rod are given by, Thermal strain = α.T and
Thermal stress = α.T.E
Where α = Co-efficient of linear expansion. (7M)
b) Derive strain energy equation for sudden loading. (7M)

3. A simply supported beam of length 8 m rests on supports 5 m apart, the right hand end is overhanging by 2 m and the left hand end is overhanging by 1m. The beam carries a uniformly distributed load of 5 kN/m over the entire length. It also carries two point loads of 4 kN and 6 kN at each end of the beam. The load of 4 kN is at the extreme left of the beam. Whereas the load of 6 kN is at the extreme right of the beam. Draw S.F and B.M diagrams for the beam and find the points of contraflexure. (14M)

4. a) How would you find the bending stress in unsymmetrical section? (7M)
b) A cast iron pipe of external diameter 60mm, internal diameter of 40mm, and of length 5 m is supported at its ends. Calculate the maximum bending stress induced in the pipe if it carries a point load of 100 N at its centre. (8M)

5. Derive the Stress distribution for 'T'section and plot shear stress diagram. (14M)

6. a) A cantilever of length 3 m carries a uniformly distributed load of 15kN/m over a length of 2 m from the free end. If $I = 10^8$ mm^{4}and E=2 x 10^5 N/mm^2, find:
(i) Slope at the free end and (ii) Deflection at the free end. (8M)
b) Find an expression for the slope at the supports of a simply supported beam, carrying a point load at the centre. (7M)
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7. a) Derive formulae for longitudinal and circumferential stresses of Thin cylinder. (10M)
   b) Differentiate between thin and thick cylinders. (4M)

Code No: R1621013 **R16** SET - 3

II B. Tech I Semester Regular Examinations, October/November - 2017
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 Resilience (2M)
   b) Define point of contra flexure. (3M)
   c) Calculate section Modulus for circular function (2M)
   d) Define Shear centre. (2M)
   e) What is Moment area method? (2M)
   f) Explain about wire wound cylinders. (3M)

PART -B

2. a) A mild steel rod of 20 mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter of 25 mm. The ends of the tube and rods are brazed together, and the composite bar is subjected to an axial pull of 40 kN. If *E* for steel and copper is 200 GN/m^2 and 100 GN/m^2 respectively, find the stresses developed in the rod and tube. Also find the extension of the rod. (7M)
   b) Derive the strain energy equation for impact loading. (7M)

3. a) A simply supported beam of length 5 m, carries a uniformly distributed load of 100 N/m extending from the left end to a point 2 m away. There is also a clockwise couple of 1500 Nm applied at the centre of the beam. Draw the S.F and B.M diagrams for the beam and find the maximum bending moment. (10M)
   b) What are the sign conventions for shear force and bending moment in general? (4M)

4. Derive the bending equation. (14M)

5. A beam of square section is used as a beam with one diagonal horizontal. The beam is subjected to a shear force F, at a section. Find the maximum shear in the cross section of the beam and draw the shear stress distribution diagram for the section. (14M)

6. Find the expression for the slope and deflection of a cantilever of length *L* which carries a uniformly distributed load over a length ‘a’ from the fixed end by Double integration method. (14M)

7. A thick spherical shell of 200 mm internal diameter is subjected to an internal fluid pressure of 7 N/mm^2. If the permissible tensile stress in the shell material is 8 N/mm^2, find the thickness of the shell. (14M)
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Code No: R1621013 **R16** SET - 4

II B. Tech I Semester Regular Examinations, October/November - 2017
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)	What are Temperature stresses?	(2M)
	b)	Draw SFD for SSB uniformly carrying varying load.	(3M)
	c)	Calculate Section Modulus for rectangular section.	(2M)
	d)	Define shear centre	(2M)
	e)	State Mohr's theorems of deflection.	(2M)
	f)	What is the radial pressure and hoop stresses for a thick spherical shell?	(3M)

PART -B

2.		Derive the relation between Modulus of elasticity, Modulus of rigidity and Bulk Modulus.	(14M)
3.	a)	How will you draw the S.F and B.M diagrams for a beam which is subjected to inclined loads?	(7M)
	b)	A cantilever 2 m long is loaded with a uniformly distributed load of 2 kN/ m run over a length of 1m from the free end. It also carries a point load of 4 kN at a distance of 0.5 m from the free end. Draw the Shear force Diagrams and Bending Moment diagrams.	(7M)
4.	a)	A rectangular beam 300 mm deep is simply supported over a span of 4 meters. Determine the uniformly distributed load per meter which the beam may carry, if the bending stress should not exceed 120 N/mm^2. Take I = 8 × 10^6 mm^4.	(10M)
	b)	What is pure bending?	(4M)
5.		The Shear force acting on a section of a beam is 50 kN. The section of the beam is of T-shaped of dimensions 100 mm × 100 mm × 20 mm. The moment of inertia about the horizontal neutral axis is 314.221× 10^4 mm^4. Calculate the shear stress at the neutral axis and at the junction of the web and the flange.	(14M)
6.		A cantilever of length 2 m carries a uniformly varying load of zero intensity at the free end, and 45 kN / m at the fixed end. If E = 2 × 10^5 N/mm^2 and $I = 10^8$ mm^4, find the slope and deflection of the free end.	(14M)
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7. A steel cylinder of 300 mm external diameter is to be shrunk to another steel cylinder of 150 mm internal diameter. After shrinking the diameter at the junction is 250 mm and radial pressure at the common junction is 28 N/mm^2. Find the original difference in radii at the junction. Take $E = 2 \times 10^5$ N/mm^2. (14M)