SYLLABUS

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<tr><td>Course Category: Program Core</td><td>Course Type: Theory with practical Component</td><td><table><tr><td>L</td><td>T</td><td>P</td><td>C</td></tr><tr><td>2</td><td>0</td><td>2</td><td>3</td></tr></table></td></tr>
<tr><td>COURSE OBJECTIVES:</td><td></td><td></td></tr>
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● To verify the principles studied in theory by conducting the experiments.</td></tr>
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<tr><td colspan="2">LIST OF EXPERIMENTS</td><td>15</td></tr>
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2. Compression test on wooden piece
3. Torsion test on mild steel rod
4. Deflection test on beams
5. Compression test on helical springs</td></tr>
<tr><td colspan="3" align="right">TOTAL: 45 PERIODS</td></tr>
<tr><td colspan="3">Course Outcomes: At the end of the course, the student will be able to</td></tr>
<tr><td colspan="3">CO1. Visualize the concept of stress, strain in various sections.</td></tr>
<tr><td colspan="3">CO2: Compute the shearing and bending of beams due to loading.</td></tr>
<tr><td colspan="3">CO3: Calculate the torsion stress and deflections on the springs.</td></tr>
<tr><td colspan="3">CO4: Recognize the deflection of beam when the stress is acted.</td></tr>
<tr><td colspan="3">CO5: Analyze the stress on columns & thin cylinders and know the application of theories of failure problems.</td></tr>
<tr><td colspan="3">CO6: Demonstrate an understanding of the concepts of stress and strain, and the stress-strain relationships for homogenous, isotropic materials.</td></tr>
<tr><td colspan="3">TEXT BOOKS
1. Bansal, R.K., "Strength of Materials", Laxmi Publicat ions (P) Ltd., 2016
2. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 2009</td></tr>
</table>

REFERENCES
1. Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995
2. Kazimi S.M.A, "Solid Mechanics",Tata McGraw-Hill Publishing Co,New Delhi, 1981.

LESSON PLAN :

S.NO	Unit	Topic to be covered	Hours needed	Mode of teaching (BB/PPT/Others)	Text/ Ref. Book	Page No
1.	I	Rigid bodies and deformable solids	1	BB	TI	
2.		Tension, Compression	1	BB/ PPT	T1	
3.		Shear Stresses	1	BB	T1	
4.		Deformation of simple and compound bars	1	BB	T2	
5.		Thermal stresses	1	BB	T2	
6.		Elastic constants	1	BB	T2	
7.	II	Beams	1	BB/ PPT	T1	
8.		types transverse loading on beams	1	BB/ PPT	T1	
9.		Shear force in beams	1	BB	T1	
10.		Bending moment in beams	1	BB	T1	
11.		Cantilevers	1	BB/ PPT	T1	
12.		Simply supported beams	1	BB/ PPT	T1	
13.	III	Torsion formulation stresses and deformation in circular Shafts	2	BB	T2	
14.		Torsion formulation stresses and deformation in hollows shafts	2	BB	T2	
15.		Stresses in helical springs	1	BB/ PPT	T2	
16.		Deflection of helical springs	1	BB	T2	
17.	IV	Double Integration method	2	BB	T1	
18.		Introduction of Area moments theorem	1	BB	T2	

19.		For computational of slopes	**2**	BB	**T2**	
20.		For computational of deflection beam	**1**	BB	**T2**	
21.	**V**	Stresses in thin cylindrical shell due to internal pressure circumferential and	**2**	BB	**T2**	
22.		Longitudinal stresses	**1**	BB	**T2**	
23.		Deformation in thin cylinders	**1**	BB	**T2**	
24.		spherical shells subjected to internal pressure	**1**	BB	**T2**	
25.		Deformation in spherical shells	**1**	BB	**T2**	
26.		1. Tension test on a mild steel rod	**3**	Experimental		
27.		2. Compression test on wooden piece	**3**	Experimental		
28.		3. Torsion test on mild steel rod	**3**	Experimental		
29.		4. Deflection test on beams	**3**	Experimental		
30.		5. Compression test on helical springs	**3**	Experimental		

Multiple Choice Questions

UNIT 1: STRESS, STRAIN AND DEFORMATION OF SOLIDS	
Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants.	

1. Up to which point on the stress-strain curve is Hooke's law valid?
   a) Elastic limit
   b) Yield point
   c) Proportionality limit
   d) Fracture point **Ans: A**
2. What is the unit for stress?
   a) N/m^2
   b) Nm^2
   c) N/m
   d) Nm **Ans: A**
3. Stress strain curve for cemented tungsten carbide is:
   a) Hyperbola
   b) Parabola
   c) A curve
   d) Straight line **Ans: D**
4. If the Poisson's ratio is given as 0.3 and the Young's modulus is given to $7e^{10}$. What will be the value for shear modulus?
   a) $2.69e^{10}$ N/m^2
   b) $3.00e^{10}$ N/m^2
   c) $2.59e^{10}$ N/m^2
   d) $2.72e^{10}$ N/m^2 **Ans: A**
5. Which of the following property cannot be determined by a tensile test?
   a) Yield strain
   b) Yield stress
   c) Elastic limit
   d) Limit of proportionality **Ans: A**
6. Which type of load is applied in tensile testing?
   a) Axial load
   b) Shear load
   c) Transverse load
   d) Longitudinal load **Ans: A**
7. Given the cross sectional are as 4 m^2, what will be the gauge length?
   a) 12.3 m
   b) 13 m
   c) 11.3 m
   d) 12 m **Ans: C**
8. Which of the following does not affect the value of ultimate tensile strength?
   a) Quality of surface finish
   b) Speed of testing
   c) Dimensional accuracy of the specimen
   d) Length of the specimen **Ans: D**
9. Which of the following is used to elongation in the material?

a) Clinometer
b) Extensiometer
c) Micrometer
d) Feeler gauge **Ans: D**

10. Which of the following factors do not affect the testing?
a) Temperature
b) Increase in number of axes for application of load
c) Fatigue
d) Pressure **Ans: D**

11. Which of the following cannot be determined using a torsion test?
a) Modulus of elasticity in shear
b) Torsion yield strength
c) Modulus of rupture
d) Young's modulus **Ans: D**

12. What is the use of weight head in a torsion testing equipment?
a) Holding the job only
b) Holding the job and applying twisting moment
c) Holding the job and measuring the twisting moment
d) It is not a part of torsion testing equipment **Ans: C**

13. Which of the following is used to measure how much the specimen is twisted?
a) Micrometer
b) Clinometer
c) Troptometer
d) Tropometer **Ans: C**

14. Torsional stress multiplied with original cross sectional are is:
a) Maximum twisting load
b) Minimum twisting load
c) Minimum shear load
d) Yield shear load **Ans: A**

15. In which of the following the angle of twist increases fast for a small amount of torque?
a) Cold working condition
b) Hot working condition
c) Warm working condition
d) The increase is the same for cold working, hot working and warm working
Ans: B

16. Which type of stress is plane stress?
a) One dimensional
b) Two dimensional
c) Zero dimensional
d) Three dimensional **Ans: B**

17. Principal plane is the plane in which ___________
a) Shear stress is maximum
b) Normal stress is zero
c) Shear stress is zero
d) It doesn't depend upon stresses **Ans: C**

18. In a Mohr's circle drawn on the x-y plane, which axis is the axis where normal stress is plotted?
a) X-axis
b) Y- axis
c) Z-axis
d) Normal stress isn't related to Mohr's circle **Ans: A**

19. In a Mohr's circle drawn on the x-y plane, which axis is the axis where shear stress is

plotted?
a) X-axis
b) Y- axis
c) Z-axis
d) Shear stress isn't related to Mohr's circle **Ans: B**

20. Up till which point will a body regain its original shape?
a) Yield point
b) Elastic limit
c) Fracture limit
d) Ultimate tensile strength point **Ans: B**

21. Which of the following is not an evidence of plastic action on the material?
a) Yield
b) Plastic flow
c) Fatigue
d) Creep **Ans: C**

22. Which of the following is the property because of which a material can be drawn into wires?
a) Ductility
b) Elasticity
c) Malleability
d) Strength **Ans: A**

23. What is the unit of impact strength?
a) N/m
b) MN/m
c) MN/m^2
d) N/m^2 **Ans: C**

24. Which of the following properties is impact strength indicative of?
a) Elasticity
b) Hardness
c) Stiffness
d) Toughness **Ans: D**

25. The thermal stress is a function of _____________
P. Coefficient of linear expansion
Q. Modulus of elasticity
R. Temperature rise
a) P and Q
b) Q and R
c) Only P
d) Only R **Ans: D**

26. Which one of the following has the largest value of thermal coefficient?
a) Brass
b) Copper
c) Steel
d) Aluminium **Ans: D**

27. Identify which factor may cause a lowered body temperature:
a) Infection
b) Stress
c) Shock
d) Exercise **Ans: C**

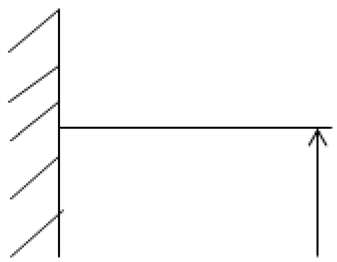
28. How many elastic constants of a linear, elastic, isotropic material will be?
a) 2
b) 3

c) 1
d) 4 **Ans: A**

29. What is the relationship between Youngs modulus E, modulus of rigidity C, and bulk modulus K?
a) E = 9KC / (3K + C)
b) E = 9KC / (9K + C)
c) E = 3KC / (3K + C)
d) E = 3KC / (9K + C) **Ans: A**
30. What is the limiting values of Poisson's ratio?
a) -1 and 0.5
b) -1 and -0.5
c) -1 and -0.5
d) 0 and 0.5 **Ans: D**

UNIT 2: TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM	
Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers –Simply supported beams.	

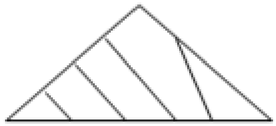
31. _______ is a horizontal structural member subjected to transverse loads perpendicular to its axis.
a) Strut
b) Column
c) Beam
d) Truss **Ans: C**
32. Example for cantilever beam is ______
a) Portico slabs
b) Roof slab
c) Bridges
d) Railway sleepers **Ans: A**
33. The diagram depicts _______ kind of beam.



a) Cantilever
b) Continuous
c) Over hanging
d) Propped cantilever **Ans: D**
34. Fixed beam is also known as __________
a) Encastered beam
b) Built on beam
c) Rigid beam
d) Tye beam **Ans: A**
35. U.D.L stands for?
a) Uniformly diluted length
b) Uniformly developed loads
c) Uniaxial distributed load

d) Uniformly distributed loads **Ans: D**

36. Given below diagram is ______ load.



a) Uniformly distributed load
b) Uniformly varying load
c) Uniformly decess load
d) Point load **Ans: B**

37. Moving train is an example of ____ load.
a) Point load
b) Cantered load
c) Rolling load
d) Uniformly varying load **Ans: C**

38. Continuous beams are _________
a) Statically determinate beams
b) Statically indeterminate beams
c) Statically gravity beams
d) Framed beams **Ans: B**

39. A beam which extends beyond it supports can be termed as __________
a) Over hang beam
b) Over span beam
c) Isolated beams
d) Tee beams **Ans: A**

40. Shear force is unbalanced _____ to the left or right of the section.
a) Horizontal force
b) Vertical force
c) Inclined force
d) Conditional force **Ans: B**

41. SI units of shear force is _______________
a) kN/m
b) kN-m
c) kN
d) m/N **Ans: C**

42. Shear force is diagram is _______ representation of shear force plotted as ordinate.
a) Scalar
b) Aerial
c) Graphical
d) Statically **Ans: C**

43. Hogging is________
a) Negative bending moment
b) Positive shear force
c) Positive bending moment
d) Negative shear force **Ans: A**

44. At the point of contraflexure, the value of bending moment is ____________
a) Zero
b) Maximum
c) Can't be determined

d) Minimum **Ans: A**

45. _________ positive/negative bending moments occur where shear force changes its sign.
a) Minimum
b) Zero
c) Maximum
d) Remains same **Ans: C**

46. SI units of Bending moment is ___________
a) kN
b) kN^2
c) kNm
d) km **Ans: C**

47. What is the other name for a positive bending moment?
a) Hogging
b) Sagging
c) Inflation
d) Contraflexure **Ans: B**

48. A simple support offers only _______ reaction normal to the axis of the beam.
a) Horizontal
b) Vertical
c) Inclined
d) Moment **Ans: B**

49. To avoid _____ stresses in beams, one end of the beam is placed on the rollers.
a) Compressive
b) Pyro
c) Temperature
d) Tensile **Ans: C**

50. ________ support develops support moment.
a) Hinged
b) Simple
c) Fixed
d) Joint **Ans: C**

51. Hinge support is called as __________
a) Socket joint
b) Swivel joint
c) Ball joint
d) Pin joint **Ans: D**

52. For a simply supported beam, the moment at the support is always __________
a) Maximum
b) Zero
c) Minimum
d) Cannot be determined **Ans: B**

53. Roller support is same as _____
a) Hinged support
b) Fixed support
c) Simply support
d) Roller support **Ans: C**

54. Hinged supports offers vertical and ________ reaction.
a) Horizontal
b) Moment
c) Rotation
d) Couple **Ans: A**

55. __________ of a beam is a measure of its resistance against deflection.

a) Strength
b) Stiffness
c) Slope
d) Maximum bending **Ans: B**

56. The maximum induced ___________ stresses should be within the safe permissible stresses to ensure strength of the beam.
a) Tensile
b) Compressive
c) Bending
d) Lateral **Ans: C**

57. In simply supported beam deflection is maximum at ____________
a) Midspan
b) Supports
c) Point of loading
d) Through out **Ans: A**

58. In simply supported beams, the slope is _____________ at supports.
a) Minimum
b) Zero
c) Maximum
d) Uniform **Ans: C**

59. Cantilever scaffolding is also known as ____________
a) mason's scaffolding
b) suspended scaffolding
c) needle scaffolding
d) ladder scaffolding **Ans: C**

60. Which of the following is a mechanical property of materials?
a) Surface Tension
b) Compressibility
c) Elasticity
d) Specific volume **Ans: C**

UNIT 3: TORSION AND SPRINGS	
Torsion formulation stresses and deformation in circular and hollows shafts – Stresses in helical springs – Deflection of helical springs.	

61. Torsional sectional modulus is also known as _________
a) Polar modulus
b) Sectional modulus
c) Torsion modulus
d) Torsional rigidity **Ans: A**

62. ________ is a measure of the strength of shaft in rotation.
a) Torsional modulus
b) Sectional modulus
c) Polar modulus
d) Torsional rigidity **Ans: C**

63. What are the units of torsional rigidity?
a) Nmm^2
b) N/mm
c) N-mm
d) N **Ans: A**

64. The angle of twist can be written as ________
a) TL/J

b) CJ/TL
c) TL/CJ
d) T/J **Ans: C**

65. The power transmitted by shaft SI system is given by __________
a) 2πNT/60
b) 3πNT/60
c) 2πNT/45
d) NT/60 W **Ans: A**

66. The shear stress is ____________ at the axis of the shaft.
a) Minimum
b) Maximum
c) Zero
d) Uniform **Ans: C**

67. The hollow shaft will transmit greater _______ then the solid shaft of the same weight.
a) Bending moment
b) Shear stress
c) Torque
d) Sectional Modulus **Ans: C**

68. The moment of inertia of a plane area with respect to an axis ____________ to the plane is called a polar moment of inertia.
a) Parallel
b) Perpendicular
c) Equal
d) Opposite **Ans: B**

69. What is the polar modulus for solid shaft?
a) $\pi/16\ D^2$
b) $\pi/12\ D^3$
c) $\pi/16\ D^3$
d) $\pi/16\ D$ **Ans: C**

70. What are the units of Polar modulus?
a) mm^3
b) mm^2
c) mm
d) mm^4 **Ans: A**

71. Calculate the polar moment of inertia for a solid circular shaft of 30 mm diameter.
a) $76m^4$
b) $79.5m^4$
c) $81m^4$
d) $84m^4$ **Ans: A**

72. A hollow shaft outside diameter 120 mm and thickness 20 mm. Find polar moment of inertia.
a) $16.36 \times 10^6\ mm^4$
b) $18.45 \times 10^6\ mm^4$
c) $21.3 \times 10^6\ mm^4$
d) $22.5 \times 10^6\ mm^4$ **Ans: A**

73. Which of the following function can the spring perform?
a) Store energy
b) Absorb shock
c) Measure force
d) All of the mentioned **Ans: D**

74. The helix angle is very small about 2^0. The spring is open coiled spring.
a) Yes

b) It is closed coiled spring
c) That small angle isn't possible
d) None of the listed **Ans: B**

75. The longest leaf in a leaf spring is called centre leaf.
a) It is called middle leaf
b) It is called master leaf
c) Yes
d) None of the listed **Ans: B**
76. If spring index=2.5, what can be concluded about stresses in the wire?
a) They are high
b) They are negligible
c) They are moderate
d) Cannot be determined **Ans: A**
77. If the spring is compressed completely and the adjacent coils touch each other,the the length of spring is called as?
a) Solid length
b) Compressed length
c) Free length
d) None of the mentioned **Ans: A**
78. If number of coils are 8 and wire diameter of spring 3mm, then solid length is given by?
a) None of the listed
b) 27mm
c) 24mm
d) 21mm **Ans: C**
Explanation: Solid length=8×3.
79. Pitch of coil is defined as axial distance in compressed state of the coil.
a) Yes
b) It is measured in uncompressed state
c) It is same in uncompressed or compressed state
d) None of the listed **Ans: B**
80. If uncompressed length of spring is 40mm and number of coils 10mm, then pitch of coil is?
a) 4
b) 40/9
c) 40/11
d) None of the mentioned **Ans: B**
Explanation: Pitch=Uncompressed length/N-1
81. If a spring has plain ends then number of inactive coils is?
a) 1
b) 2
c) 3
d) 0 **Ans: D**
82. The load shared by each spring is inversely proportional to the cross section of wire.
a) Yes
b) No, it is directly proportional
c) It is proportional to its square
d) It is proportional to its square root **Ans: B**
83. If the spring have same solid length and number of coils in the two springs are 8 and 10, then find the diameter of the spring with 8 coils. It is given diameter of spring with 10 coils is 12mm.
a) 9.6mm
b) 9mm

c) 12mm
d) 15mm **Ans: B**
Explanation : N1d1=N2d2

84. What will happen if stresses induced due to surge in the spring exceeds the endurance limit stress of the spring.
a) Fatigue Failure
b) Fracture
c) None of the listed
d) Nipping **Ans: A**

85. For a helical torsion sprig, the stress concentration factor at inner fibre is? Give spring index=5.
a) 1.005
b) 1.175
c) 1.223
d) 1.545 **Ans: B**
Explanation: $K=4C^2-C-1/4C(C-1)$

86. Spiral spring is quite rigid.
a) Yes
b) No it is flexible
c) It is of moderate rigidity
d) Rigidity can't be determined **Ans: B**

87. Calculate the bending stress induced in the strip of the helical spring. The spring is subjected to a moment of 1250N-mm with breadth and thickens of the strip being 11mm and 1.5mmm respectively.
a) 508.8N/mm²
b) 612.2N/mm²
c) 606.1N/mm²
d) 564.3N/mm² **Ans: C**
Explanation: $\sigma=12M/bt^2$.

88. Angle of rotation o arbour with respect to drum is given by?
a) None of the listed
b) $12ML/Ebt^3$
c) $8\ ML/Ebt^3$
d) $16ML/Ebt^3$ **Ans: B**
Explanation: $\theta=ML/EI$ where $I=bt^3/12$

89. Bending stress in graduated length leaves are more than that in full length leaves.
a) Yes
b) No
c) In some cases
d) Can't be stated **Ans: B**

90. Propagation of fatigue failure is always due to compressive stresses.
a) Due to bending
b) Due to tensile
c) Due to fatigue
d) None of the listed **Ans: B**

UNIT 4: DEFLECTION OF BEAMS	
Double Integration method and deflections in beams. – Area moment Theorems for computation of Slopes	

91. Units of deflection are _________
a) kNm

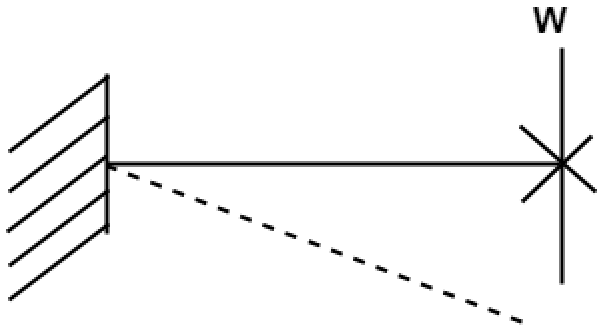
b) kN/m
c) kN
d) m **Ans: D**

92. Which of the following method is used to determine the slope and deflection at a point?
a) Arithmetic increase method
b) Mathematical curve setting
c) Macaulay's method
d) Lacey's method **Ans: C**
93. Deflection is denoted by _______
a) i
b) y
c) h
d) e **Ans: B**
94. In cantilever beams, the deflection is zero at ___________
a) Free and
b) Fixed end
c) At supports
d) Through out **Ans: B**
95. Mohr's theorem -¡¡ states?
a) Ax/EI
b) A/Ex
c) A/EI
d) Ae=Ix **Ans: A**
Explanation: Mohr's theorem -¡¡ states "the intercept taken on a vertical reference line of the tangent at any two points on an elastic line is equal to the moment of BMD between these points, about the reference line divided by flexural rigidity (EI).
96. Calculate the deflection if the slope is 0.0225 radians. Take the distance of centre of gravity of bending moment to free end as 2 metres.
a) 45mm
b) 35mm
c) 28mm
d) 49mm **Ans: A**
Explanation: The deflection at any point on the elastic curve equal to Ax/EI
So, slope × (the distance of centre of gravity of bending moment to free end = 2m).
0.0225 × 2
0.045m ~ 45 mm
97. In simply supported beams, deflection is zero at _________
a) Mid span
b) Supports
c) Through out
d) Point of action of load **Ans: B**
98. The ratio of maximum deflection of a beam to its ___________ is called stiffness of the beam.
a) Load
b) Slope
c) Span
d) Reaction at the support **Ans: C**
99. Stiffness of the beam is inversely proportional to the _____ of the beam.
a) Slope
b) Support reaction
c) Deflection
d) Load **Ans: C**

100. The maximum ____ should not exceed the permissible limit to the span of the beam.
   a) Slope
   b) Deflection
   c) Load
   d) Bending moment **Ans: B**

101. In cantilever beam the deflection occurs at ______
   a) Free end
   b) Point of loading
   c) Through out
   d) Fixed end **Ans: A**

102. The maximum deflection in cantilever beam of span "l"m and loading at free end is "W" kN.



   a) $Wl^3/2EI$
   b) $Wl^3/3EI$
   c) $Wl^3/4EI$
   d) $Wl^2/2EI$ **Ans: B**

   Explanation: Maximum deflection occurs at free end distance between centre of gravity of bending moment diagram and free end is x = 2l/3.
   As deflection is equal to the slope × "x". The slope = Wl2/2EI radians
   Maximum deflection (y) = Ax/EI = $Wl^3/3EI$.

103. In an ideal fluid, the ____________ stresses are pretend to be absent.
   a) Bending
   b) Shearing
   c) Tensile
   d) Compressive **Ans: B**

104. Air and water are the examples of ___________
   a) Non Newtonian fluids
   b) Vortex fluids
   c) Real fluids
   d) Ideal fluids **Ans: D**

105. _______ fluids are practical fluids
   a) Ideal
   b) Real
   c) Vortex
   d) Newtonian **Ans: B**

106. Specific weight of water at 4°C is ____________ N/m^3.
   a) 9810
   b) 9760
   c) 9950
   d) 9865 **Ans: A**

   Explanation: The specific weight (weight density) of a fluid is weight per unit volume. It is represented by symbol w & it is expressed in Newton per metre cube (N/m^3). The specific weight of water at 4 degree centigrade is 9810 N/m3or 9.81 kN/m^3

107. The inverse of specific weight of a fluid is __________
a) Specific gravity
b) Specific Volume
c) Compressibility
d) Viscosity **Ans: B**

108. Calculate the specific gravity of mercury.
a) 12.5
b) 14.7
c) 13.6
d) 11.8 **Ans: C**
Explanation: The specific gravity of any fluid is the ratio of the specific weight of fluid by specific weight of water. For mercury, the specific weight is 133416 N/m^3. For water, w = 9810 N/m^3.
S = 133416/9810
S= 13.6

109. Specific gravity of water is __________
a) 0.8
b) 1
c) 1.2
d) 1.5 **Ans: B**

110. Compute the maximum deflection at free end of a cantilever beam subjected to udl for entire span of l metres.
a) $wl^4/8EI$
b) $wl^4/4EI$
c) $wl^3/8EI$
d) $wl^2/6EI$ **Ans: A**
Explanation: The slope at free end = A/EI = $wl^3/6EI$
Maximum deflection at free end is Ax/EI; [x= ¾ l] y= $wl^3/6EI \times ¾\, l = wl^4/8EI$

111. Calculate the maximum deflection of a cantilever beam with udl on entire span of 3m the intensity of you udl be 25 kN/m. Take EI as 4000 kN/m^2.
a) 0.052m
b) 0.063m
c) 0.076m
d) 0.09m **Ans: B**
Explanation: For cantilever beams with udl on entire span, the maximum deflection = $wl^4/8EI$
y = $wl^4/8EI = 25 \times 3^4/ 8 \times 4000$ = 0.063m.

112. Slope of a line is given by _________ if inclination of line is α.
a) sinα
b) cosα
c) tanα
d) cotα **Ans: C**

113. Find slope of line if inclination made by the line is 60°.
a) 1/√3
b) 1/√3
c) √3
d) 1 **Ans: C**

114. What is the inclination of a line which is parallel to x-axis?
a) 0°
b) 180°
c) 45°
d) 90° **Ans: A**

115. What is the inclination of a line which is parallel to y-axis?
a) 0°
b) 180°
c) 45°
d) 90° **Ans: D**

116. What is the slope of a line which is parallel to x-axis?
a) -1
b) 0
c) 1
d) Not defined **Ans: B**

117. What is the slope of a line which is parallel to y-axis?
a) -1
b) 0
c) 1
d) Not defined **Ans: D**

118. In general $t_{A/B}$ implies:-
a) Vertical deflection of tangent at B wrt that at A
b) Vertical deflection of tangent at A wrt that at B
c) Vertical deflection of extended tangent at B wrt tangent at A
d) Vertical deflection of tangent at A wrt extended tangent at B **Ans: D**

119. What is the shape for SFD of this diagram?
a) Linear
b) Parabolic
c) Linear with discontinuity
d) Arbitrary curve **Ans: C**

120. What is the value of slope at point B w.r.t initial beam?
a) 10/EI
b) 20/EI
c) 30/EI
d) 40/E **Ans: D**
Explanation: Just calculate the area between point C and point B

UNIT 5: THIN CYLINDERS AND SPHERES	
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells.	

121. If the thickness of plate is negligible when compared to the diameter of the cylindrical, then it is called __________
a) Thick cylinder
b) Thin cylinder
c) Hoop cylinder
d) Circumferential cylinder **Ans: B**

122. In thin cylinders, the thickness should be ____________ times of internal diameter.
a) 1/20
b) 1/15
c) 1/30
d) 1/40 **Ans: A**

123. Oil tanks, steam boilers, gas pipes are examples of _____________
a) Thick shells
b) Thin cylinders
c) Hoop cylinders

d) Longitudinal cylinders **Ans: B**

124. In _________ shells, the stress distribution is not uniform over the thickness of the material.
a) Thick
b) Thin
c) Hoop
d) Circumferential **Ans: A**

125. Hydraulic radius is denoted by _________
a) T
b) A
c) R
d) N **Ans: C**
Explanation: Hydraulic radius is the ratio of wetted area to the wetted perimeter. It is also known as hydraulic mean depth. It is denoted by "R".
R = A/P.

126. Hydraulic depth is a ratio of wetted area to _____
a) Bottom width
b) Top width
c) Diameter
d) Radius **Ans: B**

127. What is the hydraulic depth (D) of a rectangular section?
a) y
b) 1/3 y
c) y^2
d) y/5 **Ans: A**

128. The stress acts tangential to circumference is called ______ stress.
a) Hoop
b) Fluid
c) Longitudinal
d) Yield **Ans: A**

129. The hoop stress is _____________ along the x axis.
a) Tensile
b) Parabolic
c) Compressed
d) Transverse **Ans: A**

130. The cylinder has a tendency to split up along _____________ due to circumferential stress.
a) Area
b) Radius
c) Diameter
d) Length **Ans: C**

131. _______ torque produces the maximum shear stress due to combined bending.
a) Seasonal
b) Equipment
c) Composite
d) Series **Ans: B**

132. _______ is the structures installed for the purpose of drawing water.
a) Intakes
b) Conduits
c) Valves
d) Springs **Ans: A**

133. A cylindrical section having no joint is known as _____________

a) Seamless section
b) Efficient section
c) Rivet less section
d) Anchorage **Ans: A**

134. The type of joint provided to release thermal stresses is called _______
a) Socket and spigot joint
b) Expansion joint
c) Flash joint
d) Simplex joint **Ans: B**

135. Isolated __________ decrease stability in the ecosystem.
a) Food web
b) Food chain
c) Food pyramid
d) Food numbers **Ans: B**

136. Which of the following joint is a simplex joint?
a) Flanged joint
b) Socket and spigot joint
c) AC pipe joint
d) Expansion joint **Ans: C**

137. Which of the following is not a leakage detection method?
a) Direct observation
b) By plotting HGL
c) Pipe corrosion
d) Sounding rod **Ans: C**

138. Which of the following well is also known as flowing well?
a) Gravity well
b) Artesian well
c) Drilled wells
d) Driven wells **Ans: B**

139. To determine hoop stress, efficiency of _________ is to be considered.
a) Construction joint
b) Transverse joint
c) Longitudinal joint
d) Rivet joint **Ans: C**

140. Cast Iron pipes are being joined a _________
a) Flange joint
b) Expansion joint
c) Socket and spigot joint
d) Simplex joint **Ans: C**

141. Which of the following joint is a simplex joint?
a) Flanged joint
b) Socket and spigot joint
c) AC pipe joint
d) Expansion joint **Ans: C**

142. The mortise and tenon are provided in __________ joint.
a) Concrete
b) Spigot
c) A C pipe
d) Flanged **Ans: A**

143. _______ is used to magnify the sound for detecting leakage.
a) Aquagaurd
b) Otoscope

c) Sonoscope
d) Horoscope **Ans: C**

144. A cylindrical section having no joint is known as _____________
a) Seamless section
b) Efficient section
c) Rivet less section
d) Anchorage section **Ans: A**

145. Strength of joint = efficiency × __________
a) Strength of section
b) Depth of plate
c) Length of plate
d) Strength of plate **Ans: D**

146. The presence of calcium and magnesium chloride in water causes ___________
a) Hardness
b) Bad taste
c) Turbidity
d) Softening **Ans: D**

147. The type of joint provided to release thermal stresses is called _______
a) Socket and spigot joint
b) Expansion joint
c) Flash joint
d) Simplex joint **Ans: B**

148. _______ is as the maximum energy that can be absorbed within the proportionality limit.
a) Proof resilience
b) Modulus of resilience
c) Impact resilience
d) Resilience **Ans: A**

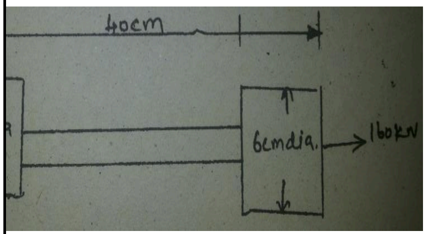
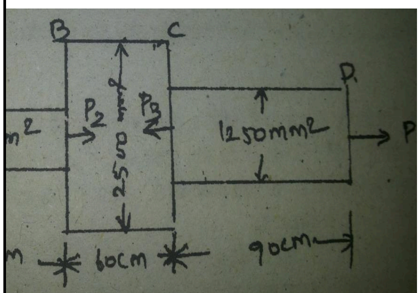
149. The tensile test is carried on ________ material.
a) Ductile
b) Brittle
c) Malleable
d) Plastic **Ans: A**

150. E – coli was formerly known as _________
a) F. Coli
b) B. Coli
c) G. Coli
d) R. Coli **Ans: B**

QUESTION BANK

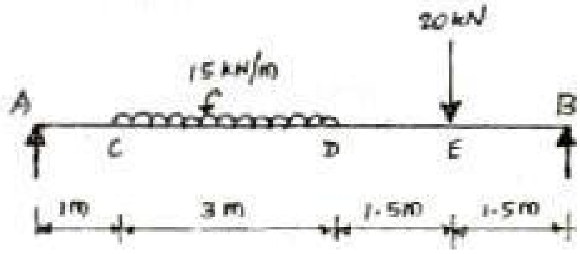
UNIT 1: STRESS, STRAIN AND DEFORMATION OF SOLIDS			
Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants.			
PART – A (2 Marks)			
S.NO	**Questions**	**BT Level***	
1.	What is Hooke's Law?	2	Understand
2.	What are the Elastic Constants?	2	Understand
3.	Define Poisson's Ratio.	1	Remembering
4.	Define: Resilience	1	Remembering
5.	Define proof resilience	1	Remembering
6.	Define modulus of resilience.	1	Remembering
7.	Define principal planes and principal stresses.	1	Remembering
8.	Define stress and strain.	1	Remembering
9.	Define Shear stress and Shear strain.	1	Remembering
10.	Define elastic limit.	1	Remembering
11.	Define volumetric strain.	1	Remembering
12.	Define tensile stress and compressive stress.	1	Remembering
13.	Define young's Modulus.	1	Remembering
14.	What is the use of Mohr's circle?	2	Understand
15.	Define thermal stress.	1	Remembering
16.	Define Bulk modulus.	1	Remembering
17.	What is modulus of rigidity?	2	Understand
18.	Define factor of safety.	1	Remembering

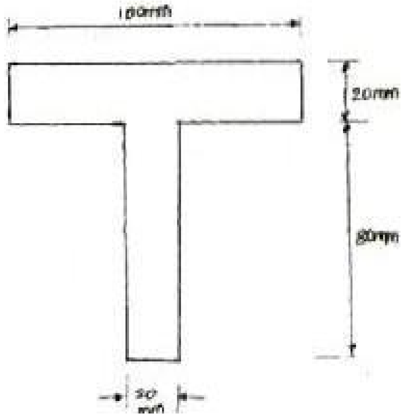
19.	State the relationship between young's modulus and modulus of rigidity..	4	Analyse
20.	What is compound bar	2	Understand
PART – B (16 Marks)			
1.	A Mild steel rod of 20 mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter 25 mm. The ends of the rod and tube are brazed together, and the composite bar is subjected to an axial pull of 40 kN. If E for steel and copper is 200 Gpa and 100 Gpa respectively, find the stresses developed in the rod and the tube also find the extension of the rod.	5	Evaluate pg-60
2.	A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0039 mm. calculate the Poisson's ratio and the values of the three moduli	5	Evaluate
3.	A cast iron flat 300 mm long and 30 mm (thickness) × 60 mm (width) uniform cross section, is acted upon by the following forces : 30 kN tensile in the direction of the length 360 kN compression in the direction of the width 240 kN tensile in the direction of the thickness. Calculate the direct strain, net strain in each direction and change in volume of the flat. Assume the modulus of elasticity and Poisson's ratio for cast iron as 140 kN/mm^2 and 0.25 respectively.	5	Evaluate

4.	The bar shown in fig. is subjected to a tensile load of 160 KN. If the stress in the middle portion is limited to 150 N/mm^2, determine the diameter of the middle portion. Find also the length of the middle portion if the total elongation of the bar is to be 0.2mm. young's  modulus is given as equal to 2.1 x 10^5 N/mm	5	Evaluate
5.	A member ABCD is subjected to point loads P1, P2, P3, P4 as shown in fig. calculate the force P2 necessary for equilibrium, if P1 = 45 KN, P3 = 450 KN and P4 = 139 KN. Determine the total elongation of the member, assuming the modulus of elasticity to be 2.1 x 10^5 N/mm^2 	5	Evaluate
6.	A steel rod of 20mm diameter passes centrally through a copper tube of 50mm external diameter and 40mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 50˚C, calculate the stress developed in copper and steel. Take E for steel and copper as 200 GN/m^2 and 100 GN/m^2 and α for steel and copper as 12 x 10^{-6} per ˚C and 18 x 10^{-6} per ˚C	5	Evaluate
7.	Two vertical rods one of steel and the other of	5	Evaluate

	copper are each rigidly fixed at the top and 50cm apart. Diameters and lengths of each rod are 2cm and 4m respectively. A cross bar fixed to the rods at the lower ends carries a load of 5000 N such that the cross bar remains horizontal even after loading. Find the stress in each rod and the position of the load on the bar. Take E for steel = 2 x 10^5 N/mm^2 and E for copper = 1x 10^5 N/mm^2.		
8.	Drive the relationship between modulus of elasticity and modulus of rigidity. Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 30 mm and of length 1.5 m if the longitudinal strain in a bar during a tensile stress is four times the lateral strain. Find the change in volume, when the bar is subjected to a hydrostatic pressure of 10 N/mm2. Take E = 1X 10^5 N/mm^2 A) what are the different types of machining operations that can be performed on a lathe? And explain any six in detail	5	Evaluate
UNIT 2: TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers –Simply supported beams			
PART – A (2 Marks)			
1.	State the different types of supports.	3	Apply
2.	What is cantilever beam?	2	Understand
3.	Write the equation for the simple bending theory.	4	Analyse
4.	What do you mean by the point of contraflexure?	3	Apply
5.	What is mean by positive or sagging BM?	2	Understand
6.	Define shear force and bending moment.	1	Remembering
7.	What is Shear stress diagram?	2	Understand
8.	What is Bending moment diagram?	2	Understand
9.	What are the different types of loading?	2	Understand
10.	Write the assumption in the theory of simple bending.	4	Analyse

11.	What are the types of beams?	2	Understand
12.	When will bending moment is maximum.	2	Understand
13.	Write down relations for maximum shear force and bending moment in case of a cantilever beam subjected to uniformly distributed load running over entire span.	4	Analyse
14.	Draw the shear force diagram for a cantilever beam of span 4 m and carrying a point load of 50 KN at mid span.	5	Evaluate
15.	Sketch (a) the bending stress distribution (b) shear stress distribution for a beam of rectangular cross section.	5	Evaluate
16.	A cantilever beam 3 m long carries a load of 20 KN at its free end. Calculate the shear force and bending moment at a section 2 m from the free end.	4	Analyse
17.	Derive the relation between the intensity of load and shear force, in bending theory.	4	Analyse
18.	A clockwise moment M is applied at the free end of a cantilever. Draw the SF and BM diagrams for the cantilever.	5	
19.	What is maximum bending moment in a simply supported beam of span 'L' subjected to UDL of 'w' over entire span?	2	Understand
20.	What is mean by negative or hogging BM?	2	Understand
PART- B (16 Marks)			
1.	Three blanks of each 50 x200 mm timber are built up to a symmetrical I section for a beam. The maximum shear force over the beam is 4KN. Propose an alternate rectangular section of the same material so that the maximum shear stress developed is same in both sections. Assume then width of the section to be 2/3 of the depth	4	Analyse
2.	A beam of uniform section 10 m long carries a udl of 2KN/m for the entire length and a concentrated load of 10 KN at right end. The beam is freely supported at the left end. Find the position of the second support so that the maximum bending moment in the beam is as minimum as possible. Also compute the	5	Evaluate

	maximum bending moment		
3.	A beam of size 150 mm wide, 250 mm deep carries a uniformly distributed load of w kN/m over entire span of 4 m. A concentrated load 1 kN is acting at a distance of 1.2 m from the left support. If the bending stress at a section 1.8 m from the left support is not to exceed 3.25 N/mm^2 find the load w.	5	Evaluate
4.	A cantilever of 2m length carries a point load of 20 KN at 0.8 m from the fixed end and another point of 5 KN at the free end. In addition, a u.d.l. of 15 KN/m is spread over the entire length of the cantilever. Draw the S.F.D, and B.M.D	5	Evaluate
5.	A Simply supported beam of effective span 6 m carries three point loads of 30 KN, 25 KN and 40 KN at 1m, 3m and 4.5m respectively from the left support. Draw the SFD and BMD. Indicating values at salient points	5	Evaluate
6.	A Simply supported beam of length 6 metres carries a udl of 20KN/m throughout its length and a point of 30 KN at 2 metres from the right support. Draw the shear force and bending moment diagram. Also find the position and magnitude of maximum Bending moment.	5	Evaluate
7.	For the simply supported beam loaded as shown in Fig. , draw the shear force diagram and bending moment diagram. Also, obtain the maximum bending moment. 	5	Evaluate
8.	A cast iron beam is of T-section as shown in Fig. The beam is simply supported on a span of 6 m. The beam carries a uniformly distributed load of 2kN/m on the entire length (span).	5	Evaluate

	Determine the maximum tensile and maximum compressive stress. 		
UNIT 3: TORSION AND SPRINGS Torsion formulation stresses and deformation in circular and hollows shafts – Stresses in helical springs – Deflection of helical springs.			
PART – A (2 Marks)			
1.	Define torsional rigidity of the solid circular shaft.	1	Remembering
2.	Distinguish between closed coil helical spring and open coil helical spring.	4	Analyse
3.	What is meant by composite shaft?	2	Understand
4.	What is called Twisting moment?	2	Understand
5.	What is Polar Modulus ?	2	Understand
6.	Define: Torsional rigidity of a shaft	1	Remembering
7.	What do mean by strength of a shaft?	2	Understand
8.	Write down the equation for Wahl factor	1	Remembering
9.	Define: Torsional stiffness.	1	Remembering
10.	What are springs? Name the two important types.	2	Understand
11.	How will you find maximum shear stress induced in the wire of a close-coiled helical spring carrying an axial load?	3	Apply
12.	Write the expressions for stiffness of a close coiled helical spring.	4	Analyse
13.	Find the minimum diameter of shaft required to transmit a torque of 29820 Nm if the maximum	5	Evaluate

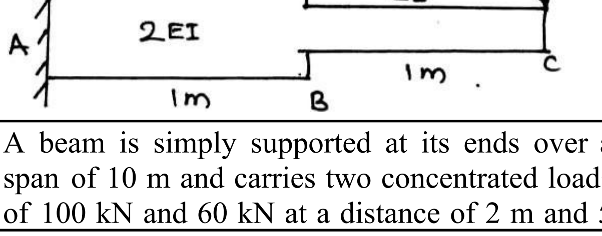
	shear stress is not to exceed 45 N/mm^2.		
14.	Find the torque which a shaft of 50 mm diameter can transmit safely, if the allowable shear stress is 75 N/mm^2.	4	Analyse
15.	Differentiate open coiled helical spring from the close coiled helical spring and state the type of stress induced in each spring due to an axial load.	2	Understand
16.	What is spring index ©?	4	Analyse
17.	State any two functions of springs	3	Apply
18.	Write the polar modulus for solid shaft and circular shaft	4	Analyse
19.	What are the assumptions made in Torsion equation	2	Understand
20.	Write an expression for the angle of twist for a hollow circular shaft with external diameter *D*, internal diameter *d*, length *l* and rigidity modulus *G*.	4	Analyse
PART – B (16 Marks)			
1.	Determine the diameter of a solid shaft which will transmit 300 KN at 250 rpm. The maximum shear stress should not exceed 30 N/mm2 and twist should not be more than 10 in a shaft length 2m. Take modulus of rigidity = 1 x 10^5 N/mm^2.	5	Evaluate
2.	The stiffness of the closed coil helical spring at mean diameter 20 cm is made of 3 cm diameter rod and has 16 turns. A weight of 3 KN is dropped on this spring. Find the height by which the weight should be dropped before striking the spring so that the spring may be compressed by 18 cm. Take C= $8x10^4$ N/mm^2	4	Analyse
3.	It is required to design a closed coiled helical spring which shall deflect 1mm under an axial load of 100 N at a shear stress of 90 Mpa. The spring is to be made of round wire having shear modulus of 0.8 x 10^5 Mpa. The mean diameter of the coil is 10 times that of the coil wire. Find the diameter and length of the wire.	4	Analyse
4.	A steel shaft ABCD having a total length of 2400 mm is contributed by three different sections as follows. The portion AB is hollow	5	Evaluate

	having outside and inside diameters 80 mm and 50 mm respectively, BC is solid and 80 mm diameter. CD is also solid and 70 mm diameter. If the angle of twist is same for each section, determine the length of each portion and the total angle of twist. Maximum permissible shear stress is 50 Mpa and shear modulus 0.82 x 10^5 MPa		
5.	Calculate the power that can be transmitted at a 300 r.p.m. by a hollow steel shaft of 75 mm external diameter and 50 mm internal diameter when the permissible shear stress for the steel is 70 N/mm2 and the maximum torque is 1.3 times the mean. Compare the strength of this hollow shaft with that of an solid shaft. The same material, weight and length of both the shafts are the same.	5	Evaluate
6.	A helical spring of circular cross-section wire 18 mm in diameter is loaded by a force of 500N. The mean coil diameter of the spring is 125mm. The modulus of rigidity is 80 kN/mm2. Determine the maximum shear stress in the material of the spring. What number of coils must the spring have for its deflection to be 6 mm?	4	Analyse
7.	A closely coiled helical spring of round steel wire 10 mm in diameter having 10 complete turns with a mean diameter of 12 cm is subjected to an axial load of 250 N. Determine a. the deflection of the spring b. maximum shear stress in the wire and c. stiffness of the spring and frequency of vibration. Take C = 0.8 x 10^5 N/mm^2	4	Analyse
8.	A close coiled helical spring is to have a stiffness of 1.5 N/mm of compression under a maximum load of 60 N. the maximum shearing stress produced in the wire of the spring is 125 N/mm^2 .The solid length of the spring is 50mm. Find the diameter of coil, diameter of wire and number of coils .C = 4.5 xl04N/mm^2	4	Analyse

UNIT 4: DEFLECTION OF BEAMS

Double Integration method and deflections in beams. –Area moment theorems for computation of slopes

PART – A (2 Marks)			
1.	State the condition for the use of Macaulay's method.	4	Analyse
2.	What is the maximum deflection in a simply supported beam subjected to uniformly distributed load over the entire span?	2	Understand
3.	What is crippling load? Give the effective length of columns when both ends hinged and when both ends fixed.	2	Understand
4.	Find the critical load of an Euler's column having 4 m length, 50 mm x 100 mm cross section and hinged at both the ends E = 200 kn/mm2.	4	Analyse
5.	Calculate the maximum deflection of a simply supported beam carrying a point load of 100 KN at mid span. Span = 6 m, E= 20000 kn/m2.	4	Analyse
6.	A cantilever beam of spring 2 m is carrying a point load of 20 kn at its free end. Calculate the slope at the free end. Assume EI = 12×10^3 KNm^2.	4	Analyse
7.	Calculate the effective length of a long column, whose actual length is 4 m when : a. Both ends are fixed b. One end fixed while the other end is free.	4	Analyse
8.	A cantilever is subjected to a point load W at the free end. What is the slope and deflection at the free end?	4	Analyse
9.	What are the methods for finding out the slope and deflection at a section?	2	Understand
10.	Why moment area method is more useful, when compared with double integration?	2	Understand
11.	Explain the Theorem for conjugate beam method?	4	Analyse
12.	What are the points to be worth for conjugate beam method**?**	2	Understand
13.	What are the different modes of failures of a column?	2	Understand
14.	Write down the Rankine formula for columns.	4	Analyse
15.	What is effective or equivalent length of column?	2	Understand
16.	Define Slenderness Ratio.	1	Remembering

17.	Define the terms column and strut.	1	Remembering
18.	What are the advantages of Macaulay method over the double integration method, for finding the slope and deflections of beams?	2	Understand
19.	State the limitations of Euler's formula	3	Apply
20.	A cantilever beam of spring 4 m is carrying a point load of $2x10^3$Nat its free end. Calculate the slope at the free end. Assume EI = $2X10^5 N/mm^2$	4	Analyse
PART – B (16 Marks)			
1.	A beam AB of length 8 m is simply supported at its ends and carries two point loads of 50 kN and 40 kN at a distance of 2 m and 5 m respectively from left support A. Determine, deflection under each load, maximum deflection and the position at which maximum deflection occurs. Take E = 2 x 10^5 N/mm^2 and I = 8.5 $X10^6$ mm^4	4	Analyse
2.	A 1.2 m long column has a circular cross section of 45 mm diameter one of the ends of the column is fixed in direction and position and other ends is free. Taking factor of safety as 3, calculate the safe load using i) Rankine's formula, take yield stress = 560 N/mm^2 and a = 1/1600 for pinned ends ii) Euler's formula, Young's modulus for cast iron = 1.2 x 105 N/mm^2	4	Analyse
3.	For the cantilever beam shown in Fig.3. Find the deflection and slope at the free end. EI = 10000 kN/m^2 	5	Evaluate
4.	A beam is simply supported at its ends over a span of 10 m and carries two concentrated loads of 100 kN and 60 kN at a distance of 2 m and 5	4	Analyse

	m respectively from the left support. Calculate (i) slope at the left support (ii)slope and deflection under the 100 kN load. Assume EI = 36 x 104 kN-m^2		
5.	A 3 m long cantilever of uniform rectangular cross–section 150 mm wide and 300 mm deep is loaded with a point load of 3 kN at the free end and a udl of 2 kN/m over the entire length. Find the maximum deflection. E = 210 kN/mm2. Use Macaulay's method	4	Analyse
6.	A simply supported beam of span 6 m is subjected to a udl of 2 kN/m over the entire span and a point load of 3 kN at 4 m from the left support. Find the deflection under the point load in terms of EI. Use strain energy method.	4	Analyse
7.	A simply supported beam of uniform flexural rigidity EI and span *l*, carries two symmetrically placed loads *P* at one–third of the span from each end. Find the slope at the supports and the deflection at mid–span. Use moment area theorems	4	Analyse
8.	Derive double integration method for cantilever beam concentrated load at free end	5	Evaluate
UNIT 5: THIN CYLINDERS AND SPHERES Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells.			
PART – A (2 Marks)			
1.	A cylindrical pipe of diameter 1.5 m and thickness 1.5 cm is subjected to an internal fluid pressure of 1.2 N/mm^2. Determine the longitudinal stress developed in the pipe.	4	Analyse
2.	Find the thickness of the pipe due to an internal pressure of 10 N/mm^2 if the permissible stress is 120 N/mm^2. The diameter of pipe is 750 mm.	4	Analyse
3.	The principal stress at a point are 100 N/mm^2 (tensile) and 50 N/mm^2 (compressive) respectively. Calculate the maximum shear stress at this point.	4	Analyse
4.	A spherical shell of 1 m diameter is subjected to an internal pressure 0.5N/mm^2. Find the thickness if the thickness of the shell, if the allowable stress in the material of the shell is 75 N/mm^2.	4	Analyse
5.	Normal stresses *s x* and *s y* and shear stress *t* act at a point. Find the principal stresses and	4	Analyse

	the principal planes.		
6.	Derive an expression for the longitudinal stress in a thin cylinder subjected to an uniform internal fluid pressure.	5	Evaluate
7.	Distinguish between thick and thin cylinders.	4	Analyse
8.	What is mean by compressive and tensile force?	2	Understand
9.	How will you determine the forces in a member by method of joints?	3	Apply
10.	Define thin cylinder?	1	Remembering
11.	What are types of stress in a thin cylindrical vessel subjected to internal pressure?	2	Understand
12.	What is mean by Circumferential stress (or hoop stress) and Longitudinal stress?	2	Understand
13.	What are the formula for finding circumferential stress and longitudinal stress?	2	Understand
14.	What are maximum shear stresses at any point in a cylinder	2	Understand
15.	What are the formula for finding circumferential strain and longitudinal strain?	2	Understand
16.	What are the formula for finding change in diameter, change in length and change volume of a cylindrical shell subjected to internal fluid pressure p?	2	Understand
17.	Distinguish between Circumferential stress (or hoop stress) and Longitudinal stress?	4	Analyse
18.	Find the thickness of the pipe due to an internal pressure of 10 N/mm^2 if the permissible stress is 120 N/mm^2. The diameter of pipe is 750 mm.	4	Analyse
19.	what do you mean by a thick compound cylinder? how will you determine the hoop stresses in a thick compound cylinder?	3	Apply
20.	what are the different methods of reducing hoop stresses?	2	Understand
PART – B (16 Marks)			
1.	A thin cylinder 1.5 m internal diameter and 5 m long is subjected to an internal pressure of 2 N/mm^2. If the maximum stress is limited to 160 N/mm^2, find the thickness of the cylinder. E = 200 kN/mm^2 and Poisson's ratio = 0.3. Also find the changes in diameter, length and volume of the cylinder.	4	Analyse

2.	At a point in a strained material the horizontal tensile stress is 80 N/mm^2 and the vertical compressive stress is 140 N/mm^2. The shear stress is 40N/mm^2. Find the principal stresses and the principal planes. Find also the maximum shear stress and its planes.	4	Analyse
3.	A thin cylindrical shell 3 m long has 1m internal diameter and 15 mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also the change in the dimensions of the shell, if it is subjected to an internal pressure of1.5 N/mm^2 Take E = $2x10^5$ N/mm^2 and poison's ratio =0.3. Also calculate change in volume.	4	Analyse
4.	A cylindrical shell 3 m long, 1 m internal diameter and 10 mm thick is subjected to an internal pressure of 1.5 N/mm2. Calculate the changes in length, diameter and volume of the cylinder. E = 200 kN/mm^2, Poisson's ratio = 0.3.	4	Analyse
5.	A cylindrical shell 3 m long which is closed at the ends has an internal diameter 1m and wall thickness of 15 mm. Calculate the change in dimensions and change in volume if the internal pressure is 1.5 N/mm^2,E = 2 x 10^5 N/min2, μ= 0.3	4	Analyse
6.	A cylindrical shell 3 m long which is closed at the ends, has an internal diameter of 1m and a wall thickness of 20 mm. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 2.0 N/mm^2 . Take E = 2 X 10^5 N/mm^2 and — 1= 0.3.m	4	Analyse
7.	Determine the maximum hoop stress across the section of a pipe of external diameter 600mm and internal diameter 440mm. when the pipe is subjected to an internal fluid pressure of 50N/mm^2.	5	Evaluate