SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY :: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code : Introduction to Solid Mechanics(18CE0103) **Course & Branch**: B.Tech - CE

Year &Sem: II-B.Tech & I-Sem **Regulation:** R18

UNIT –I

SIMPLE STRESSES AND STRAINS &
COMPOUND STRESSES AND STRAINS

1. **a)** Define: Modulus of rigidity and Modulus of Elasticity [2M]

b) Define: Bulk-modulus and Poisson's Ratio. [2M]

c) What is thermal Stress? [2M]

d) Define principal stresses and principal plane. [2M]

e) What is the radius of Mohr's circle? [2M]

f) What is mean by position of principal planes? [2M]

2. **a)** A rod 150 cm long and of diameter 2 cm is subjected to an axial pull of 20 kN. If the modulus of elasticity of the material of the rod is $2x10^5$ N/ mm^2; determine: the Stress, Strain and Elongation of the rod. [7M]

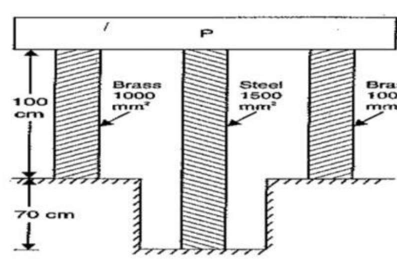
b) Explain about St.Venant's principle [3M]

3. A steel bar 50 mm wide, 12 mm thick and 300 mm long is subjected to an axial pull of 84 kN. Find the changes in the length, width, thickness and the volume of the bar. [10M]

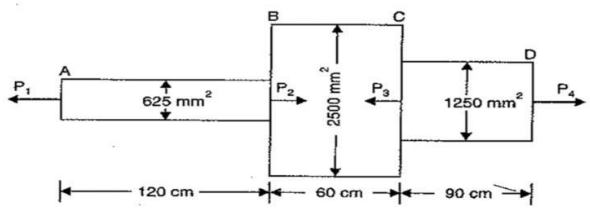
4. Derive the relation between Young's Modulus (E), Rigidity Modulus (G) and Bulk Modulus (K).

[10M]

5. Two brass rods and one steel rod together supports a load as shown in fig. If the stresses in brass and steel are not to exceed 60 N/mm^2 and 120 N/ mm^2, find the safe load that can be supported. Take E for steel = $2x10^5$ N/ mm2 and for brass =$1x10^5$N/ mm2. The cross-sectional area of steel rod is 1500 mm^2 and of each brass rod is 1000 mm^2 [10M]



6. A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in figure. Calculate the force P_2 necessary for equilibrium, if P_1=45 kN, P_3 =450 kN and P_4=130kN. Determine the total elongation of the member, assuming the modulus of elasticity to be 2.1 x 10^5 N/ mm^2 [10M]



7. The modulus of rigidity for a material is 0.51 x 10^5 N/ mm^2. A 10 mm diameter rod of a material was subjected to an axial pull of 10 kN and the changes in diameter was observed to be 3 x 10^{-3} mm. Calculate Poisson's ratio, E and K. [10M]

8. The normal stress in two mutually perpendicular directions are 600N/mm^2 and 300N/mm^2 both tensile. The complimentary shear stresses in these directions are of intensity 450 N/mm^2. Find the normal, tangential stresses on the two planes which are equally inclined to the planes carrying the normal stresses mentioned above. [10M]

9. Direct stresses of 120 N/mm^2 tensile and 90 N/mm^2 compressive exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stress on the planes. The greatest principal stress at a point due to these is 150 N/mm^2. [10M]

i) What must be the magnitude of shearing stresses on the two planes? [5M]

ii) What will be the maximum shearing stress at the point? [5M]

10. At a point in a strained material, the stresses on two planes, at right angles to each other are 20 N/mm^2 and 10 N/mm^2 both tensile. They are also accompanied by shear stress of a magnitude of 10 N/mm^2. Find the location of principal planes and evaluate the principal stresses [10M]

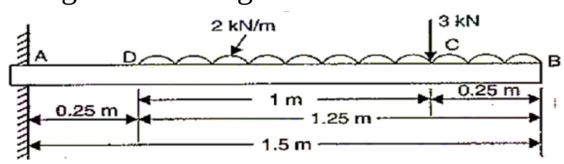
11. An elemental cube is subjected to tensile stresses of 30 N/mm^2 and 10 N/mm^2 acting on two mutually perpendicular planes and a shear stress of 10 N/mm^2 on these planes. Draw the Mohr's circle of stresses and hence or otherwise determine the magnitudes and directions of principal stresses and also the greatest shear stress. [10M]

UNIT –II

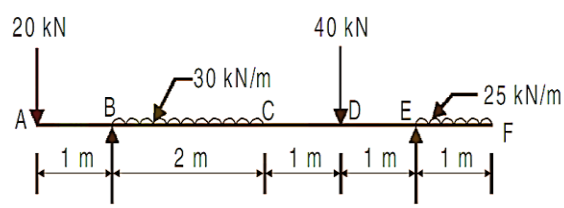
SHEAR FORCE AND BENDING MOMENTS &

THEORY OF SIMPLE BENDING

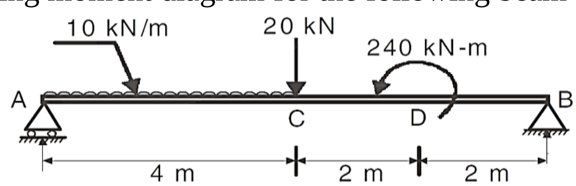
1. **a)** Mention the different types of beams. [2M]
   b) What do you understand by the term point of contra flexure? [2M]
   c) What is maximum bending moment in a simply supported beam of span 'L' subjected to UDL of 'w' over entire span? [2M]
   d) Mention the types of supports. [2M]
   e) Write down the bending stress equation. [2M]
   f) What is meant by Neutral axis of the beam? [2M]
2. Draw shear force and bending moment diagram for cantilever beam subjected to uniformly distributed load. [10M]
3. Draw the shear force and bending moment diagram for the cantilever beam shown in figure [10M]



4. Draw shear force and bending moment diagram for the following beam [10M]

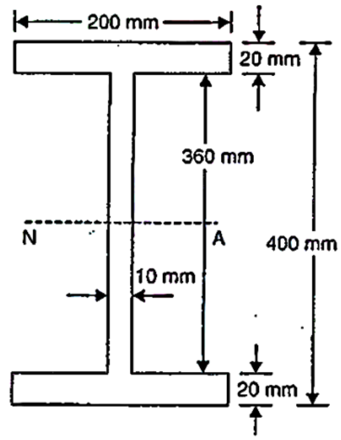


5. Draw shear force and bending moment diagram for the following beam [10M]



6. Draw shear force and bending moment diagram for simply supported beam subjected to Eccentric point load. [10M]
7. Derive the bending equation M/I = f/y = E/R, write all the assumptions made [10M].
8. A cast Iron beam is of T- section has the following dimensions Flange: 100 mm x 20 mm Web: 80 mm x 20 mm. The beam is simply supported on a span of 8 meters and carries a uniformly distributed load of 1.5 KN/m length of entire span. Determine the maximum tensile and compressive stresses. [10M]
9. A rolled steel joist of I section has a dimensions as shown in fig. This beam of I section carries a uniformly distributed load of 40 kN /m run on a span of 10 m, calculate the maximum stress

produced due to bending. [10M]



10. A beam is simply supported and carries a uniformly distributed load of 40KN/m run over the whole span. The section of the beam is rectangular having depth as 500 mm. If the maximum stress in the material of the beam is 120 N/mm^2 and moment of inertia of the section is $7 \times 10^8 mm^4$, find the span of the beam. [10M]

11. A water main of 500 mm internal diameter and 20 mm thick is running full. The water main is of cast iron and is supported at two points 10 m apart. Find the maximum stress in the metal. The cast iron and weigh 72×10^3 N/m^3 and 1×10^4 N/m^3 respectively [10M]

UNIT –III

SHEAR STRESS DISTRIBUTION &

TORSION OF CIRCULAR SHAFTS AND SPRINGS

1. **a)** State the assumptions while deriving the general formula for shear stresses. [2M]

b) What is the ratio of maximum shear stress to the average shear stress in the case of solid circular section? [2M]

c) Where the shear stress is max for Triangular section? [2M]

d) What are the assumptions made in torsion equation? [2M]

e) Write down the expression for power transmitted by a shaft. [2M]

f) State the differences between closed and open coil helical springs. [2M]

2. A rectangular beam 100 mm wide and 250 mm deep is subjected to a maximum shear force of 50 KN. Determine i) Average shear stress ii) Maximum shear stress iii) Shear stress at a distance of 25 mm above neutral axis. [10M]

3. An I-section has 100 mm wide and 12 mm thickness, a web of 120 mm height and 10 mm thickness. The section is subjected to bending moment of 15 KN-m and shear force of 10 KN. Find the maximum bending stress and maximum shear stress and draw shear stress distribution diagram [10M]

4. A simply supported beam carries a uniformly distributed load of intensity 30 N/mm over the entire span of 2 m. The cross section of beam is a T-section having flange 125 x 25 mm and web 175 x 25 mm. Calculate the maximum shear stress for the section subjected to maximum shear force. Also draw the shear stress distribution. [10M]

5. Prove that the maximum shear stress in a circular section of a beam is 4/3 times the average shear stress [10M]

6. The shear force acting on a beam at a section is ‘F’. The section of the beam is triangular base b and of an altitude h. The beam is placed with its base horizontal. Find the maximum shear stress and the shear stress at the neutral axis . [10M]

7. Derive the relation for a circular shaft when subjected to torsion $\frac{T}{J} = \frac{\tau}{R} = \frac{C\theta}{L}$ [10M]

8. A solid shaft of 200 mm diameter has the same cross sectional area as that of a hollow shaft of the same material with inside diameter of 150 mm. Find the ratio of the power transmitted by the hollow shaft by the same speed. [10M]

9. A hollow shaft is to transmit 300kW power at 80 rpm. If the shear stress is not exceed 60 N/mm2 and the internal diameter is 0.6 of the external diameter. Find the external and internal diameters assuming that the maximum torque is 1.4 times the mean. [10M]

10. A solid circular shaft transmits 75 kW power at 200 rpm. Calculate the shaft diameter, if the twist in the shaft is not to exceed 1^0 in 2 m length of shaft, and shear stress is limited to 50 N/mm2. Take C= 1×10^5 N/mm2. [10M]

11. A closely coil 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 200 N. Determine : (i) Deflection of the beam spring (ii) Maximum shear stress in the wire and (iii) Stiffness of the spring. Take C= $8x10^4$ N/mm2. [10M]

UNIT –IV

DEFLECTIONS OF BEAMS

1. **a)** A cantilever is subjected to a point load W at the free end. What is the slope and deflection at the free end? [2M]

   b) 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/m^2. [2M]

   c) State the condition for the use of Macaulay's method. [2M]

   d) Define: Mohr's Theorem for slope and deflection. [2M]

   e) What is the relation between slope, deflection and radius of curvature of a beam? [2M]

   f) What is the maximum deflection in a simply supported beam subjected to uniformly distributed load over the entire span? [2M]

2. Prove that the relation that M=$EI\,\frac{d^2y}{dx^2}$ [10M]
3. Derive the expression for slope and deflection of a simply supported beam carrying a point load at Centre using Moment area method [10M]
4. A beam 6 m long, simply supported at its ends, is carrying a point load of 50 kN at its center. The moment of inertia of the beam is given as equal to 78 x 10^6 mm^4 and. If E for the material of the beam = 2.1 x 10^5 N/mm^2, calculate: (i) deflection at the centre of the beam and (ii) slope at the supports. [10M]
5. A beam of length 6 m is simply supported at its ends and carries a point load of 40 kN at a distance of 4 m from the left support. Find the deflection under the load and maximum deflection. Also calculate the point at which maximum deflection takes place. Given moment of inertia of beam is 7.33 x 10^7 N/mm2 and E = 2 x 10^5 N/mm2. Use Macaulay's method. [10M]
6. A cantilever of length 3m carries a uniformly distributed load over the entire length. If the deflection at the free end is 40 mm, find the slope at the free end. [10M]
7. Derive the expression for slope and deflection of a cantilever beam carrying a point load at the free end by Moment Area method. [10M]
8. A beam of uniform rectangular section 200 mm wide and 300 deep is simply support at its ends. It carries a uniformly distributed load of 9 kN/m run over the entire span of 5 m. If the value of E for the beam material is 1 x 104 N/mm2, find: (i) Slope at the supports and (ii) Maximum deflection. [10M]
9. A simply supported beam carries a UDL of 20 kN/m over its span of 8 m. Determine the slope at the ends and the deflection at mid span by moment area method if E = 200 G N/m^2 and I= 30,000 cm^4. [10M]
10. Derive the expression for slope and deflection of a simply supported beam carrying a uniformly distributed load of w per unit length over the entire length using Macaulay's method [10M]
11. A beam of length 5 m of uniform rectangular section is supported at its ends and carries a uniformly distributed load over the entire length. Calculate the depth of the section if the maximum permissible bending stress is 8 N/mm^2 and central deflection not to exceed 10 mm.

Take E = 1.2 X 10^4 N/ mm2. [10M]

UNIT – V

COLUMNS

1. **a)** Define the terms column and what are the types of columns? [2M]

   b) Define Slenderness Ratio and Buckling. [2M]

   c) What are the different modes of failures of a column? [2M]

   d) What is crippling load? Give the effective length of columns when both ends hinged and when both ends fixed. [2M]

   e) How columns are classified depending upon slenderness ratio? [2M]

2. **a)** What are the assumptions made in Euler's theory? [3M]

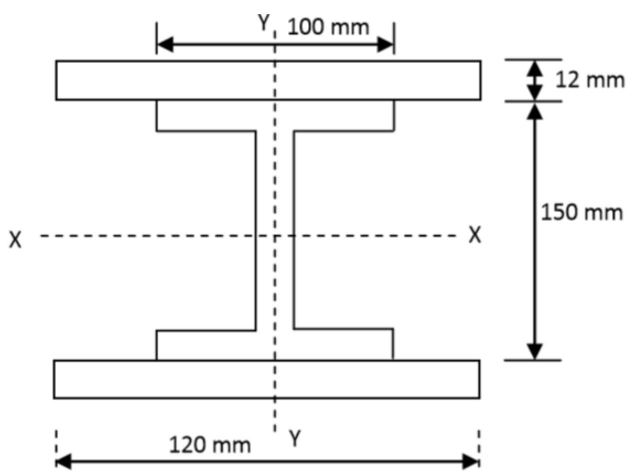
   b) Find the ratio of buckling strength of a solid column to that of a hollow column of the same material and having the same cross –sectional area. The internal diameter of the hollow column is half of its external diameter. Both the columns are hinged and the same length. [7M]

3. Compare the Euler crippling loads of two columns-one of solid circular section and the second of hollow circular section of internal diameter 70% of the external diameter if they are of the same material, same length, same area, and same end conditions. [10M]

4. **a)** Determine the crippling load on a column when both ends of columns are hinged. [5M]

   b) An angular section 240 x 120 x 20 mm is used as 6 m long column with both ends are fixed. What is the crippling load for the column? Take E = 210 GPa [5M]

5. A Built-Up column consisting of 150 mm × 100 mm R.S.J with 20 mm × 12 mm riveted in each plane as shown in figure given below. Calculate the safe load of the column carry of 4 m long having one end fixed and the other hinged with a factor of safety 3.5. Take the properties of the joist: area = 2167 mm2, $I_{XX} = 8.39 \times 10^6$ mm^4, $I_{YY} = 0.945 \times 10^6$ mm^4 and E= 2 x 10^5 N/mm^2 [10M]



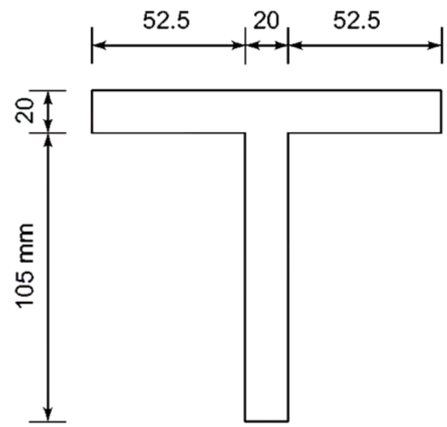
6. A rectangular column of wood, 3 m long, carries a load of 300 kN. Determine whether or not a section of size 200 mm x 150 mm will be able to carry this load if a factor of safety of 3 is to be used, assuming Euler's formula is applicable. E = 12.5 GPa and the permissible stress is 12 MPa. If this section will not be able to carry this load, design a square section to do so. [10M]

7. A built up section has an overall depth of 400 mm, width of flanges 50 mm and web thickness 30 mm. It is used as a beam with simply supported ends and it deflects by 10 mm when subjected to a load of 40 kN/m length. Find the safe load if this I-section is used as a column with both ends hinged. Use Euler's formula. Assume a factor of safety 1.75 and take $E = 2 \times 10^5$ N/mm^2. [10M]

8. Derive an Euler's load expression for the column with one end fixed and the other end hinged.

[10M]

9. Determine the Euler critical load for the column section shown in Fig. if its length is 3 m and (i) if its ends are hinged and (ii) if its ends are fixed. E = 200 GPa. [10M]



10. a) What are the limitations of Euler's theory? [3M]

b) Derive the Euler's equation for the condition both ends are hinged. [7M]

11. Drive the equation for the Euler's crippling load for a both ends are fixed. [10M]

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UNIT –I

SIMPLE STRESSES AND STRAINS & COMPOUND STRESSES AND STRAINS

1) Stress is [ ]

A) External force B) Internal resistive force

C) Axial force D) Radial force

2) Following are the basic types of stress except [ ]

A) Tensile stress B) Compressive stress

C) Shear stress D) volumetric stress

3) When tensile stress is applied axially on a circular rod its [ ]

A) Diameter decreases B) length decreases

C) Volume does not change D) All of the above

4) When compressive stress is applied axially on a circular rod its [ ]

A) Diameter decreases B) length decreases

C) Volume does not change D) All of the above

5) Tensile Strain is [ ]

A) Increase in length / original length B) Decrease in length / original length

C) Change in volume / original volume D) All of the above

6) Compressive Strain is [ ]

A) Increase in length / original length B) Decrease in length / original length

C) Change in volume / original volume D) All of the above

7) Volumetric Strain is [ ]

A) Increase in length / original length B) Decrease in length / original length

C) Change in volume / original volume D) All of the above

8) Hooke's law is applicable within [ ]

A) Elastic limit B) Plastic limit

C) Fracture point D) Ultimate strength

9) Young's Modulus of elasticity is [ ]

A) Tensile stress / Tensile strain B) Shear stress / Shear strain

C) Tensile stress / Shear strain D) Shear stress / Tensile strain

10) Modulus of rigidity is [ ]

A) Tensile stress / Tensile strain B) Shear stress / Shear strain

C) Tensile stress / Shear strain D) Shear stress / Tensile strain

11) Bulk modulus of elasticity is [ ]

A) Tensile stress / Tensile strain B) Shear stress / Shear strain

C) Tensile stress / Shear strain D) Normal stress on each face of cube / Volumetric strain

12) Factor of safety is [ ]

A) Tensile stress / Permissible stress B) Compressive stress / Ultimate stress

C) Ultimate stress / Permissible stress D) Ultimate stress / Shear stress

13) Poisson's ratio is [ ]

A) Lateral strain / Longitudinal strain B) Shear strain / Lateral strain

C) Longitudinal strain / Lateral strain D) Lateral strain / Volumetric strain

14) The total extension in a bar, consists of 3 bars of same material, of varying sections is[ ]

A) P/E(L1/A1+L2/A2+L3/A3) B) P/E(L1A1+L2A2+L3A3)

C) PE(L1/A1+L2/A2+L3/A3) D) PE(L1/A1+L2/A2+L3/A3)

15) The relationship between Young's modulus (E), Bulk modulus (K) and Poisson's ratio (μ) is given by [ ]

A) E=2K(1-2μ) B) E=3K(1-2μ) C) E=2K(1-2μ) D) E=2K(1-3μ)

16) The relationship between Young's modulus (E), Modulus of rigidity (C) and Bulk modulus (K) is given by [ ]

A) E=9CK/(C+3K) B) E=9CK/(2C+3K)

C) E=9CK/(3C+K) D) E=9CK/(C-3K)

17) The total extension of a taper rod of length 'L' and end diameters 'D1' and 'D2', subjected to a load (P), is given of [ ]

A) 4PL/ΠE. D1D2 B) 3PL/ΠE. D1D2

C) 2PL/ΠE. D1D2 D) PL/ΠE.D1D2

18) The deformation per unit length is called [ ]

A) tensile stress B) compressive stress C) shear stress D) strain

19) The maximum energy stored at elastic limit of a material is called [ ]

A) resilience B) proof resilience C) modulus of resilience D) bulk resilience

20) The region in the stress-strain curve extending from origin to proportional limit is called[ ]

A) plastic range B) elastic range C) semi plastic range D) semi elastic range

21) A rigid body has Poisson's ratio equal to _____ [ ]

A) 0 B) 1 C) less than 1 D) greater than one

22) The ratio of stress and strain is known as _____ [ ]

A) Modulus of elasticity B) Young's modulus

C) Both a. and b. D) None of the above

23) The actual breaking stress in stress-strain diagram is the ratio of ______ [ ]

A) load at breaking point and original cross-sectional area

B) load at breaking point and reduced cross-sectional area

C) maximum load and original cross-sectional area

D) yield load and original cross-sectional area

24) A rectangular bar has volume of 1.5 x 106 mm3. What is the change in volume, if stresses in x, y and z direction are 100 Mpa, 150 Mpa and 160 Mpa respectively. (Assume K = 2 x 105 N/mm2 & μ = 0.3) [ ]

A) 1000 mm3 B) 1230 mm3 C) 1500 mm3 D) 2000 mm3

25) Two parallel, equal and opposite forces acting tangentially to the surface of the body is called as [ ]

A) Complementary stress B) Compressive stress

C) Shear stress D) Tensile stress

26) Maximum shear stress is equal to [ ]

A) (σ1 –σ2)/2 B) (σ1 + σ2)/2 C) (σ1 + 2σ2)/2 D) None

27) Maximum total strain energy is equal to [ ]

A) (σ12 +σ22)/2E B) (σ12 +σ22+ 2μ σ1 σ2)/2E C) (σ12 +σ22-2μ σ1 σ2)/2E D) None

28) Maximum strain energy theory is also called as [ ]

A) Energy distortion theory B) Energy principal theoryC) Both A & B D) None

29) Mohr’s circle is a graphical method to find [ ]

A) Bending stresses B) Principal stresses C) Torsional stresses D) None

30) Mohr’s stress circle method is used to analyze a body under [ ]

A) Complex stresses B) Tensile and compressive stresses

C) Axial and longitudinal stresses D) None

31) The ordinate of the Mohr's circle is a [ ]

A) Shear stress B) Normal stress C) Normal as well as shear stressD) None

32) The principal strain due to σ1(tensile) and σ2(Compressive) stress will be [ ]

A) (1/E)(σ1 + σ2) B) (1/E)(σ1 +μ σ2) C) (1/E)(σ1 -μ σ2) D) None

33) The principal strain due to σ1 (compressive) and σ2 (tensile) stress will be [ ]

A) (1/E)(-σ1 + σ2) B) (1/E)(-σ1 +μ σ2) C) (1/E)(- σ1 -μ σ2) D) None

34) The angle between normal stress and tangential stress is known as angle of ______[ ]

A) Declination B) orientation C) obliquity D) rotation

35) Principal stress is the magnitude of ________ stress acting on the principal plane.[ ]

A) Normal stress B) Shear stressC) Both a. and b D) None of the above

36) Which of the following stresses can be determined using Mohr's circle method? [ ]

A) Torsional stress B) Bending stress C) Principal stress D) All of the above

37) In Mohr's circle method, compressive direct stress is represented on ____ [ ]

A) positive x-axis B) positive y-axis C) negative x-axis D) negative y-axis

38) What is the value of shear stress acting on a plane of circular bar which is subjected to axial tensile load of 100 kN? (Diameter of bar = 40 mm , θ = 42.3^0) [ ]

A) 58.73 Mpa B) 40.23 Mpa C) 39.60 Mpa D) None of the above

39)The maximum tangential stress σt = (σx sin 2θ)/2 is maximum if, θ is equal to ______[ ]

A) 45^0 B) 90^0 C) 270^0 D) all of the above

40) Mohr' s circle is a graphical method to find

A) Bending stresses B) Bucking stresses C) Torsional shear stressesD) None

UNIT –II

SHEAR FORCE AND BENDING MOMENTS & THEORY OF SIMPLE BENDING

1) The point of contraflexture occurs in [ ]
A) Cantilever beams only B) Continuous beams only
C) Over hanging beams only D) All types of beams

2) Bending moment is a function of [ ]
A)Linear between two point loads B) Non-linear between two point loads
C) Uniformly distributed loading D) Always non linear

3) The point of contra flexure points that occur in a fixed end beam and subjected to concentrated load is [ ]
A) 0 B) 2 C)1 D) 3

4) If the load at the free end of a cantilever is increased the failure will occur [ ]
A) At the free end B) At the support C) At the centreD) Between free end and centere

5) Point of contra flexure is where [ ]
A) Shear force is zero B) Shear force is maximum
C) Bending moment changes sign D) None

6) The number of reaction components possible at a hinge end for a general loading [ ]
A) 2 B) 1 C) 0 D) 3

7) A cantilever beam curved in plan and subjected to lateral loads will develop at any section[ ]
A) Bending moment and shear force B) Bending moment and twisting moment
C) Twisting moment and shear force D) Bending moment twisting momentand shear force

8) Two people weighing W each are sitting on a plank of length L floating on waterat L/4 from either end. Neglecting the weight of the plank, the bending momentat the centre of the plank is
A) WL/8 B) WL /16 C) WL /32 D) Zero [ ]

9) A unique relation between bending moment (M) and intensity of load (w) acting continuously on a beam of span (L) at a distance (x) along the axis is given by [ ]
A) $M = wL^2/8$ B) $w = d^2M/dx^2$ C) $M = EI\, d^2M/dx^2$ D) $M = wL^2/12$

10) A uniform beam of span 'l' is simply supported at both supports. It carries a uniformly distributed load w per unit length. The bending moment at mid span is [ ]
A) $wL^2/8$ B) $wL^2/12$ C) $wL^2/16$ D) $wL^2/24$

11) If the shear force diagram of a simply supported beam is parabolic, then the load on the beam is
A) Uniformly distributed load B) Concentrated load
C) Couple D) Linearly varying distributed load [ ]

12) If the point load at free end on a cantilever is increased so as to cause raptur, same will occur
A) Below the load B) At fixed end
C) At centre D) Between centre and free end [ ]

13) The bending moment on a section is maximum where shearing force is [ ]
A) Maximum B) Minimum C) Zero D) Constant

14) The bending moment on a cantilever beam carrying concentrated load at the end is[ ]
A) Rectangle B) Parabola C) Triangle D) Elliptical

15) Shear force is associated with [ ]
A) Bending Moment B) Torsional moment C) Normal thrust D) Axial thrust

16) The bending moment at the fixed end of a cantilever beam is [ ]
A) Maximum B) Minimum C) WL/2 D) WL

17) The bending moment diagram for a cantilever with point load, at the free end will be[ ]
A) A triangle with max. height under free endB) A triangle with max. height under fixed end
C) A parabolic curve D) none of these

18) At the point of contra flexure [ ]
A) B.M is minimum B) B.M is maximum
C) B.M is either zero or changes sign D) None of these

19) Bending moment at supports in case of simply supported beam is always [ ]
A) Zero B) Positive C) Negative D) Depends upon loading

20) The rate of change of bending moment is equal to [ ]
A) Shear force B) Slope C) Deflection D) None of these

21) The variation of the bending moment in the portion of a beam carrying linearly varying load is
[ ]
A)Linear B)Parabolic C)Cubic D)Constant

22) A portion of beam between two sections is said to be in pure bending when the section is subjected to [ ]
A) constant bending moment and zero S.F. B) constant shear force and zero bending moment
C) constant bending moment and constant S.F.D) None of the above

23) Of the several prismatic beams of equal length the strongest in flexure is the one having maximum [ ]
A) moment of inertia B) section modulus C) tensile strength D) area of c/s

24) A beam of uniform strength has at every section same [ ]
A) bending moment B) bending stress C) deflection D) stiffness

25) A wooden beam of length 4 m and weighing 4 kN/m is floating in water. The maximum B.M. at mid span [ ]

A) 8 kN-m B) 16 kN-m C) Zero D) 32 kN-m

26) The curvature of the beam is equal to [ ]

A) $\frac{EI}{M}$ B) $\frac{ME}{I}$ C) $\frac{M}{EI}$ D) $\frac{MI}{E}$

27) A steel plate is bent into a circular arc of radius 10 m. If the plate section be 120 mm wide and 20 mm thick, then the maximum bending stress is equal to (Take E = 2 x 10^5 N/mm^2)[ ]

A) 100 N/mm^2 B) 120 N/mm^2 C) 150 N/mm^2 D) 200 N/mm^2

28) The ratio of moment of inertia about the neutral axis to the distance of the most distance point of the section from the neutral axis is called [ ]

A) Moment of inertia B) section modulus

C) polar moment of inertia D) modulus of rigidity

29) The relation between maximum stress (σ) offered by a section, moment of resistance (M) and section modulus (Z) is given by [ ]

A) $M = \frac{\sigma}{Z}$ B) $M = \frac{Z}{\sigma}$ C) $M = \sigma \times Z$ D) $M = \frac{1}{\sigma \times Z}$

30) Choose the correct statement [ ]

A) Section modulus of a hollow circular section of external diameter D and internal diameter d is equal to $\frac{\pi(D^4-d^4)}{64D}$ B) Section modulus of a circular section of diameter D is $\frac{\pi D^4}{32}$

C) Section modulus of a rectangular section is $\frac{bd^2}{6}$ D) none of the above

31) A beam of uniform strength can be designed by [ ]

A) varying the depth of the beam but maintaining constant width

B) varying the width of the beam but maintaining constant depth

C) varying width and depth D) any one of the above

32) Fliched beam means a [ ]

A) continuous beam B) fixed beam

C) beam of composite section consisting of a wooden beam strengthened by mild steel plates

D) none of the above

33) A short column of rectangular section carries a point load (W) acting with an eccentricity (e). The shape of Kernel area would be [ ]

A) square B) rectangle C) circle D) rhombus

34) Which one of the correct assumption of the theory of simple bending [ ]

A) The value of “Young’s Modulus” is same in tension & compression

B) Transverse section of the beam remains plane before of the bending

C) The material of the beam is homogeneous D) All of the above

35) A rectangular beam of cross section 50 mm x 100 mm subjected to bending stress of 20 N/mm^2. Then the moment of resistance of the section is given by [ ]

A) 1666.67 kN-m B) 1666.67 N-mm C) 1666.67 N-m D) 1.67 N-m

36) A circular section of a beam having dia 200 mm. Then the section modulus is given by[ ]

A) 785.398 cm^3 B) 785.3 mm^3 C) 785 m^3 D) none

37) Section modulus of a beam is maximum at [ ]

A) where the M.I. of a section is minimum B) where the M.I. of a section is maximum

C) where the 'y' is maximum D) none of the above

38) Units for section modulus of a beam is [ ]

A) mm^2 B) N/mm^2 C) mm^3 D) mm^4

39) Section modulus for a hollow rectangular section of outside dimensions is B, D and inside dimensions are b, d. Then the section modulus is given by [ ]

A) $\frac{BD^3-bd^3}{32D}$ B) $\frac{BD^3-bd^3}{16D}$ C) $\frac{BD^3-bd^3}{6D}$ D) $\frac{BD^3-bd^3}{12D}$

40) When a rectangular beam is loaded transverse the max. compressive stress develops on [ ]

A) bottomfibre B) top fibre C) neutral axis D) None

UNIT –III

SHEAR STRESS DISTRIBUTION &

TORSION OF CIRCULAR SHAFTS AND SPRINGS

1. The shear stress in a beam is zero [ ]
   (A) at the centroid of the section (B) on the extreme free surfacefibres
   (C) at the neutral axis but not at the centroid (D) at the free edges
2. The shear stress on a beam section is maximum [ ]
   (A) at the centroid of the section (B) on the extreme free surface fibres
   (C) at the neutral axis but not at the centroid (D) at the free edges
3. The ratio of the maximum shear stress to the average shear stress of a rectangular section is
   (A) 2 (B) 1.5 (C) 1.75 (D) None [ ]
4. The shear stress distribution across a rectangle beam section [ ]
   (A) linear (B) cubic parabola (C) parabolic (D) hyperbolic
5. The ratio of average shear stress to maximum shear stress for a circular section is [ ]
   (A) 2 (B) 3/2 (C) 4/3 (D) 3/4
6. A beam of triangular cross-section of base ‘b’ and height ‘h’ subjected to a shear force ‘F’. The shear stress will be maximum at a distance from the bottom equal to [ ]
   (A) h/3 (B) 2h/3 (C) h/2 (D) 3h/4
7. A beam of triangular cross-section of base ‘b’ and height ‘h’ subjected to a shear force ‘F’. The maximum shear stress will be [ ]
   (A) $\frac{F}{bh}$ (B) $\frac{2F}{bh}$ (C) $\frac{3F}{bh}$ (D) $\frac{4F}{bh}$
8. A beam of triangular cross-section of base ‘b’ and height ‘h’ subjected to a shear force ‘F’. The shear stress at the neutral axis is [ ]
   (A) $\frac{8F}{3bh}$ (B) $\frac{2F}{bh}$ (C) $\frac{3F}{4bh}$ (D) $\frac{4F}{3bh}$
9. A beam of triangular cross-section of base ‘b’ and height ‘h’ subjected to a shear force ‘F’. The ratio of maximum shear stress to the shear stress at the neutral axis is [ ]
   (A) 7/5 (B) 9/5 (C) 11/8 (D) 9/8
10. The variations of shear stress in web & flange of an I-section are [ ]
    (A) linear and parabolic (B) parabolic and linear
    (C) parabolic and parabolic (D) linear andlinear
11. When a beam is subjected to bending, the most economical section for equal stress is[ ]
    (A) circular (B) square (C) rectangular (D) hollow circular
12. . A solid shaft of diameter D transmits the torque equal to [ ]

(A) $\frac{\pi}{32}\tau D^3$ (B) $\frac{\pi}{64}\tau D^3$ (C) $\frac{\pi}{16}\tau D^3$ (D) $\frac{\pi}{8}\tau D^3$

13. The torque transmitted by a hallow shaft of external diameter (D) and internal diameter (d) is equal to [ ]

    (A) $\frac{\pi}{32}\tau[D^3-d^3]$ (B) $\frac{\pi}{64}\tau[D^3-d^3]$ (C) $\frac{\pi}{16D}\tau[D^4-d^4]$ (D) $\frac{\pi}{8D}\tau[D^4-d^4]$

14. Polar moment of inertia of a hallow circular shaft is [ ]

    (A) $\frac{\pi}{32}[D^3-d^3]$ (B) $\frac{\pi}{32}[D^4-d^4]$ (C) $\frac{\pi}{64}[D^3-d^3]$ (D) $\frac{\pi}{64}[D^4-d^4]$

15. The torsional rigidity of a shaft is defined as the torque required to produce [ ]

    (A) Maximum twist in shaft (B) Maximum shear stress in shaft
    (C) Minimum twist in shaft (D) A twist of one radian per unit length of shaft

16. Polar modulus of shaft is [ ]

    (A) J*R (B) J/R (C) R/J (D) 1/J

17. For two shafts in parallel or for two concentric shafts [ ]

    (A) T = T1 + T2 (B) T = T1 = T2 (C) T = T1 – T2 (D) T = (T1.T2)^1/2

18. A carriage spring is designed on the basis of [ ]

    (A) Shear (B) Compression (C) Bending (D) None

19. A closed helical spring under axial load is designed on the basis of [ ]

    (A) Shear (B) Compression (C) Bending (D) None

20. A closed helical spring under axial torque is designed on the basis of [ ]

    (A) Shear (B) Compression (C) Bending (D) None

21. An open helical spring under axial torque is designed on the basis of [ ]

    (A) Shear B) Compression C) Bending D) None

22. Spring index is [ ]

    (A) D – d (B) D/d (C) D2 –d2 (D) None

23. A power transmitting ductile material shaft under P, T and M will be designed on the basis of [ ]

    (A) Rankine theory (B) Guest Theory (C) Haigh theory (D) None

24. 13) Two shafts having same length and material are joined in series and subjected to a torque of 10KN-m. If the ratio of their diameters is 2:1, then the ratio of their angles of twist is[ ]

    (A) 16:1 (B) 2:1 (C) 1:2 (D) 1:16

25. A solid circular shaft of diameter D is subjected to a twisting moment T. The maximum shear stress in the shaft is proportional to [ ]

    (A) D^2 (B) D (C) $1/D^2$ (D) $1/D^3$

26. The maximum shear stress produced in a shaft is $5N/mm^2$. The shaft is 40mm dia, and then twisting moment is [ ]

    (A) 628 N-m (B) 63 N-m (C) 126 N-m (D) 251 N-m

27. If a shaft rotates at 100rpm and is subjected to a torque of 3000 N-m, the power transmitted in KW would be [ ]
(A) 30Π (B) 15Π (C) 20Π (D) 10Π

28. Leaf springs are used in [ ]
(A) Scooters (B) Bikes (C) Trucks (D) None

29. Angle of helix in a close coiled spring is [ ]
(A) < 100 (B) >100 (C) =100 (D) None

30. Shear stress in a close coiled helical spring is [ ]
(A) $16WD/\pi d^3$ (B) $32WD/\pi d^3$ (C) $8WD/\pi d^3$ (D) $18WD/\pi d^3$

31. Strain energy in a close coiled helical spring is [ ]
(A) $\tau^2/4G$ (B) $\tau^2/16G$ (C) $\tau^2/8G$ (D) $\tau^2/18G$

32. Spring is an [ ]
(A) Elastic device (B) Plastic device (C) Elastic as well as plastic device (D) None

33. If depth of a beam is doubled then changes in its section modulus [ ]
(A) Will remain same (B) Will decrease (C)Will be doubled (D) Will increase by 4 times

34. Centroid of a section is [ ]
(A) About which ∫y^2dA =0 (B) About which ∫ydA=0
(C) About which ∫xydA=0 (D) About which ∫x^2y^2dA=0

35. Variation of shear stress in a beam has [ ]
(A) Parabolic variation (B) Linear variation
(C) Cubical variation (D) None

36. A beam is designed on the basis of [ ]
(A) Shear force (B) Bending moment
(C) Shear force as well as bending moment (D) None

37. Bending stress will be least at the extreme fibers for [ ]
(A) Maximum area of cross section (B) Maximum moment of inertia
(C) Maximum section modulus (D) None

38. Moment of resistance of a beam should be [ ]
(A) Greater than the bending moment (B) Less than the bending moment
(C) Two times the bending moment (D) None

39. Variation of bending strain in a beam has [ ]
(A) Parabolic variation (B) Linear variation
(C) Cubical variation (D) None

40. Variation of shear stress in a beam has [ ]
(A) Parabolic variation (B) Linear variation (C) Cubical variation (D) None

UNIT –IV

DEFLECTIONS OF BEAMS

1. Which of the following equations is correct [ ]

   (A) $\frac{1}{R} = \frac{d^2y}{dx^2} = \frac{EI}{M}$ (B) $\frac{1}{R} = \frac{d^2y}{dx^2} = \frac{M}{EI}$ (C) $R = \frac{d^2y}{dx^2} = \frac{M}{EI}$ (D) $R = \frac{d^2y}{dx^2} = \frac{EI}{M}$

2. The expression EI $\frac{d^2y}{dx^2}$at a section of a member represents [ ]

   (A) shear force (B) rate of loading (C) bending moment (D) slope

3. The expression EI $\frac{d^3y}{dx^3}$at a section of a member represents [ ]

   (A) shear force (B) rate of loading (C) bending moment (D) slope

4. The expression EI $\frac{d^4y}{dx^4}$at a section of a member represents [ ]

   (A) shear force (B) rate of loading (C) bending moment (D) slope

5. A cantilever of length (L) carries a point load (W) at the free end. The downward deflection at the free end is equal to [ ]

   (A) $\frac{WL^3}{8EI}$ (B) $\frac{WL^3}{3EI}$ (C) $\frac{5WL^3}{384EI}$ (D) $\frac{WL^3}{48EI}$

6. A cantilever of length (L) carries a point load (W) at the free end. The slope at the free end will be [ ]

   (A) $\frac{WL^2}{6EI}$ (B) $\frac{WL^2}{2EI}$ (C) $\frac{WL^2}{24EI}$ (D) $\frac{WL^2}{16EI}$

7. A cantilever of length (L) carries audl w per unit length over the whole length. The downward deflection at the free end will be [ ]

   (A) $\frac{wL^4}{8EI}$ (B) $\frac{wL^4}{3EI}$ (C) $\frac{5wL^4}{384EI}$ (D) $\frac{wL^4}{48EI}$

8. A cantilever of length (L) carries audl w per unit length over the whole length. The slope at the free end will be [ ]

   (A) $\frac{wL^3}{6EI}$ (B) $\frac{wL^3}{2EI}$ (C) $\frac{wL^3}{24EI}$ (D) $\frac{wL^3}{16EI}$

9. A uniform simply supported beam of span (L) carries a point load (W) at the centre. The downward deflection at the centre will be [ ]

(A) $\frac{WL^3}{8EI}$ (B) $\frac{WL^3}{3EI}$ (C) $\frac{5WL^3}{384EI}$ (D) $\frac{WL^3}{48EI}$

10. A uniform simply supported beam of span (L) carries a point load (W) at the centre. The slope at the support will be [ ]

(A) $\frac{WL^2}{6EI}$ (B) $\frac{WL^2}{2EI}$ (C) $\frac{WL^2}{24EI}$ (D) $\frac{WL^2}{16EI}$

11. A uniform simply supported beam of span (L) carries a uniformly distributed load w per unit length over the whole span. The downward deflection at the centre will be [ ]

(A) $\frac{wL^4}{8EI}$ (B) $\frac{wL^4}{3EI}$ (C) $\frac{5wL^4}{384EI}$ (D) $\frac{wL^4}{48EI}$

12. A simply supported beam is of rectangular section. It carries a udl over the whole span. The deflection at the Centre is y. If the depth of the beam is doubled, then the deflection at the centre would be [ ]

(A) 2y (B) 4y (C) y/2 (D) y/8

13. A simply supported beam carries a udl over the whole span. The deflection at the centre is y. If the distributed load per unit length is doubled and also depth of the beam is doubled, then the deflection at the centre would be [ ]

(A) 2y (B) 4y (C) y/4 (D) y/8

14. Maximum deflection of a cantilever due to pure bending moments 'M' at its free end is [ ]

(A) $\frac{ML^2}{3EI}$ (B) $\frac{ML^2}{4EI}$ (C) $\frac{ML^2}{6EI}$ (D) $\frac{ML^2}{2EI}$

15. A simply supported beam of span 'L' metres is subjected to a point load at the mid span. If 'θ' is the slope at the support, the maximum deflection is equal to [ ]

(A) θ/3 (B) L/3θ (C) 3L/θ (D) θL/3

16. A simply supported beam carries uniformly distributed load of 20 kN/m over the length of 5 m. If flexural rigidity is 30000 kN-m^2, what is the maximum deflection in the beam? [ ]

(A) 5.4 mm (B) 1.08 mm (C) 6.2 mm (D) 8.6 mm

17. In cantilever beam, slope and deflection at free end is _____ [ ]

(A) zero (B) maximum (C) minimum (D) none of the above

18. Which of the following statements is/are true for a simply supported beam? [ ]

(A) Deflection at supports in a simply supported beam is maximum

(B) Deflection is maximum at a point where slope is zero

(C) Slope is minimum at supports in a simply supported beam

(D) All of the above

19. The vertical distance between the axis of the beam before and after loading at a point is called as [ ]

(A) deformation (B) slope (C) deflection (D) none of the above

20. Difference in slopes between two points A and B by the moment area method is given by

(A) Area of BMD between A and B/2EI (B) Area of BMD between A and B/3EI

(C) Area of BMD between A and B/EI (D) None [ ]

21. According to Mohr's theorem the deflection of the beam is given by 'y' and is equal to (where 'A' is area of B.M.D.) [ ]

(A) $\frac{A}{EI}$ (B) $\frac{M}{EI}$ (C) $\frac{M\bar{x}}{EI}$ (D) $\frac{A\bar{x}}{EI}$

22. According to Mohr's theorem the slope of the beam is given by 'θ' and is equal to (where 'A' is area of B.M.D.) [ ]

(A) $\frac{A}{EI}$ (B) $\frac{M}{EI}$ (C) $\frac{M\bar{x}}{EI}$ (D) $\frac{A\bar{x}}{EI}$

23. In the strain energy method of slope and deflection, load is applied [ ]

(A) gradually (B) suddenly (C) with an impact (D) none

24. Macaulay's method is more convenient for beams carrying [ ]

(A) single concentrated load (B) multi-loads (C) UDL (D) none

25. Maximum deflection in a S.S. beam with UDL 'w' over the entire span will be [ ]

(A) at the left hand support (B) at the Right support (C) at the center (D) none

26. __ of a beam is a measure of its resistance against deflection [ ]

(A) Strength (B) Stiffness (C) Slope (D) Maximum bending

27. 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

28. Elastic line is also called as _______ [ ]

(A) Deflection curve (B) Plastic curve (C) Linear curve (D) Hooke's curve

29. In simply supported beams, the slope is ____at supports [ ]

(A) Minimum (B) Zero (C) Maximum (D) Uniform

30. In simply supported beam deflection is maximum at _____ [ ]

(A) Midspan (B) Supports (C) Point of loading (D) Through out

31. Calculate the maximum deflection of a simply supported beam if the maximum slope at A is 0.0075 radians and the distance of centre of gravity of bending moment diagram to support A is 1.33 metres [ ]
(A) 9.975 mm (B) 9.5 mm (C) 9.25 mm (D) 9.785 mm
32. A simply supported beam of span as shown in the figure is subjected to a concentrated load w at its metre span and also to a uniformly distributed load equality w what is the total diffraction it its midpoint. [ ]
(A) 18 Wl^3 /384 EI (B) 13 Wl^3 /384 EI (C) 5 Wl^3 /384 EI (D) 8 Wl^3 /384 EI
33. Deflection under the load in a S.S.Beam with 'W' not at the center will be [ ]
(A) 4Wa2b2/3EIL (B) 2Wa2b2/3EIL (C) Wa2b2/3EIL (D) None
34. Difference in slopes between two points A and B by the moment area method is given by
(A) Area of BMD between A and B/2EI (B) Area of BMD between A and B/3EI
(C) Area of BMD between A and B/EI (D) None [ ]
35. Difference in deflections between two points A and B by the moment area method is given by
(A) (Area of BMD between A and B) . XB/2EI(B) (Area of BMD between A and B) . XB /3EI
(C) (Area of BMD between A and B) . XB /EI (D) None [ ]
36. Difference in slopes between two points A and B by the moment area method is given by
(A) Area of BMD between A and B/2EI (B) Area of BMD between A and B/3EI
(C) Area of BMD between A and B/EI (D) None [ ]
37. Which one method is the best for finding slope and deflection [ ]
(A) Double integration method (B) Macaulay 's method
(C) Strain energy method (D) None
38. Slope at a point in a beam is the [ ]
(A) Vertical displacement(B) Angular displacement (C) Horizontal displacement (D) None
39. Deflection at a point in a beam is the [ ]
(A) Vertical displacement (B) Angular displacement
(C) Horizontal displacement (D) None
40. Maximum slope in a cantilever beam with a moment M at the free end will be [ ]
(A) 3ML/EI (B) 2ML/EI (C) ML/EI (D) None

UNIT – V

COLUMNS

1. The length of a column, having a uniform circular cross-section of 7.5 cm diameter and whose ends are hinged, is 5 m. If the value of *E* for the material is 2100 tonnes/cm^2, the permissible maximum crippling load will be [ ]
   (A) 1.288 tonnes (B) 12.88 (C) 128.8 tonnes (D) 288.0
2. Stress in a beam due to simple bending, is [ ]
   (A) directly proportional (B) inversely proportional (C) curvilinearly related (D) none of these.
3. __________ is a vertical member subjected to direct compressive force. [ ]
   (A) Strut (B) Beam (C) column (D) post
4. The inclined member carrying compressive loads is __________ [ ]
   (A) Strut (B) Beam (C) column (D) post
5. The load at which a vertical compression member just buckles is known as [ ]
   (A) Critical load (B) Crippling load (C) Buckling load (D) Any one of these
6. A column that fails due to direct stress is called [ ]
   (A) Short column (B) Long column (C) Medium column (D) Slender column
7. A column whose slenderness ratio is greater than 120 is known as [ ]
   (A) short column (B) Long column (C) Medium column (D) Composite column
8. The direct stress included in a long column is…as compared to bending stress. [ ]
   (A) More (B) Less (C) Same (D) Negligible
9. 9. For long columns, the value of buckling load is……………..crushing load. [ ]
   (A) Less than (B) More than (C) Equal to (D) None of these
10. The slenderness ratio is the ratio of [ ]
    (A) Length of column to least radius of gyration
    (B) Moment of inertia to area of cross-section
    (C) Area of cross-section to moment of inertia
    (D) Least radius of gyration to length of the column
11. The Rankine formula holds good for [ ]
    (A) Short column (B) Long column
    (C) Medium column (D) Both short and long column

12. A column of length 4m with both ends fixed may be considered as equivalent to a column of length …………with both ends hinged [ ]

(A) 2 m (B) 1 m (C) 3 m (D) 6 m

13. According to Euler, the buckling load for a column is given by $P= \pi^2 EI/l^2$ in this equation, the value of x for a column with one end fixed and other end free is [ ]

(A) 1 (B) 2 (C) 4 (D) ½

14. Rankine's formula is generally used when slenderness ratio lies in between [ ]

(A) 0-60 (B) 0-80 (C) 0-100 (D) Any value

15. Euler's formula is not valid for mild steel column when slenderness ratio is [ ]

(A) More than 100 (B) Less than 100 (C) Less than 80 (D)More than 80

16. An electric pole is 6.5 m high from the ground level. Its effective length for design purposes will be [ ]

(A) 6.5 m (B) 3.25 m (C) 13.0 m (D) 12.0 m

17. Rankine-Gordon's empirical formula is applicable for _____ [ ]

(A) long column (B) short column (C) both A and B (D) none of the above

18. What is the value of Rankine's constant for cast iron? [ ]

(A) 1 / 750 (B) 1 / 1600 (C) 1 / 7500 (D) 1 / 9000

19. The ratio of effective length and least lateral dimension for short column is _______ [ ]

(A) > 12 (B) b < 12 (C) ≥ 12 (D) none of the above

20. In Euler's theory, long columns having the ratio of $(L_e /LLD) \geq 12$ fail due to ____ [ ]

(A) Crushing (B) buckling (C) both a. and b (D) none of the above

21. Euler's formula is applicable only __________ [ ]

1. for short columns 2. for long columns 3. if slenderness ratio is greater than $\sqrt{(\pi^2 E / \sigma_c)}$
4. if crushing stress < buckling stress 5. if crushing stress ≥ buckling stress

(A) 1, 2 and 3 (B) 2, 3 and 5 (C)3 and 4 (D) all of the above

22. Slenderness ratio is the ratio of effective length of column and ______ [ ]

(A) lateral dimension of a column (B) least radius of gyration of a column
(C) maximum radius of gyration of a column (D) none of the above

23. What is the relation between actual length and effective length while determining crippling load for a hollow rectangular cast iron column having both ends fixed? [ ]
(where L= actual length and L_e =effective length)

(A) $L_e = L$ (B) $L_e = L/2$ (C) $L_e = 2L$ (D) $L_e = 4L$

24. While determining crippling load, the effective length of solid circular bar is 1/ √2 of actual length if, _______ [ ]

(A) both ends of solid circular bar are fixed (B) both ends of solid circular bar are hinged
(C)one end is fixed and one is free (D) one end is fixed and other end is hinged

25. What is the safe load acting on a long column of 2 m having diameter of 40 mm. The column is fixed at both the ends and modulus of elasticity is 2 x 10^5 N/mm^2? (F.O.S = 2) [ ]

(A) 120 Kn (B) 124 kN (C) 130 Kn (D) 150 kN

26. If the effective length of a column is twice the actual length, then the column is _____[ ]

(A) fixed at both the ends (B) hinged at both the ends

(C) fixed at one end and free at the other end (D) fixed at one end and hinged at the other end

27. Bucking of column means [ ]

(A) Lateral deflection (B) Axial deflection (C) Torsional deflection (D) None of the above

28. . Slenderness ratio is [l= length of column and k= least radius of gyration of cross section about its axis] [ ]

(A) l/k (B) l/k (C) l/2k (D) k/2l

29. Columns with what slenderness ratio are not designed with respect to buckling but are designed for compressive stresses. [ ]

(A) >1 (B) <1 (C) >30 (D) <30

30. If slenderness ratio=45, which mode of failure will dominate? [ ]

(A) Buckling (B) Compressive Stresses

(C) Both buckling and compressive stress (D) Can't be stated

31. Short column and long column are classified on the basis of [ ]
    (A) Slenderness ratio (B) Diameter (C) Length (D) None of the above

32. Cast iron column with a slenderness ratio of 75 are [ ]
    (A) Short Columns (B) Long Columns (C) Very short columns (D) None of the above

33. Pure Buckling uses the equation of [ ]
    (A) Rankin-Gordon (B) Euler (C) Stiffness (D) None

34. A steel column is a short column when the slenderness ratio is [ ]
    (A) >120 (B) <30 (C) >30 (D) None
35. A steel column is a long column when the slenderness ratio is [ ]
    (A) >120 (B) <30 (C) >30 (D) None
36. A steel column is a medium column when the slenderness ratio is [ ]
    (A) >120 (B) <30 (C) >30 (D) None
37. With identical beam and column, buckling occurs as compared to bending under a [ ]
    (A) Lesser load (B) Larger load (C) Equal load (D) None
38. Nature of stresses produced in buckling and bending are [ ]
    (A) Same (B) Different (C) Only tensile (D) None
39. Keeping loading same but increasing the length, normal stresses in a beam will [ ]
    (A) Increase (B) Decrease (C) No change (D) None
40. Keeping loading same but increasing the length, shear stresses in a beam will [ ]
    (A) Increase (B) Decrease (C) No change (D) None

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