SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : Strength of Materials-I (16CE103) **Course & Branch**: B.Tech - CE

Year & Sem: II-B.Tech & I-Sem **Regulation:** R16

UNIT –I

SIMPLE STRESSES AND STRAINS & STRAIN ENERGY

1. a) A rod 150 cm long and of diameter 2.0 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. [6M]

   b) Define Poisson's ratio and Factor of safety. [4M]

2. a) Fid the Young's Modulus of a brass rod of diameter 25 mm ad of length 300 mm subjected to a tensile load of 60 kN when the extension of the rod is equal to 0.2 m. [7M]

   b) Write the classification of stresses. [3M]

3. The following data refer to a mild steel specimen tested in a laboratory:

   (i) Diameter of the specimen = 25 mm

   (ii) Length of specimen = 300 mm

   (iii) Extension under a load of 15 kN = 0.045 mm

   (iv) Load at yield point = 127.65 kN

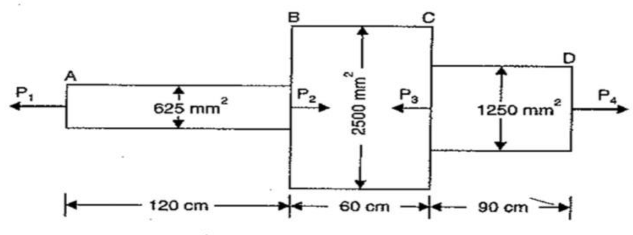
   (v) Maximum load = 208.6 kN

   (vi) Length of specimen after failure= 375 mm

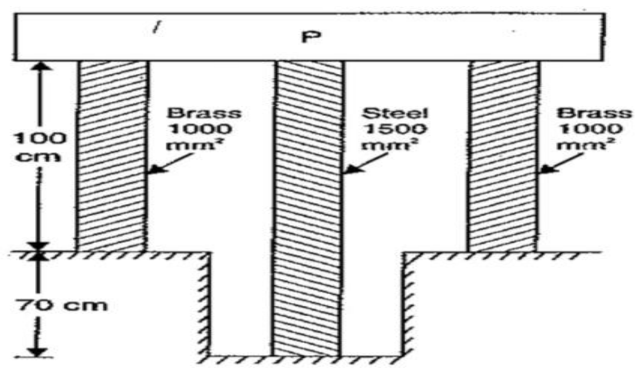
   (vii) Neck diameter = 17.75 mm

   Determine (a) Young's modulus (b) Yield stress (c) Ultimate stress (d) Percentage of elongation (e) Percentage in reduction area. [2M+2M+2M+2M+2M]

4. 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]



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/ mm^2 and for brass =1x10^5 N/ mm^2. The cross-sectional area of steel rod is 1500 mm^2 and of each brass rod is 1000 mm^2. [10M]



6. 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]
7. Derive the relation between Young's Modulus (E), Rigidity Modulus (G) and Bulk Modulus (K). [10M]
8. A rectangular block 250 mm x 100 mm x 80 mm is subjected to axial load as follows:
   480kN tensile in the direction of its length, 1000 kN compressive on the 250 mm x 100 mm faces and 900 kN tensile on 250 mm x 80 mm. Assuming Poisson's ratio as 0.25, find in terms of modulus of elasticity of the material E, the strain in the direction of force. If E = 2 x 10^5 N/ mm^2, find the values of the modulus of rigidity and bulk modulus for the material of the block. Also calculate the change in volume of the block. [10M]
9. A tension bar 5 m long is made up of two parts, 3m of its length has a cross-sectional area 10 cm^2 while the remaining 2 m has a cross-sectional area of 20 cm^2. An axial load of 80 kN is gradually applied. Find the total strain energy produced in the bar and compare this value with that obtained in a uniform bar of the same length and having the same volume when under the same load. Take E= 2 x 10^5 N/ mm^2. [10M]

10. The modulus of rigidity for a material is 0.51×10^5 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 3×10^{-3} mm. Calculate Poisson's ratio, E and K. [10M]

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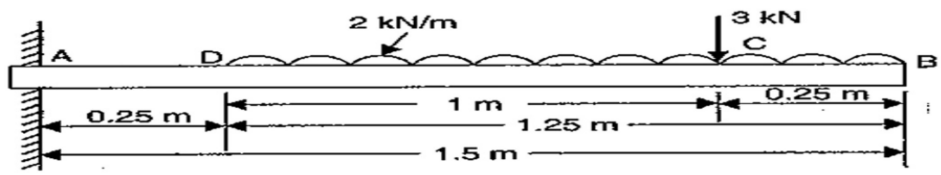
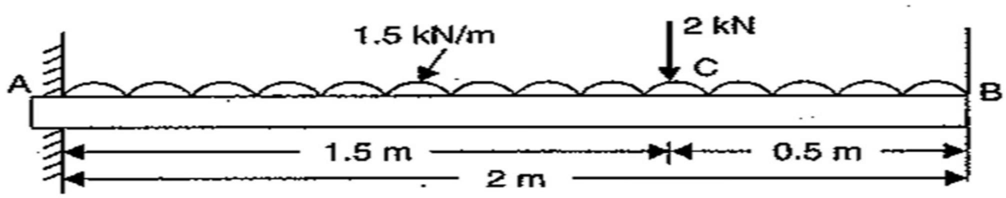
UNIT –II

SHEAR FORCE AND BENDING MOMENT

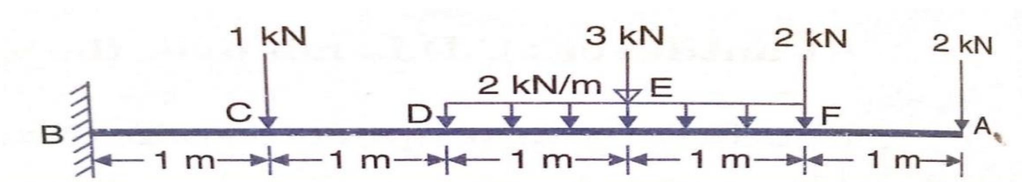
1. Draw shear force and bending moment diagram for cantilever beam subjected to uniformly distributed load. [10M]
2. Draw the shear force and bending moment diagram for the cantilever beam shown in figure. [10M]



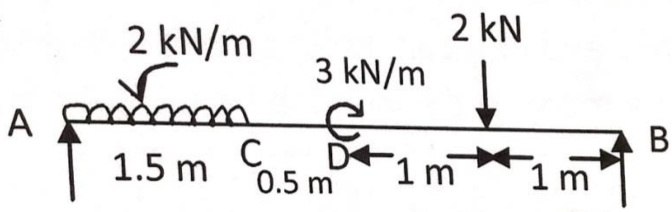
3. Draw shear force and bending moment diagram for the following beam [10M]



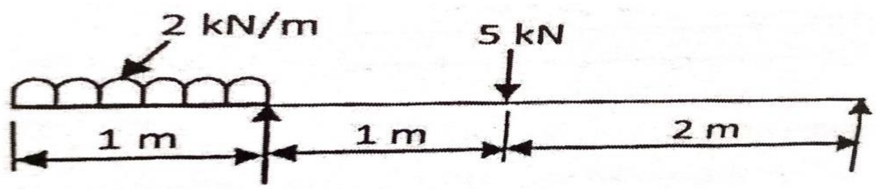
4. Draw shear force and bending moment diagram for the following beam [10M]



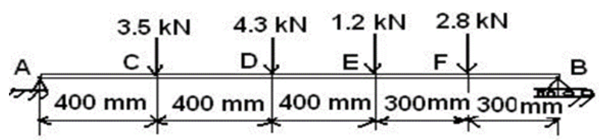
5. A cantilever beam AB of span 10 m carries a uniformly distributed load of 50 kN /m on span 5 m from free end B. A point load of 30 kN at the mid span. Draw shear force and bending moment diagrams. [10M]
6. Draw shear force and bending moment diagram for the following beam [10M]



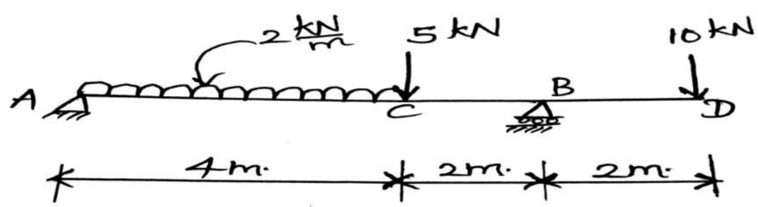
7. Draw shear force and bending moment diagram for the overhanging loaded as show in fig. And also locate the point of contra-flexure. [10M]



8. Draw the shearing force and bending moment diagrams for the beam shown in figure. [10M]



9. Draw the SFD and BMD for simply supported beam carrying uniformly distributed load of whole length and also derive equation for it. [10M]
10. Draw shear force and bending moment diagram for the following beam [10M]



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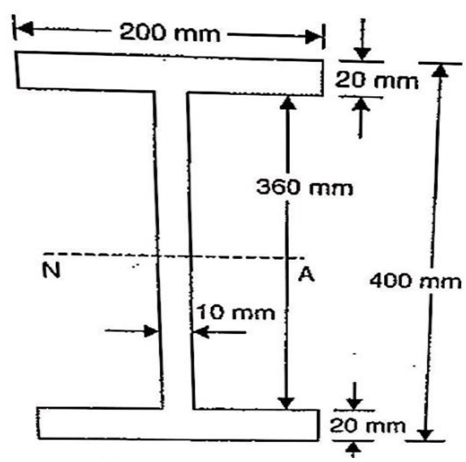
UNIT –III

THEORY OF SIMPLE BENDING AND SHEAR STRESS DISTRIBUTION

1. Derive the bending equation M/I = f/y = E/R Writing all the assumptions made. [10M]
2. 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]
3. 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]



4. 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 500mm. If the maximum stress in the material of the beam is 120 N/mm^2 and moment of inertia of the section is 7 x 10 ^{8} mm^4, find the span of the beam. [10M]

5. An I-section has the following dimensions

   Flanges: 150 mm x 20 mm Web: 310 mm x 10 mm. If the shear force acting on the section is 40 KN. Calculate the maximum shear stress developed in I-section and stress distribution diagram. [10M]

6. A simply supported wooden beam of span 1.3 m having a cross section 150 mm wide and 250 mm deep carries a point load W at the center. The permissible shear stress is 7 N/mm^2 in bending and 1 N/mm^2 in shearing. Calculate the safe load W. [10M]

7. 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]

8. 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]

9. 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]

10. 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]

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UNIT –IV

DEFLECTIONS OF BEAMS

1. Derive the expression for slope and deflection of a simply supported beam carrying a point load at centre using double integration method. [10M]
2. 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/mm^2 and E = 2 x 10^5 N/mm^2. Use Macaulay's method. [10M]
3. 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]
4. 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 10^4 N/mm^2, find :
   (i) Slope at the supports and (ii) Maximum deflection. [10M]
5. Derive the expression for slope and deflection of a simply supported beam carrying a uniformly distributed load by Mohr's theorem. [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. 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 double integration method. [10M]
9. 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 $E = 1.2 \times 10^4$ N/mm^2. [10M]
10. 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]

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UNIT –V

CONJUGATE BEAM METHOD AND TORSION OF CIRCULAR SHAFTS AND SPRINGS

1. Derive the expression for slope and deflection of a simply supported beam with a point load at the center by Conjugate beam method. [10M]
2. A cantilever beam of length 3m carries a uniformly distributed load of 80 kN/m over the entire length. If E= 2 x 10^8 kN/m^2 and I=1 x 10^8 mm^4, find the slope and deflection at the free end using conjugate beam method. [10M]
3. A Simply supported beam of length 5 m carries a point load of 5 kN at a distance of 3 m from left end. If E = 2 x 10^5 N/mm^2 and I = 1 × 10^8 mm^4 for the beam, determine: (i) slope at left support and (ii) deflection under the point load using conjugate beam method. [10M]
4. A cantilever beam of length 3 m carries a point load of 10 kN at a distance of 2 m from the fixed end. If E=2 x 10^5 N/mm^2 and I = 1 x 10^8 mm^4, find the slope and deflection at the free end using conjugate bean method. [10M]
5. A tensile test, a test piece 25 mm in diameter, 200 mm gauge length stretched 0.0975 mm under a pull of 50,000 N. In a torsion test the same rod twisted 0.025 rad over a length of 200 mm, when a torque of 400 Nmm was applied. Evaluate the Poisson’s ratio and the three elastic moduli for the material. [10M]
6. 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]
7. A hollow shaft of external diameter 120 mm transmits 300 kW power at 200 r.p.m. (rotations per minute) Determine the maximum internal diameter if the maximum stress in the shaft is not exceeded to 60 N/mm^2. [10M]

8. A hollow shaft is to transmit 300kW power at 80 rpm. If the shear stress is not exceed 60 N/mm^2 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]
9. 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/mm^2. Take C= 1 x 10^5 N/mm^2. [10M]
10. 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/mm^2. [10M]

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UNIT –1

SIMPLE STRESS AND STRAINS & STRAIN ENERGY

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 [ ]

(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 mm^3. 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 mm^3 B) 1230 mm^3 C) 1500 mm^3 D) 2000 mm^3

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) Modulus of rigidity is the ratio of ______ [ ]

A) Lateral strain and linear strain B) Linear stress and lateral strain

C) Shear stress and shear strain D) Shear strain and shear stress

27) The relation between modulus of elasticity (E), modulus of rigidity (G) and bulk modulus (K) is given as ________ [ ]

A) K+G / (3K+ G) B) 3 KG / (3K+ G) C) 3 KG / (9K+ G) D) 9 KG / (3K+ G)

28) What is the bulk modulus of a material, if a cube of 100 mm changes its volume to 4000 mm3 when subjected to compressive force of 2.5 x 106 N? [ ]

A) 62.5 Gpa B) 65 Gpa C) 67.5 Gpa D) 70 Gpa

29) When a rectangular bar is uniaxially loaded, the volumetric strain (ev) is given as [ ]

A)σ_x / E(1- μ) B)σ_x / E(1+ μ) C)σ_x / E(1- 2μ) D)σ_x / E(1+2μ)

30) Every material obeys the Hooke's law within [ ]

A) Elastic limit B) Plastic limit C) Limit of proportionality D) None of these

31)The ability of the material to deform without breaking is called [ ]

A) Elasticity B) Plasticity C) Creep D) None of these

33) Which of the following material is more elastic? [ ]

A) Rubber B) Glass C) Steel D) Wood

34) The percentage elongation and the percentage reduction in area depends upon [ ]

A) Tensile strength of the material B) Ductility of the material

C) Toughness of the material D)None of these

35)The property of a material by which it can be beaten or rolled into thin sheets, is called [ ]

A) Elasticity B) Plasticity C) Ductility D) Malleability

36) The property of a material by which it can be drawn to a smaller section by applying a tensile load is called [ ]

A) Elasticity B) Plasticity C) Ductility D) Malleability

37) If a material has identical properties in all directions, it is called [ ]

A) Elastic B) Plastic C) Isotropic D) Homogeneous

38) If a material has identical properties in all directions, it is called [ ]

A) Elastic B) Plastic C) Isotropic D) Homogeneous

39) Units of strain [ ]
A) cm/cm B) m/m C) N/cm^2 D) No unit

40) The ratio of lateral strain to linear strain is called [ ]

A) Modulus of Elasticity B) Modulus of Rigidity

C) Bulk Modulus D) Poisson's Ratio

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UNIT –II

SHEAR FORCE & BENDING MOMENT

1) A beam is a structural member which is subjected to [ ]

A) Axial tension or compression B) Transverse loads and couples

C) Twisting moment D) No load

2) Which of the following are statically determinate beams? [ ]

A) Only simply supported beams B) Cantilever, overhanging and simply supported

C) Fixed beams D) Continuous beams

3) A cantilever is a beam whose [ ]

A) Both ends are supported either on rollers or hingesB) One end is fixed and other end is free

C) Both ends are fixed D) Whose both or one of the end has overhang

4) In a cantilever carrying a uniformly varying load starting from zero at the free end, The shear force diagram is [ ]

A) A horizontal line parallel to x-axis B) A line inclined to x-axis

C) Follows a parabolic law D) Follows a cubic law

5) In a cantilever carrying a uniformly varying load starting from zero at the free end, the Bending moment diagram is [ ]

A) A horizontal line parallel to x-axis B) A line inclined to x-axis

B) Follows a parabolic law D) Follows a cubic law

6) In a simply supported beam, bending moment at the end [ ]

A) Is always zero if it does not carry couple at the end
B) Is zero, if the beam has uniformly distributed load only
C) Is zero if the beam has concentrated loads only
D) May or may not be zero

7) For any part of the beam, between two concentrated loads Shear force diagram is a [ ]

A) Horizontal straight-line B) Vertical straight line

B) Line inclined to x-axis D) Parabola

8) For any part of a beam between two concentrated loads, bending moment diagram is a [ ]

A) Horizontal straight-line B) Vertical straight line

C) Line inclined to x-axis D) Parabola

9) For any part of a beam subjected to uniformly distributed load, Shear force diagram is [ ]

A) Horizontal straight line B) Vertical straight line

C) Line inclined to x-axis D) Parabola

10) For any part of a beam subjected to uniformly distributed load, bending moment diagram is

A) Horizontal straight-line B) Vertical straight line [ ]

C) Line inclined to x-axis D) Parabola

11) A sudden jump anywhere on the Bending moment diagram of a beam is caused by [ ]

A) Couple acting at that point B) Couple acting at some other point

C) Concentrated load at the point D) u.d.l or u.v.l on the beam

12) In a simple supported beam having length = l and subjected to a concentrated load (W) at mid-point.

A) Maximum Bending moment = Wl/4 at the mid-point [ ]

B) Maximum Bending moment = Wl/4 at the end

C) Maximum Bending moment = Wl/8 at the mid-point

D) Maximum Bending moment = Wl/8 at the end

13) In a simply supported beam subjected to uniformly distributed load (w) over the entire length (l), total load=W, maximum Bending moment is [ ]

A) Wl/8 or $wl^2/8$ at the mid-point B) Wl/8 or $wl^2/8$ at the end

C) Wl/4 or $wl^2/4$ D) Wl/2

14) In a cantilever subjected to a concentrated load (W) at the free end and having length =l, Maximum bending moment is [ ]

A) Wl at the free end B) Wl at the fixed end

C) Wl/2 at the fixed end D) Wl at the free end

15) An axle is subjected to loads as shown [ ]

Maximum bending moment is

A) Wl B) W(l-A) C) Wa D) W(l+A)

16) At a point in a simply supported or overhanging beam where Shear force changes sign and = 0, Bending moment is [ ]

A) Maximum B) Zero C) Either increasing or decreasing D) Infinity

17) In a cantilever subjected to a combination of concentrated load, uniformly distributed load and uniformly varying load, Maximum bending moment is [ ]

A) Where shear force=0 B) At the free end C) At the fixed end D) At the mid-point

18) Point of contra-flexure is a [ ]

A) Point where Shear force is maximum

B) Point where bending moment is maximum

C) Point where bending moment is zero

D) Point where Bending moment=0 but also changes sign from positive to negative

19) Point of contra-flexure is also called [ ]

A) Point of maximum Shear force B) Point of maximum Bending moment

C) Point of inflexion D) Fixed end

20) The slope of shear force line at any section of the beam is also called [ ]

A) Bending moment at that section B) Rate of loading at that section

C) Maximum Shear force D) Maximum bending moment

21) 1. In a simply supported beam carrying a uniformly distributed load over the left half span, the point of contraflexure will occur in [ ]

A) Left half span of the beam B) Right half span of the beam.

C) Quarter points of the beam D) Does not exist

22) A sudden increase or decrease in shear force diagram between any two points indicates that there is

A) No loading between the two points B) Point loads between the two points[ ]

C) U.D.L. between the two points D) None of these

23) When the bending moment is parabolic curve between two points, it indicates that there is

A) No loading between the two points B) Point loads between the two points[ ]

C) U.D.L. between the two points D) UVL between the two points

24) In Fig. (A), max. S.F. will be [ ]

A) 5 KN B) 10 KN C) 15 KN D) 30 KN

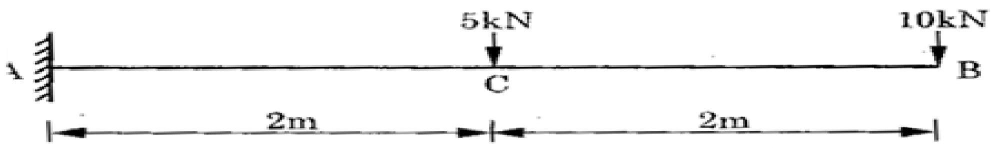

Fig (A)

25) In Fig. (A) , max B.M. will be [ ]

A) 40 KN-m B) 50 KN-m C) 60 KN-m D) 80 KN-m

26) In Fig. (A), slope of S.F.D. between B and C will be [ ]

A) Zero B) 10 KN C) 15 KN D) 20 KN

27) In Fig. (A), slope of B.M.D. between B and C will be [ ]

A) Zero B) 5KN C) 20 KN D) 15 KN

28) In Fig. (B), at point B, the value of B.M will be [ ]

A) 5 KN B) 10 KN C) Zero D) None of these

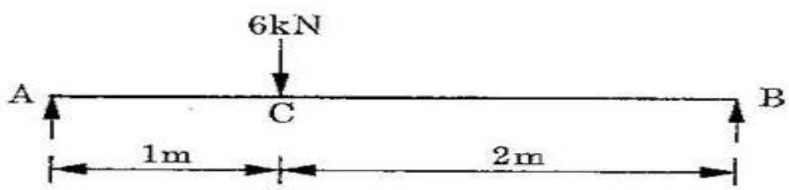

Fig. (B)

29) In Fig. (B), the reaction at support A will be [ ]

A) 6 KN B) 2 KN C) 4 KN D) None of these

30) In Fig. (B), the maximum B.M. will be at [ ]

A) Support A B) Support B C) Centre of beam D) Under the load

31) In Fig. (B), the maximum B.M. will be [ ]

A) 6 KN -m B) 4 KN -m C) 2 KN -m D) 8 KN -m

32) In Fig. (C), the slope of B.M.D. will be more for [ ]

A) Portion AC B) Portion BC C) Will be equal D) None of these

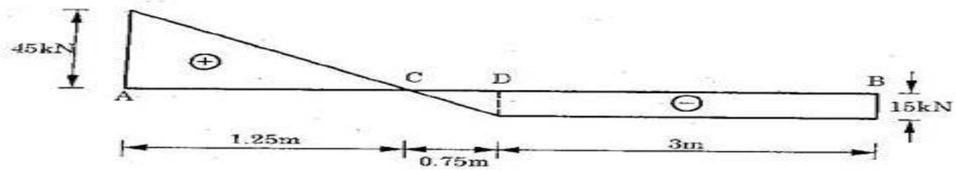

Fig. (C) S.F.D

33) Fig. (C) gives the S.F.D. for a [ ]

A) Cantilever beam B) Simply supported beam C) Overhanging beam D) Insufficient data

34) Corresponding to Fig. (C), the loading on the portion AD of the beam will be [ ]

A) Uniformly distributed load B) Uniformly varying load

C) Point loads D) cannot be said

35) Corresponding to Fig. (C) , the maximum bending moment will be at [ ]

A) A B) B C) C D) D

36) The beam having one end free and one end fixed is called as _______ [ ]

A) Cantilever beam B) Continuous beam C) Overhang beam D) Simply supported beam

37) In axial thrust diagram, at which point bending moment is zero? [ ]

A) Point of contra-flexure B) Point of inflection C) Both a and b D) None of the above

38) Uniformly varying load between two sections in shear force diagram is represented by [ ]

A) Cubic curve B) inclined line C) horizontal line D) parabolic curve

39) In bending moment diagram, if no load acts between two sections, then it is represented by

A) horizontal line B) inclined line C) vertical line D) all of the above [ ]

40) The graphical representation of variation of axial load on y axis and position of cross section along x axis is called as _____ [ ]

A) Bending moment diagram B) Shear force diagram

C) Stress-strain diagram D) Thrust diagram

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QUESTION BANK (OBJECTIVE)

Subject with Code: Strength of Materials-I (16CE103) **Course & Branch**: B.Tech - CE
Year & Sem: II-B.Tech & I-Sem **Regulation:** R16

UNIT–III

THEORY OF SIMPLE BENDING AND SHEAR STRESSES

1) Which of the machine component is designed under bending stress? [ ]
A) Shaft B) Arm of a lever C) Key D) Belts and ropes

2) For bending equation to be valid, radius of curvature of the beam after bending should be
A) Equal to its transverse dimensions B) Infinity [ ]
C) Very large compared to its transverse dimensions D) Double its transverse dimensions

3) Neutral axis of a beam always coincides with [ ]
A) Axis passing through bottom of beam B) Axis passing through height h/2 from bottom
C) Axis passing through height h/3 from bottom D) Axis passing through centroid

4) Moment of resistance of a beam [ ]
A) Is equal to safe maximum bending moment to which it can be subjected
B) Is equal to any bending moment to which it is subjected
C) Is equal to or less than maximum bending moment to which it is subjected
D) Is equal to or more than maximum bending moment to which it is subjected

5) Section modulus of a beam is always given by formula [ ]
A) Πd^3/32 B) bd^2/6 C) I/y(max) D) I/y

6) Moment of Inertia of a rectangular section about any axis= [ ]
A) bd^3/12 B) db^3/12 C) bd^3/12 + Ax^2 D) πd^4/64
Where b=width, A=Area of cross section, d=depth for rectangular section and diameter of circular sections, x=distance between the centroid of the section from the axis

7) Two beams have same length and same weight and same material. One beam has solid circular section and other hollow circular section with outside diameter/inside diameter ratio=K and having moment of resistance=M, then [ ]
A) both beams will have same strength in terms of M
B) Solid beam will have more strength in terms of M
C) Hollow beam will have more strength in terms of M and it will be a function of K

D) Hollow beam will have more strength in terms of M and it will be independent of K

8) 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

9) 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

10) Variation of shear stress in a beam has [ ]

A) Parabolic variation B) Linear variation

C) Cubical variation D) None

11) A beam is designed on the basis of [ ]

A) Shear force B) Bending moment

C) Shear force as well as bending moment D) None

12) 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

13) 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

14) Variation of bending strain in a beam has [ ]

A)Parabolic variation B) Linear variation

C) Cubical variation D) None

15) Tensile and compressive stresses in a beam of symmetrical section are [ ]

A) $\sigma t = \sigma c$ B) $\sigma t > \sigma c$ C) $\sigma t < \sigma c$ D) None

16) Tensile and compressive stresses in a beam of un-symmetrical section are [ ]

A) $\sigma t = \sigma c$ B) $\sigma t = 0$ C) $\sigma c = 0$ D) None

17)Bending stresses in a beam are maximum at the [ ]

A) Centeroidal axis B) Extreme fibres C) Geometric axis D) None

18) Shear stress in a beam is maximum at the [ ]

A) Centeroidal axis B) Extreme fibres C) Geometric axis D) None

19) Bending stresses in a beam is zeero at the [ ]

A) Centeroidal axis B) Extreme fibres C) Geometric axis D) None

20) Shear stress in a beam is zero at the [ ]

A) Centeroidal axis B) Extreme fibres C) Geometric axis D) None

21) Variation of bending stresses in a beam have [ ]

A) Parabolic variation B) Linear variation C) Cubical variation D) None

22) Variation of shear stress in a beam has [ ]

A) Parabolic variation B) Linear variation C) Cubical variation D) None

23) A beam is designed on the basis of [ ]

A) Shear force B) Bending moment C) Shear force as well as bending moment D) None

24) Bending stress will be least at the extreme fibres for [ ]

A) Maximum area of cross section B) Maximum moment of inertia

C) Maximum section modulus D) None

25) 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

26)Variation of bending strain in a beam has [ ]

A) Parabolic variation B) Linear variation C) Cubical variation D) None

27)The section modulus of a circular section about an axis through its C.G., is [ ]

A) $\pi d^2/4$ B) $\pi d^2/16$ C) $\pi d3/16$ D) $\pi d3/32$

28) If a part is constrained to move and heated, it will develop [ ]

A) Principal stress B) Tensile stress C) Compressive stress D) Shear stress

29) The assumption made in Euler's column theory is that [ ]

A) The failure of column occurs due to buckling alone

B) The length of column is very large as compared to its cross-sectional dimensions

C) The column material obeys Hooke's law

D) All of the above

30) Modular ratio of two materials is the ratio of [ ]

A) Strains B) Stress and strain C) Shear stress and shear strain D) Moduli and elasticity

31)Tensile and compressive stresses in a beam of symmetrical section are [ ]

A) $\sigma t = \sigma c$ B) $\sigma t > \sigma c$ C) $\sigma t < \sigma c$ D) None

32) Tensile and compressive stresses in a beam of un-symmetrical section are [ ]

A) $\sigma t = \sigma c$ B) $\sigma t = 0$ C) $\sigma c = 0$ D) None

33) Bending stresses in a beam are maximum at the [ ]

A) Centeroidal axis B) Extreme fibres C) Geometric axis D) None

34) Shear stress in a beam is maximum at the [ ]

A) Centeroidal axis B) Extreme fibres C) Geometric axis D) None

35) Bending stresses in a beam is zeero at the [ ]

A) Centeroidal axis B) Extreme fibres C) Geometric axis D) None

36) Shear stress in a beam is zero at the [ ]

A) Centeroidal axis B) Extreme fibres C) Geometric axis D) None

37) Variation of bending stresses in a beam have [ ]

A) Parabolic variation B) Linear variation C) Cubical variation D) None

38) Variation of shear stress in a beam has [ ]

A) Parabolic variation B) Linear variation C) Cubical variation D) None

39) A beam is designed on the basis of [ ]

A) Shear force B) Bending moment

C) Shear force as well as bending moment D) None

40) Bending stress will be least at the extreme fibres for [ ]

A) Maximum area of cross section B) Maximum moment of inertia

C) Maximum section modulus D) None

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QUESTION BANK (OBJECTIVE)

Subject with Code : Strength of Materials-I (16CE103) **Course & Branch**: B.Tech - CE

Year & Sem: II-B.Tech & I-Sem **Regulation:** R16

UNIT–IV

DEFLECTION OF BEAMS

1) Distance of maximum deflection from the center in a S.S.Beam with 'W' not at the center will be
A) $[2 (L^2—b^2)/3]^{0.5}$ B) $[(L^2—b^2)/3]^{0.5}$ C) $[(3L^2—b^2)/3]^{0.5}$ D) None [ ]
2) 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
3) Maximum deflection in a cantilever beam with a moment M at the free end will be [ ]
A) $3M^2L/2EI$ B) $2M^2L/2EI$ C) $M_2L/2EI$ D) None
4) Which bracket is used in Macaulay's Method of slope and deflection [ ]
A) Parentheses ( ) B) square brackets [ ]
C) braces { } D) None
5) 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
6) 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
7) In the strain energy method of slope and deflection, load is applied [ ]
A) Gradually B) Suddenly C) With an impact D) None
8) A prop is used to cause [ ]
A) Less deflection B) More deflection C) No change in deflection D) None
9) Props can be used in [ ]
A) S.S.Beam B) Cantilever beam C) S.S. beam as well as cantilever D) None
10) Deflection due to shear is significant in [ ]
A) Long beams B) Short beams C) Long as well as short beams D) None
11) Macaulay's method is more convenient for beams carrying [ ]
A) Single concentrated load B) UDL C) Multi-loads D) None

12) Slope is found by moment area method by using [ ]
A) First moment of the area B) Second moment of the area
C) Third moment of the area D) None
13) Deflection is found by moment area method by using [ ]
A) First moment of the area B) Second moment of the area
C) Third moment of the area D) None
14) Props are used to decrease [ ]
A) Slope B) Deflection C) Slope as well as deflection D) None
15) Deflection due to shear force as compared to bending moment will be [ ]
A) Equal B) Less C) More D) None
16) Deflection under a concentrated load not at the center (distance a from left support and distance b from right hand support) will be [ ]
A) $WL^3/48EI$ B) $5WL^3/384EI$ C) $Wa^2 b^2/3EI$ where a = L–b D) None
17) Macaulay's method is more convenient for beams carrying [ ]
A) Multi concentrated loads B) Multi number of UDL
C) Multi-concentrated and multi UDL loads D) None
18) A beam is designed on the basis of [ ]
A) Maximum deflection B) Minimum deflection C) Maximum slope D) None
19) A beam is designed on the basis of [ ]
A) Maximum bending moment B) Minimum shear force
C) Maximum bending moment as well as for maximum shear force D) None
20) The second moment of a circular area about the diameter is given by (D is the diameter).[ ]
A) $\frac{\pi D^4}{4}$ B) $\frac{\pi D^4}{16}$ C) $\frac{\pi D^4}{32}$ D) $\frac{\pi D^4}{64}$
21) 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
22) Variation of bending strain in a beam has [ ]
A) Parabolic variation B) Linear variation C) Cubical variation D) None
23) Strain energy is the [ ]
A) energy stored in a body when strained within elastic limits
B) energy stored in a body when strained upto the breaking of a specimen
C) maximum strain energy which can be stored in a body
D) proof resilience per unit volume of a material
24) A vertical column has two moments of inertia (i.e. Ixx and Iyy). The column will tend to buckle in the direction of the [ ]
A) axis of load B) perpendicular to the axis of load
C) maximum moment of inertia D) minimum moment of inertia
25) The neutral axis of the cross-section a beam is that axis at which the bending stress is[ ]
A) zero B) minimum c) maximum D) infinity
26) Euler's formula holds good only for [ ]
A) short columns B) long columns C) both short and long columns D)weak columns

27) The object of caulking in a riveted joint is to make the joint [ ]
A) free from corrosion. B) stronger in tension
C) free from stresses D) leak-proof
28) A steel bar of 5 mm is heated from 15° C to 40° C and it is free to expand. The bar Will induce
A) no stress B) shear stress C) tensile stress d)compressive stress
29) A body is subjected to a tensile stress of 1200 MPa on one plane and another tensile stress of 600 MPa on a plane at right angles to the former. It is also subjected to a shear stress of 400 MPa on the same planes. The maximum normal stress will be [ ]
A) 400 MPa B) 500 MPa c) 900 MPa D) 1400 MPa
30) Two shafts 'A' and 'B' transmit the same power. The speed of shaft 'A' is 250 r.p.m. and that of shaft 'B' is 300 r.p.m. The shaft 'B' has the greater diameter. [ ]
A) True B) False C) not correct D) none of them
31) The stress induced in a body, when suddenly loaded, is __________ the stress induced when the same load is applied gradually. [ ]
A) equal to B)bone-half C) twice D)four times
32) Maximum deflection in a S.S.Beam with 'W' not at the center will be [ ]
A) Wb (L2 –b2)1.5/3√3EI B) Wb (L2 –b2)1.5 /6√3EI
C) Wb (L2 –b2)1.5/ 9√3EI D) None
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) 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
37) Slope at a point in a beam is the [ ]
A) Vertical displacement B) Angular displacement C) Horizontal displacement D) None
38) Deflection at a point in a beam is the [ ]
A) Vertical displacement B) Angular displacement
C) Horizontal displacement D) None
39) Identify the differential equation for finding slope and deflection [ ]
A) EI d2y/dx2 = –M B) EI d2y/dx2 = +M
C) EI d2y/dx2 = ±M D) None
40) Maximum deflection in a S.S. beam with W at centre will be [ ]

A) WL3/36EI B) WL3/24EI C) WL3/48EI D) None

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Year & Sem: II-B.Tech & I-Sem **Regulation:** R16

UNIT–5

THIN CYLINDERS AND THICK CYLINDERS

1) The hoop stress in a thin cylinder of diameter d and thickness t is subjected to pressure p is

A) pd/2t B) pd/4t C) pd/t D) 2pd/t [ ]

2) The design of thin cylindrical shell is based on [ ]

A) hoop stress B) volumetric stress C) longitudinal stress D) none

3) A large cylindrical vessel was sealed in summer. What is likely to happen to it in winter?

A) explode B) buckle and collapse C) seal will get loosened D) none [ ]

4) A cylindrical vessel is said to be thin if the ratio of its internal dimension to wall thickness

A) less than 20 B) equal to 20 C) more than 20 D) none [ ]

5) The longitudinal stress in a thin cylindrical shell of diameter d ,length l, and thickness t,when subjected to internal pressure p is [ ]

A) pd/4t B) pd/2t C) 2pd/t D) 4pd/t

6) The maximum shear stress in a thin cylindrical shell , when subjected to internal pressure p is equal to [ ]

A) pd/4t B) pd/8t C) pd/2t D) pd/t

7) The maximum shear stress in a thin spherical shell , when subjected to internal pressure p is equal to
A) pd/4t B) pd/8t C) pd/2t D) zero [ ]

8) The hoop stress in a thin spherical shell , when subjected to internal pressure p is equal to

A) pd/4t B) pd/8t C) pd/2t D) zero [ ]

9) The circumferential strain in case of thin cylindrical shell, when subjected to internal pressure p is equal to [ ]

A) pd/2tE {½-1/m} B) pd/2tE { 1-1/2m} C) pd/4tE { 1-1/m} D) 3pd/4tE{1-1/m}

10) The longitudinal strain in case of thin cylindrical shell, when subjected to internal pressure p is equal to [ ]

A) pd/2tE {½-1/m} B) pd/2tE {1-1/2m} C) pd/4tE {1-1/m} D) 3pd/4tE {1-1/m}

11) The strain in any direction in case of thin cylindrical shell, when subjected to internal pressure p is equal to [ ]

A) pd/2tE {½-1/m} B) pd/2tE {1-1/2m} C) pd/4tE { 1-1/m} D) 3pd/4tE{1-1/m}

12) The volumetric strain in case of thin cylindrical shell, when subjected to internal pressure p is equal to [ ]

A) pd/2tE {½-1/m} B) pd/2tE { 1-1/2m} C) pd/4tE { 1-1/m} D) 3pd/4tE{1-1/m}

13) The circumferential strain in case of thin cylindrical shell ,when subjected to internal fluid pressure p is [ ]

A) more than diametral strain B) less than diametral strain C) equal to diametral strain D) none

14) In case of thick cylinders ,at any point the 3 principal stresses [ ]

A) are all tensile B) are all compressive C) are all shear stresses D) none

15) The radial pressure ,at any radius x in case of thick spherical shell subjected to internal pressure p is equal to [ ]

A) $(2b/x^3) - a$ B) $(b/x^3) + a$ C) $(x^3/2B) - a$ D) $(x^3/B) + a$

16) The circumferential stress ,at any radius x in case of thick spherical shell subjected to internal pressure p is equal to [ ]

A) $(2b/x^3) - a$ B) $(b/x^3) + a$ C) $(x^3/2B) - a$ D) $(x^3/B) + a$

17) The ratio of the tensile stress developed in the wall of a boiler in the circumferential direction to the tensile in the axial direction is [ ]

A) 4 B) 3 C) 2 D) ½

18) The circumferential stress is always ___ the longitudinal stress [ ]

A) Equal to B) less than to C) twice D) none

19) If the hoop stress in a thin cylinder is 20 N/mm^2, then its longitudinal stress is [ ]

A) 10 N/mm^2 B) 20 N/mm^2 C) 5 N/mm^2 D) 8 N/mm^2

20) The hoop stress in case of thick cylinder is maximum at [ ]

A) inner circumference B) outer circumference C) longitudinal direction D) none

21) The hoop stress in case of thick cylinder is minimum at [ ]

A) inner circumference B) outer circumference C) longitudinal direction D) none

22) The lame's theorm is applicable only for [ ]

A) thin cylinders B) thick cylinders C) both a and b D) none

23) The hoop stress in case of thin cylinders are reduced by [ ]

A) wire winding B) shrinking one cylinder over other C) both a & b D) none

24) The hoop stress in case of thick cylinders are reduced by [ ]

A) wire winding B) shrinking one cylinder over other C) both a & b D) none

25) Torsional rigidity of a shaft is given by [ ]

A) T/G B) T/J C) GJ D) TJ

26) If a shaft subjected to pure twisting moment,an element on the surface is subjected to [ ]

A) normal tensile stress B) normal compressive stress C) pure shear stress D) bending stress

27) The moment on a pulley which produces rotation is called [ ]

A) inertia B) momentum C) moment of momentum D) torque

28) Circular shafts ,under pure torsion are subjected to ____ stresses [ ]

A) axial B) tensile C) bending D) shear

29) The ratio of maximum shear stress to the maximum longitudinal stress in a shaft subjected to uniform torque is [ ]

A) ½ T/M B) 1.0 T/M C) 1.5 T/M D) 0.375 T/M

30) Torsional rigidity of a shaft is an index of the [ ]

A) power transmitted B) shear stress sustained C) deformability D) failure load

31) Torsional rigidity of a shaft of diameter D is proportional to [ ]

A) D B) D^2 C) D^4 D) D^3

32) Shear stress trajectories in a shaft subjected to torsion are [ ]

A) straight lines B) helical curves C) straight lines and curves D) none

33) Torsion equation is valid for [ ]

A) any cross section B) prismatic shafts C) circular prismatic shafts D) none

34) The maximum power a shaft can transmit propotional to [ ]

A) shaft length B) shaft diameter C) cube of shaft diameter D) none

35) A thin circular tube under torsion is likely to fail [ ]

A) by buckling B) in compression C) in tension D) in shear

36) Torsional rigidity of shaft is [ ]

A)twisting moment B)torsional stiffness per unit length C)twist per unit length D)none

37) The maximum shear stress produced in a shaft is 5 N/mm^2.The shaft is of 40 mm diameter. The value of twisting moment is [ ]

A) 628 N-m B) 62.8N-m C) 125.6 N-m D) 1256 N-m

38) Twisting moment is a moment applied in the plane of cross section acting [ ]

A) along longitudinal axis B) about longitudinal axis C) about neutral axis D) none

39) In a shaft subjected to pure twist,the shear stress at any section is maximum at [ ]

A) center of section B) mid radius C) surface D) none

40) Polar moment of inertia is [ ]

A) the moment of inertia an axis in the plane of cross section

B) the product of inertia C) about the axis of member D) none

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