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THEORY of STRUCTURES Multiple Choice

Questions :-

Q No: 01

$P=4^2EI/L^2$ is the equation of Euler's crippling load if

- A. Both the ends are fixed
- B. Both the ends are hinged
- C. One end is fixed and other end is free
- D. One end is fixed and other end is hinged

ANS: A

Q No: 02

Pick up the correct statement from the following:

A. The structural member subjected to compression and whose dimensions are small as

B. compared to its length, is called a stmt

The vertical compression members are generally known as columns or stanchions

C. Deflection in lateral direction of a long column, is generally known as buckling

D. All the above

ANS: D

Q No: 03

**oy/n $[1 - a (1/r)^2]$ is the empirical formula,
For calculating the allowable stress of long columns
known as**

A. Straight line formula

B. Parabolic formula

C. Perry's formula

D. Rankine's formula

ANS: B

Q No: 04

**Maximum principal stress theory for the failure of a
material at elastic point, is known**

A. Guest's or Trecas' theory

B. St. Venant's theory

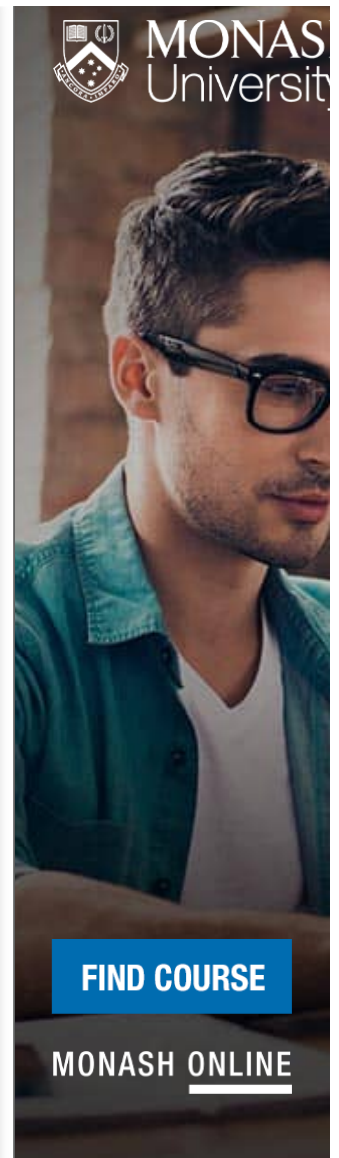
C. Rankine's theory

D. Von Mises' theory

ANS: C

Q No: 05

Pick up the correct statement from the following:



- A. The moment of inertia is calculated about the axis about which bending takes place
- B. If tensile stress is less than axial stress, the section experiences compressive stress
- C. If tensile stress is equal to axial stress, the section experiences compressive stress
- D. All the above

ANS: D



THEORY of STRUCTURES
Objective Questions

Q No: 06

A composite beam is composed of two equal strips one of brass and other of steel. If the temperature is raised

- A. Steel experiences tensile force
- B. Brass experiences compressive force

C. Composite beam gets subjected to a couple

D. All the above

ANS: D

Q No: 07

A shaft subjected to a bending moment M and a torque T, experiences

A. Maximum bending stress = $\frac{32M}{d^3}$

B. Maximum shear stress = $\frac{16T}{d^3}$

C. Both A. and B.

D. Neither A. nor B.

ANS: C

Q No: 08

A two hinged parabolic arch of span l and rise h carries a load varying from zero at the left end to

A. $\frac{1}{4}hl$ thrust is

B. $\frac{1}{8}hl$

C. $\frac{1}{12}hl$

D. $\frac{1}{16}hl$

ANS: D

Q No: 09

The horizontal thrust on the ends of a two hinged semicircular arch of radius carrying

A. A uniform load $\frac{4}{3}$

B.

C. end, is

D. All the above

ANS: D

Q No: 10

Maximum strain theory for the failure of a material at the elastic limit, is known as

- A. Guest's or Trecas' theory
- B. St. Venant's theory
- C. Rankine's theory
- D. Haig's theory

ANS: B

Q No: 11

Slenderness ratio of a long column, is

- A. Area of cross-section divided by radius of gyration
- B. Area of cross-section divided by least radius of gyration

C. Radius of gyration divided by area of cross-section

D. Length of column divided by least radius of gyration

ANS: D

Q No: 12

A close coil helical spring when subjected to a moment M having its axis along the axis of the helix

- A. It is subjected to pure bending
- B. Its mean diameter will decrease
- C. Its number of coils will increase
- D. All the above

ANS: A

Q No: 13

The ratio of the stresses produced by a suddenly applied load and by a gradually applied load on a bar, is

- A. $1/4$
- B. $1/2$
- C. 1

D. 2

ANS: D

Q No: 14

Maximum shear stress theory for the failure of a material at the elastic limit, is known

A. Guest's or Treca's theory

B. St. Venant's theory

C. Rankine's theory

D. Haig's theory

ANS: A

Q No: 15

A cantilever of length L is subjected to a bending moment at its free end. If EI is the flexural rigidity of the section, the deflection of the free end, is

A. ML/EI

B. $ML/2EI$

C. $ML^2/2EI$

D. $ML^2/3EI$

ANS: D

Q No: 16

Pick up the correct statement from the following:

A. For channels, the shear centre does not coincide its centroid

B. The point of intersection of the bending axis with the cross section of the beam, is called shear centre

C. For I sections, the shear centre coincides with the centroid of the cross section of the beam

D. All the above

ANS: D

Q No: 17 constant, depth of a cantilever of length of uniform strength loaded with

Keeping breadth

uniformly distributed load varies from zero at the free end and

A. $2wl$ at the fixed end

B. l at the fixed end

C. wl at the fixed end

D. $3wl$ at the fixed end

ANS: B

Q No: 18

If a three hinged parabolic arch, (span l , rise h) is carrying a uniformly distributed load w /unit length over the entire span,

A. Horizontal thrust is $wl^2/8h$

B. S.F. will be zero throughout

C. B.M. will be zero throughout

D. All the above

ANS: D

Q No: 19

The force in BC of the truss shown in the given figure, is

A. 3.0 t compression

B. 3.0 t tension

C. t tension

D. t compression

ANS: C

Q No: 20

$P = \frac{\pi^2 EI}{L^2}$ is the equation for Euler's crippling load if

A. Both the ends are fixed

B. Both the ends are hinged

C. One end is fixed and other end is free

D. One end is fixed and other end is hinged

ANS: B

Q No: 21

The degree of indeterminacy of the frame in the given figure, is

A. Zero

B. 1

C. 2

D. 3

ANS: B

Q No: 22

The forces in the members of simple trusses, may be analysed by

A. Graphical method

- B. Method of joints
- C. Method of sections
- D. All the above

ANS: D

Q No: 23

A simply supported beam A carries a point load at its mid span. Another identical beam B carries the same load but uniformly distributed over the entire span. The ratio of the maximum deflections of the beams A and B, will be

- A. $2/3$
- B. $3/2$
- C. $5/8$
- D. $8/5$

ANS: D

Q No: 24

A rod of uniform cross-section A and length L force P. The Young's Modulus E of the material, is

- A. $E = P/A \cdot L$
- B. $E = P \cdot L$
- C. $E = P \cdot L/A$
- D. $E = P \cdot A$ **ANS: C**

Q No: 25

In case of a simply supported I-section beam of span L and loaded with a central load W , the length of elasto-plastic zone of the plastic hinge, is

- A. $L/2$
- B. $L/3$
- C. $L/4$
- D. $L/5$

ANS: D

Q No: 26

The yield moment of a cross section is defined as the moment that will just produce the yield stress in

- A. The outer most fibre of the section
- B. The inner most fibre of the section
- C. The neutral fibre of the section
- D. The fibre everywhere

ANS: A

Q No: 27

If I_x and I_y are the moments of inertia of a section about X and Y axes, the polar moment of inertia of the section, is

- A. $(I_x + I_y)/2$
- B. $(I_x - I_y)/2$
- C. $I_x + I_y$
- D. (I_x / I_y)

ANS:XY Option C

Q No: 28

A simply supported beam carries varying load from zero at one end and w at the other end. If the length of the beam is a , the maximum bending moment will be

A. $wa/27$

B. $wa^2/27$

C. w^2a

D. wa^2

ANS: D

Q No: 29

If E , N , K and $1/m$ are modulus of elasticity, modulus of rigidity, Bulk modulus and Poisson ratio of the material, the following relationship holds good

A. $E = 3K (1 - 2/m)$

B. $E = 2N (1 + 1/m)$

C. $(3/2)K (1 - 2/m) = N (1 + 1/m)$

D. All the above

ANS: D

Q No: 30

The forces acting on the bar as shown in the given figure introduce

A. Compressive stress

B. Tensile stress

C. Shear stress

D. None of these **ANS: C**

Q No: 31

Gradually applied static loads do not change with time their

A. Magnitude

B. Direction

C. Point of application

D. All the above

ANS: D

Q No: 32

The tangential component of stre

obtained by multiplying the normal stress by

A.

B.

C.

D. \sin^2

ANS: D

Q No: 33

A body is said to be in equilibrium if

A. It moves horizontally

B. It moves vertically

C. It rotates about its C.G.

D. None of these

ANS: D

Q No: 34

Pick up the incorrect statement from the following: The torsional resistance of a shaft is directly proportional to

A. Modulus of rigidity

B. Angle of twist

C. Reciprocal of the length of the shaft

D. Moment of inertia of the shaft section **ANS: D**

Q No: 35

The forces acting normally on the cross section of a bar shown in the given figure introduce

A. Compressive stress

B. Tensile stress

C. Shear stress

D. None of these **ANS: B**

Q No: 36

The ratio of circumferential stress to the longitudinal stress in the walls of a cylindrical shell, due to flowing liquid, is

A. $\frac{1}{2}$

B. 1

C. $1\frac{1}{2}$

D. 2

ANS: D

Q No: 37

The load on a spring per unit deflection, is called

A. Stiffness

B. Proof resilience

C. Proof stress

D. Proof load

ANS: A

Q No: 38

A compound bar consists of two bars of equal length. Steel bar cross-section is 3500 mm^2 and that of brass bar is 3000 mm^2 . These are subjected to a compressive load $100,000 \text{ N}$. If $E_b = 0.2 \text{ MN/mm}^2$ and $E_{br} = 0.1 \text{ MN/mm}^2$, the stresses developed are:

A. $b = 10 \text{ N/mm}^2$ $s = 20 \text{ N/mm}^2$

B. $b = 8 \text{ N/mm}^2$ $s = 16 \text{ N/mm}^2$

C. $b = 6 \text{ N/mm}^2$ $s = 12 \text{ N/mm}^2$

D. $b = 5 \text{ N/mm}^2$ $s = 10 \text{ N/mm}^2$

ANS: A

Q No: 39

A close coil helical spring of mean diameter D consists of n coils of diameter d . If it carries an axial load W , the energy stored in the spring, is

A. $\frac{4WD^2n}{d^4N}$

B. $4W^2Dn/d4N$

C. $4W^2D3n/d4N$

D. $4W^2D3n^2/d4N$

ANS: C

Q No: 40

The degree of indeterminacy of the frame in the given figure, is

A. 1

B. 2

C. 3

D. Zero **ANS: C**

Q No: 41 1 2 respectively, the

A. $1 \ 2 \ 2$

B. $1 - 2 \cos^2$

C. $1 \ 2$

D. $1 \ 2) \ \text{si}$

ANS: B

Q No: 42

The moment of inertia of a triangular section (height h, base b) about its base, is

A. $bh^2/12$

B. $b^2h/12$

C. $bh^3/12$

D. $b^3h/12$ **ANS: C**

Q No: 43

Shear centre of a half circular section of radius and of constant thickness, lies at a distance of from the centre where is

- A.
- B.
- C.
- D.

ANS: D

Q No: 44

The assumption in the theory of bending of beams is:

- A. Material is homogeneous
- B. Material is isotropic
- C. Young's modulus is same in tension as well as in compression
- D. All the above

ANS: D

Q No: 45

For determining the force in the member AB of the truss shown in the given figure by method of sections, the section is made to pass through AB, AD and ED and the moments are taken about

- A. Joint C
- B. Joint B
- C. Joint D

D. Joint A

ANS: C

Q No: 46

A concentrated load P is supported by the free end of a quadrantal ring AB whose end B is fixed. The ratio of the vertical to horizontal deflections of the end A, is

A.

B. /2

C. /3

D. /4

ANS: B

Q No: 47

The ratio of crippling loads of a column having both the ends fixed to the column having both the ends hinged, is

A. 1

B. 2

C. 3

D. 4

ANS: D

Q No: 48

A load of 1960 N is raised at the end of a steel wire. The minimum diameter of the wire so that stress in the wire does not exceed 100 N/mm² is:

A. 4.0 mm

B. 4.5 mm

C. 5.0 mm

D. 5.5 mm

ANS: C

Q No: 49

of th

A. 45°

B. 30°

C. 60°

D. 90°

ANS: A

Q No: 50

The maximum deflection due to a uniformly distributed load w /unit length over entire span of a cantilever of length l and of flexural rigidity EI , is

A. $wl^3/3EI$

B. $wl^4/3EI$

C. $wl^4/8EI$

D. $wl^4/12EI$

ANS: C

Q No: 51

A compound truss may be formed by connecting two simple rigid frames, by

- A. Two bars
- B. Three bars
- C. Three parallel bars
- D. Three bars intersecting at a point

ANS: B

Q No: 52

The forces acting normally on the cross section of a bar shown in the given figure introduce

- A. Compressive stress
- B. Tensile stress
- C. Shear stress
- D. None of these **ANS: A**

Q No: 53

A spring of mean radius 40 mm contains 8 active coils of steel ($N = 80000 \text{ N/mm}^2$), 4 mm in diameter. The clearance between the coils being 1 mm when unloaded, the minimum compressive load to remove the clearance, is

- A. 25 N
- B. 30 N
- C. 35 N
- D. 40 N

ANS: C

Q No: 54

If a solid shaft (diameter 20 cm, length 400 cm, $N = 0.8 \times 10^5$ N/mm²) when subjected to a twisting moment, produces maximum shear stress of 50 N/mm², the angle of twist in radians, is

- A. 0.001
- B. 0.002
- C. 0.0025
- D. 0.003

ANS: C

Q No: 55

The strain energy stored in a spring when subjected to greatest load without being permanently distorted, is called

- A. Stiffness
- B. Proof resilience
- C. Proof stress
- D. Proof load

ANS: B

Q No: 56

To determine the force in BD of the truss shown in the given figure a section is passed through BD, CD and CE, and the moments are taken about

- A. A joint

B. B joint

C. C joint

D. D joint **ANS: C**

Q No: 57

The strain energy due to volumetric strain

A. Is directly proportional to the volume

B. Is directly proportional to the square of exerted pressure

C. Is inversely proportional to Bulk modulus

D. All the above

ANS: D

Q No: 58

A simply supported uniform rectangular bar breadth b , depth d and length L carries an isolated load W at its mid-span. The same bar experiences an extension e under same tensile load. The ratio of the maximum deflection to the elongation, is

A. L/d

B. $L/2d$

C. $(L/2d)^2$

D. $(L/3d)^2$

ANS: C

Q No: 59

A simply supported beam which carries a uniformly distributed load has two equal overhangs. To have maximum B.M. produced in

the beam least possible, the ratio of the length of the overhang to the total length of the beam, is

- A. 0.207
- B. 0.307
- C. 0.407
- D. 0.508

ANS: A

Q No: 60

In the truss shown in given figure the force in member DC is

- A. 100 t compressive
- B. 100 t tensile
- C. Zero
- D. Indeterminate **ANS: C**

Q No: 61

Pick up the correct statement from the following:

- A. A wire wound in spiral form, is called a helical spring
- B. The pitch of a close coil spring, is very small
- C. The angle made by the coil with horizontal, is called the angle of helix
- D. All the above

ANS: D

Q No: 62

The ratio of lateral strain to axial strain of a homogeneous material, is known

- A. Yield ratio
- B. Hooke's ratio
- C. Poisson's ratio
- D. Plastic ratio

ANS: C

Q No: 63

A short column ($30\text{ cm} \times 20\text{ cm}$) carries a load P_1 at 4 cm on one side and another load P_2 at 8 cm on the other side along a principal section parallel to longer dimension. If the extreme intensity on either side is same, the ratio of P_1 to P_2 will be

- A. $2/3$
- B. $3/2$
- C. $8/5$
- D. $5/8$

ANS: C

Q No: 64

The force in BF of the truss shown in given figure, is

- A. $4t$ tension
- B. $4t$ compression
- C. $4.5t$ tension
- D. $4.5t$ compression

ANS: D

Q No: 65

For beams breadth is constant,

- A. Depth $d \propto M$
- B. Depth $d \propto \sqrt[3]{M}$
- C. Depth $d \propto M^2$
- D. Depth $d \propto 1/M$

ANS: B

Q No: 66

The ratio of maximum shear stress to average shear stress of a circular beam, is

- A. $2/3$
- B. $3/2$
- C. $3/4$
- D. $4/3$

ANS: D

Q No: 67

For calculating the permissible stress $\sigma_y / [(1 + a(l/r)^2)]$ is the empirical formula, known as

- A. Straight line formula
- B. Parabolic formula
- C. Perry's formula
- D. Rankine's formula

ANS: D

Q No: 68

Pick up the correct statement from the following:

- A. In a loaded beam, the moment at which the first yield occurs is called yield moment
- B. In a loaded beam, the moment at which the entire section of the beam becomes fully plastic, is called plastic moment
- C. In a fully plastic stage of the beam, the neutral axis divides the section in two sections of equal area
- D. All the above

ANS: D

Q No: 69

For a strongest rectangular beam cut from a circular log, the ratio of the width and depth, is

- A. 0.303
- B. 0.404
- C. 0.505
- D. 0.707

ANS: D

Q No: 70

Pick up the correct statement from the following:

- A. $M_{cg} = M \sqrt{M^2 + r^2}$ where letters carry their usual meanings
- B. $T_{cp} = m \sqrt{m^2 + T^2}$ where letters carry their usual meanings
- C. The torque which when acting alone would produce maximum shear stress equal to the maximum shear stress caused by the combined bending and torsion, is called equivalent torque

D. All the above

ANS: D

Q No: 71

m_1 and m_2 are the members of two individual simple trusses of a compound truss. The compound truss will be rigid and determinate if

A. $m = m_1 + m_2$

B. $m = m_1 + m_2 + 1$

C. $m = m_1 + m_2 + 2$

D. $m = m + m + 3$

ANS:12 D

Q No: 72

The maximum B.M. due to an isolated load in a three hinged parabolic arch, (span l and rise h) having one of its hinges at the crown, occurs on either side of the crown at a distance

A. $l/4$

B. $h/4$

C. l

D. l

ANS: C

Q No: 73

The greatest load which a spring can carry without getting permanently distorted, is called

- A. Stiffness
- B. Proof resilience
- C. Proof stress
- D. Proof load

ANS: D

Q No: 74

The force in AC of the truss shown in the given figure, is

- A. 5t tension
- B. 4t tension
- C. 4t compression
- D. 5t compression **ANS: B**

Q No: 75

A bar L metre long and having its area of cross-section A, is subjected to a gradually applied tensile load W. The strain energy stored in the bar is

- A. $WL/2AE$
- B. WL/AE
- C. W^2L/AE
- D. $W^2L/2AE$

ANS: D

Q No: 76

The maximum bending moment for a simply supported beam with a uniformly distributed load w /unit length, is

- A. $Wl/2$
- B. $Wl^2/4$
- C. $Wl^2/8$
- D. $Wl^2/12$

ANS: C

Q No: 77

An isolated load W is acting at a distance a from the left hand support, of a three hinged arch of span $2l$ and rise h hinged at the crown, the horizontal reaction at the support, is

- A. Wa/h
- B. $Wa/2h$
- C. $2W/ha$
- D. $2h/Wa$ **ANS: B**

Q No: 78

The force in CD of the truss shown in given figure, is

- A. $3t$ compression
- B. $3t$ tension
- C. Zero
- D. $1.5t$ compression **ANS: C**

Q No: 79

At any point of a beam, the section modulus may be obtained by dividing the moment of inertia of the section by

- A. Depth of the section
- B. Depth of the neutral axis
- C. Maximum tensile stress at the section
- D. Maximum compressive stress at the section

ANS: B

Q No: 80

The ratio of the area of cross-section of a circular section to the area of its core, is

- A. 4
- B. 8
- C. 12
- D. 16

ANS: D

Q No: 81

The ratio of maximum and average shear stresses on a rectangular section, is

- A. 1
- B. 1.25
- C. 1.5
- D. 2.5

ANS: C

Q No: 82

In the truss shown in the given figure, the force in member BC is

- A. 100 t compressive
- B. 100 t tensile
- C. Zero
- D. Indeterminate **ANS: C**

Q No: 83

If a concrete column 200×200 mm in cross-section is reinforced with four steel bars of 1200 mm^2 total cross-sectional area. Calculate the safe load for the column if permissible stress in concrete is 5 N/mm^2 and E_s is $15 E_c$

- A. 264 MN
- B. 274 MN
- C. 284 MN
- D. 294 MN

ANS: C

Q No: 84

In plastic analysis, the shape factor for rectangular section, is

- A. 1.4
- B. 1.5
- C. 1.6

D. 1.7

ANS: B

Q No: 85

A masonry dam (density = $20,000 \text{ N/m}^3$) 6 m high, one metre wide at the top and 4 m wide at the base, has vertical water face. The minimum stress at the base of the dam when the reservoir is full, will be

A. 75 N/m^2

B. 750 N/m^2

C. 7500 N/m^2

D. 75000 N/m^2

ANS: C

Q No: 86

A material is said to be perfectly elastic if

A. It regains its original shape on removal of the load

B. It regains its original shape partially on removal of the load

C. It does not regain its original shape at all

D. None of these

ANS: A

Q No: 87

A shaft rotating N.R.M. under a torque T, transmits a power

A. $\frac{1}{30} \text{ Newton metres/sec}$

B. /30 Newton metres/min

C. /60 Newton metres/min

D. /60 Newton metres/sec

ANS: A

Q No: 88

If Q is load factor, S is shape factor and F is factor of safety in elastic design, the following:

A. $Q = S + F$

B. $Q = S - F$

C. $Q = F - S$

D. $Q = S \times F$

ANS: D

Q No: 89

The maximum deflection due to a load W at the free end of a cantilever of length L and having flexural rigidity EI, is

A. $WL^2/2EI$

B. $WL^2/3EI$

C. $WL^3/2EI$

D. $WL^3/3EI$

ANS: D

Q No: 90

Pick up the correct statement from the following:

- A. For a uniformly distributed load, the shear force varies linearly
- B. For a uniformly distributed load, B.M. curve is a parabola
- C. For a load varying linearly, the shear force curve is a parabola
- D. All the above

ANS: D

Q No: 91

The ratio of the length and depth of a simply supported rectangular beam which experiences maximum bending stress equal to tensile stress, due to same load at its mid span, is

- A. $1/2$
- B. $2/3$
- C. $1/4$
- D. $1/3$

ANS: B

Q No: 92

A simply supported rolled steel joist 8 m long carries a uniformly distributed load over its span so that the maximum bending stress is 75 N/mm^2 . If the slope at the ends is 0.005 radian and the value of $E = 0.2 \times 10^6 \text{ N/mm}^2$, the depth of the joist, is

- A. 200 mm
- B. 250 mm
- C. 300 mm
- D. 400 mm

ANS: D

Q No: 93

The force in EC of the truss shown in the given figure, is

- A. Zero
- B. 5t tension
- C. 5t compression
- D. 4t tension **ANS: C**

Q No: 94

The area of the core of a column of cross sectional area A, is

- A. $(1/3) A$
- B. $(1/6) A$
- C. $(1/12) A$
- D. $(1/18) A$

ANS: D

Q No: 95

If D and d are external and internal diameters of a circular shaft respectively, its polar moment of inertia, is

- A. $D^4 - d^4$
- B. $(D^4 - d^4)/32$
- C. $(D^4 - d^4)/64$
- D. $(D^4 - d^4)/2048$ **ANS: D**

Q No: 96

The force in AD of the truss shown in given figure, is

- A. 4.0t compression
- B. 3.0t compression
- C. 0.5t compression
- D. 0.5t tension **ANS: C**

Q No: 97

length of a column of length L, having one end fixed and other end hinged, is

The equivalent

- A. 2 L
- B. L
- C. L/2
- D. L

ANS: D

Q No: 98

static equations i.e. $\sum H = 0$, $\sum V = 0$, $\sum M = 0$, to a determinate structure, we may

By applying the
determine

- A. Supporting reactions only
- B. Shear forces only
- C. Bending moments only
- D. All the above

ANS: D

Q No: 99

A lift of weight W is lifted by a rope with an acceleration f. If the area of cross-section of the rope is A, the stress in the rope is

- A. $[W (1 + f/ G)]/ A$
- B. $(1 - g/f)/A$
- C. $[W (2 + f/G)]/A$

D. $[W(2 + g/f)]/A$

ANS: A

Q No: 100

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Co-efficient of wind resistance of a circular surface, is

A. $1/2$

B. $1/3$

C. $2/3$

D. $3/2$

ANS: C

THEORY OF STRUCTURE MCQs Pdf ::

Q No: 101

parabolic arch of span and rise , is given by

The equation of a

A. $y = h/l^2 \times (1 - x)$

B. $y = 2h/l^2 \times (1 - x)$

C. $y = 3h/l^2 \times (1 - x)$

D. $y = 4h/l^2 \times (1 - x)$

ANS: D

Q No: 102

A rectangular column shown in the given figure carries a load P having eccentricities e_x and e_y along X and Y axes. The stress at any point (x, y) is

A. $(p/bd) [1 + (12e_y \cdot y/d^2) + (12e_x \cdot x/d^2)]$

B. $p [1 + (6e_y \cdot y/b) + (6e_x \cdot x/b)]$

C. $(p/bd) [1 + (6ey \cdot y/d) + (6ex \cdot x/b)]$

D. $(p/bd) [1 + (ey \cdot y/d) + (ex \cdot x/d)]$ **ANS: A**

Q No: 103

In case of principal axes of a section

- A. Sum of moment of inertia is zero
- B. Difference of moment inertia is zero
- C. Product of moment of inertia is zero
- D. None of these

ANS: C

Q No: 104

A simply supported beam carries a varying load from zero at one end and w at the other end. If the length of the beam is a , the shear force will be zero at a distance x from least loaded point where x is

- A. $a/2$
- B. $a/3$
- C. a
- D. a

ANS: C

Q No: 105

The locus of the end point of the resultant of the normal and tangential components of the stress on an inclined plane, is

- A. Circle

B. Parabola

C. Ellipse

D. Straight line

ANS: C

Q No: 106

The shape factor of standard rolled beam section varies from

A. 1.10 to 1.20

B. 1.20 to 1.30

C. 1.30 to 1.40

D. 1.40 to 1.50

ANS: A

Q No: 107

In the cable shown in the given figure, the minimum tension occurs at

A. A

B. B

C. C

D. Between A and C **ANS: C**

Q No: 108

Principal planes are subjected to

A. Normal stresses only

- B. Tangential stresses only
- C. Normal stresses as well as tangential stresses
- D. None of these

ANS: A

Q No: 109

cross sections of bronze and copper bars of equal length b and c are their moduli E_b and E_c are the respective stresses due to load P . If P_b and P_c are the loads shared by them, (where E_b and E_c are their moduli).

- A. $b c = E_b / E_c$
- B. $P = P_b + P_c$
- C. $P = A_b b + A_c c$
- D. All the above

ANS: D

A rolled steel joist is simply supported at its ends and carries a uniformly distributed load which causes a maximum deflection of 10 mm and slope at the ends of 0.002 radian. The length of the joist will be,

- A. 10 m
- B. 12 m
- C. 14 m
- D. 16 m

ANS: D

If the strain energy stored per unit volume in a hollow shaft subjected to a pure torque

when t attains maximum shear stress f_s the ratio of inner diameter to outer diameter, is $17/64 (f_s / N)$

- s A. $1/2$
- B. $1/3$
- C. $1/4$

D. $1/5$

ANS: C

Q No: 112

H V are the algebraic sums of the forces resolved horizontally and vertically respectively,

M is the algebraic sum of the moments of forces about any point, for the equilibrium of the body acted upon

A. $H = 0$

B. $V = 0$

C. $M = 0$

D. All the above

ANS: D

Q No: 113

The eccentricity (e) of a hollow circular column, external diameter 25 cm, internal diameter 15 cm for an eccentric load 100 t for non-development of tension, is

A. 2.75 cm

B. 3.00 cm

C. 3.50 cm

D. 4.25 cm

ANS: D

Q No: 114

A steel rod of sectional area 250 sq. mm connects two parallel walls 5 m apart. The nuts at the ends were tightened when the rod was heated to 100°C . If $\text{steel} = 0.000012/\text{C}^{\circ}$, $E_{\text{steel}} = 0.2 \text{ MN}/\text{mm}^2$, the tensile force developed at a temperature of 50°C , is

A. 80 N/mm²

B. 100 N/mm²

C. 120 N/mm²

D. 150 N/mm²

ANS: C

Q No: 115

In the truss shown in given figure, the force in member BD is

A. 100 t compressive

B. 100 t tensile

C. Zero

D. Indeterminate **ANS: A**

Q No: 116

$P = \frac{\pi^2 EI}{4L^2}$ is the equation of Euler's crippling load, if

A. Both the ends are fixed

B. Both the ends are hinged

C. One end is fixed and other end is free

D. One end is fixed and other end is hinged

ANS: C

Q No: 117

The moment of inertia of a circular section about any diameter D, is

A. $\frac{\pi D^4}{64}$

B. $\frac{\pi D^4}{32}$

C. 3/64

D. 4/64

ANS: D

Q No: 118

The S.F. diagram of a loaded beam shown in the given figure is that of

- A. A simply supported beam with isolated central load
- B. A simply supported beam with uniformly distributed load
- C. A cantilever with an isolated load at the free end
- D. A cantilever with a uniformly distributed load

ANS: D

Q No: 119

Y are the bending moment, moment of inertia, radius of curvature, modulus of

If M, I, R, E, F, and

elasticity stress and the depth of the neutral axis at section, then

- A. $M/I = R/E = F/Y$
- B. $I/M = R/E = F/Y$
- C. $M/I = E/R = E/Y$
- D. $M/I = E/R = Y/F$

ANS: C

Q No: 120

Shear strain energy theory for the failure of a material at elastic limit, is due to

- A. Rankine
- B. Guest or Treca's
- C. St. Venant
- D. Von Mises

ANS: D

Q No: 121 2 respectively,
the tangent 1

- A. $1/2$
- B. $1/2 \cos^2$
- C. $1 - 2$

- D.

ANS: 1 Option 2 C

Q No: 122

The radius of gyration of a section of area A and least moment of inertia I about the centroidal axis, is

- A. A/I
- B. I/A
- C. \sqrt{A}
- D. \sqrt{I}

ANS: C

Q No: 123

The locus of the moment of inertia about inclined axes to the principal axis, is

- A. Straight line
- B. Parabola
- C. Circle
- D. Ellipse

ANS: D

Q No: 124

Beams composed of more than one material, rigidly connected together so as to behave as one piece, are known as

- A. Compound beams
- B. Indeterminate beams
- C. Determinate beams
- D. Composite beams

ANS: D

Q No: 125

A steel plate $d \times b$ is sandwiched rigidly between two timber joists each $D \times B/2$ in section. The

steel will be (where Young's modulus of steel is m times that of the timber).

- A. $BD^2 + mbd^2)/6D]$
- B. $BD^3 + mbd^3)/6D]$
- C. $BD^2 + mbd^3)/4D]$
- D. $BD^2 + mbd^2)/4D]$

ANS: B

Q No: 126

The general expression for the B.M. of a beam of length l is the beam carries $M = (wl/2)x - (wx^2/2)$

- A. A uniformly distributed load w /unit length
- B. A load varying linearly from zero at one end to w at the other end
- C. An isolated load at mid span

D. None of these

ANS: A

Q No: 127

In a shaft, the shear stress is not directly proportional to

A. Radius of the shaft

B. Angle of twist

C. Length of the shaft

D. Modulus of rigidity

ANS: C

Q No: 128

In the truss, the force in the member AC is

A. 6.25 t compressive

B. 8.75 t tensile

C. t tensile

D. t compressive

ANS: D

Q No: 129

The maximum deflection of a simply supported beam of span L, carrying an isolated load at the centre of the span; flexural rigidity being EI, is

A. $WL^3/3EI$

B. $WL^3/8EI$

C. WL₃/24EL

D. WL₃/48EL

ANS: D

Q No: 130

The point of contraflexure is the point where

A. B.M. changes sign

B. B.M. is maximum

C. B.M. is minimum

D. S.F. is zero

ANS: A

Q No: 131

A steel bar 20 mm in diameter simply-supported at its ends over a total span of 40 cm carries a load at its centre. If the maximum stress induced in the bar is limited to N/mm², the bending strain energy stored in the bar, is

A. 411 N mm

B. 511 N mm

C. 611 N mm

D. 711 N mm

ANS: C

Q No: 132

d constant, the width of a cantilever of length l of uniform strength loaded with
Keeping the depth

a uniformly distributed load w varies from zero at the free end and

- A. $(2w/ \times l^2$ at the fixed end
- B. $(3w/ \times l^2$ at the fixed end
- C. $(3w/ \times l^2$ at the fixed end
- D. $(5w/ \times l^2$ at the fixed end

ANS: C

Q No: 133

The equivalent length is of a column of length having both the ends fixed, is

- A. $2 L$
- B. L
- C. $L/2$
- D. L

ANS: C

Q No: 134 $y/n) (1 - a l/r)$, is

For calculating the allowable stress of long columns. The empirical formula o known as

- A. Straight line formula
- B. Parabolic formula
- C. Perry's formula
- D. Rankine's formula

ANS: A

Q No: 135

The equivalent length of a column of length L having one end fixed and the other end free, is

- A. $2L$
- B. L
- C. $L/2$
- D. L

ANS: A

Q No: 136

For determining the support reactions at A and B of a three hinged arch, points B and C are joined and produced to intersect the load line at D and a line parallel to the load line through A at D'. Distances AD, DD' and AD' when measured were 4 cm, 3 cm and 5 cm respectively. The angle between the reactions at A and B is

A. 30°

B. 45°

C. 60°

D. 90°

ANS: D

Q No: 137

a uniform circular bar of diameter d and length l , which extends by an amount e

The deflection of

amount under a tensile pull P , when it carries the same load at its mid-span, is

A. $el/2d$

B. $e^2l/3d^2$

C. $el^2/3d^2$

D. $e^2l^2/3d^2$

ANS: C

Q No: 138

The ratio of the maximum deflections of a simply supported beam with a central load W and of a cantilever of same length and with a load W at its free end, is

A. $1/8$

B. $1/10$

C. $1/12$

D. $1/16$

ANS: D

Q No: 139

The radius of gyration of a rectangular section (depth D, width B) from a centroidal axis parallel to the width is

A. $D/2$

B. D

C. D

D. D

ANS: C

Q No: 140

A square column carries a load P at the centroid of one of the quarters of the square. If a is the side of the main square, the combined bending stress will be

A. p/a^2

B. $2p/a^2$

C. $3p/a^2$

D. $4p/a^2$

ANS: C

Q No: 141

inertia of a rectangular section of width and depth about an axis passing

The moment of

through C.G. and parallel to its width is

A. $BD^2/6$

B. $BD^3/6$

C. $BD^3/12$

D. $B^2D/6$

ANS: C

A.

B.

C.

D.

Q No: 143

section modulus of a square section of side B and that of a circular section of

The ratio of the diameter D, is

A. $2/15$

B. $3/16$

C. $3/8$

D. $/16$

ANS: B

Q No: 144

A material may fail if

A. 0

B. Maximum strain exceeds $/E$

$0/2$

C. Maximum shear stress exceeds

D. All the above

ANS: D

Q No: 145

The ratio of tangential and normal compone

direction of the force is:

A.

B.

C.

D.

ANS: C

Q No: 146

A shaft is subjected to bending moment M and a torque T simultaneously. The ratio of the maximum bending stress to maximum shear stress developed in the shaft, is

A. M/T

B. T/M

C. $2M/T$

D. $2T/M$

ANS: C

Q No: 147

The maximum height of a masonry dam of a triangular section whose base width is b and specific gravity s , is

A.

B. $b.s$

C.

D. $s b$

ANS: A

Q No: 148

A bar of square section of area a^2 is held such that its one of its diameters is vertical. The maximum shear stress will develop at a depth h where h is

A.

B.

C.

D.

ANS: B

Q No: 149

A cantilever of length 2 m and depth 10 cm tapers in plan from a width 24 cm to zero at its free end. If the modulus of elasticity of the material is $0.2 \times 10^6 \text{ N/mm}^2$, the deflection of the free end, is

A. 2 mm

B. 3 mm

C. 4 mm

D. 5 mm **ANS: D**

Q No: 150

The locus of reaction of a two hinged semi-circular arch, is

A. Straight line

B. Parabola

C. Circle

D. Hyperbola

ANS: A

Q No: 151 o. At its elastic limit, the following statement is true,

o/E

- A. Strain is equal to
- B. Maximum shear stress = $\tau/2$
- C. Strain energy = $\frac{\sigma^2}{2E} \times \text{volume}$
- D. All the above

ANS: D

Q No: 152

A truss containing j joints and m members, will be a simple truss if

- A. $m = 2j - 3$
- B. $j = 2m - 3$
- C. $m = 3j - 2$
- D. $j = 3m - 2$

ANS: A

Q No: 153

In plastic analysis, the shape factor for a triangular section, is

- A. 1.5
- B. 1.34
- C. 2.34
- D. 2.5

ANS: C

Q No: 154

A three hinged arch is generally hinged at its supports and

- A. At one quarter span

- B. At the crown
- C. Anywhere in the rib
- D. None of these

ANS: C

Q No: 155

A steel bar $5 \text{ m} \times 50 \text{ mm}$ is loaded with $250,000 \text{ N}$. If the modulus of elasticity of the material is 0.2

MN/mm^2 and Poisson's ratio is 0.25 , the change in the volume of the bar is:

- A. 1.125 cm^3
- B. 2.125 cm^3
- C. 3.125 cm^3
- D. 4.125 cm^2

ANS: C

Q No: 156

Stress may be defined as

- A. Force per unit length
- B. Force per unit volume
- C. Force per unit area
- D. None of these **ANS: C**

Q No: 157

A steel rod 1 metre long having square cross section is pulled under a tensile load of 8 tonnes. The extension in the rod was 1 mm only. If $E_{\text{steel}} = 2 \times 10^6 \text{ kg/cm}^2$, the side of the rod, is

- A. 1 cm
- B. 1.5 cm
- C. 2 cm
- D. 2.5 cm

ANS: C

Q No: 158

The equivalent length of a column of length L, having both the ends hinged, is

- A. 2L
- B. L
- C. L/2
- D. L

ANS: B

Q No: 159

Pick up the correct statement from the following:

- A. The bending stress in a section is zero at its neutral axis and maximum at the outer fibres
- B. The shear stress is zero at the outer fibres and maximum at the neutral axis
- C. The bending stress at the outer fibres, is known as principal stress
- D. All the above

ANS: D

Q No: 160

Total strain energy theory for the failure of a material at elastic limit, is known

- A. Guest's or Trecas' theory
- B. St. Venant's theory
- C. Rankine's theory
- D. Haig's theory

ANS: D

Q No: 161

There are two hinged semicircular arches A, B and C of radii 5 m, 7.5 m and 10 m respectively and each carries a concentrated load W at their crowns. The horizontal thrust at their supports will be in the ratio of

- A. $1 : 1\frac{1}{2} : 2$
- B. $2 : 1\frac{1}{2} : 1$
- C. $1 : 1 : 2$
- D. None of these **ANS: C**

Q No: 162

The horizontal deflection of a parabolic curved beam of span 10 m and rise 3 m when loaded with a uniformly distributed load l t per horizontal length is (where I_c is the M.I. at the crown, which varies as the slope of the arch).

- A. $50/EI_c$
- B. $100/EI_c$

C. $150/EIc$

D. $200/EIc$

ANS: D

Q No: 163

For beams of uniform strength, if depth is constant,

A. Width $b \propto M$

B. Width $b \propto M^2$

C. Width $b \propto \sqrt{M}$

D. Width $b \propto 1/M$

ANS: A

Q No: 164

Stress may be expressed in Newtons

A. Per millimetre square (N/mm^2)

B. Per centimetre square (N/cm^2)

C. Per metre square (N/m^2)

D. None of these

ANS: A

Q No: 165

The maximum magnitude of shear stress due to shear force F on a rectangular section of area A at the neutral axis, is

A. F/A

B. $F/2A$

C. $3F/2A$

D. $2F/3A$

ANS: C

Q No: 166

The vertical reaction for the arch is

- A. $wa/2l$
- B. wl/a
- C. wa/l
- D. $wa^2/2l$

ANS: A

Q No: 167

Flat spiral springs

- A. Consist of uniform thin strips
- B. Are supported at outer end
- C. Are wound by applying a torque
- D. All the above

ANS: D

Q No: 168

In plastic analysis, the shape factor for a circular section, is

- A. 1.5
- B. 1.6
- C. 1.7
- D. 1.75

ANS: C

Q No: 169

In case of a simply supported rectangular beam of span L and loaded with a central load W , the length of elasto-plastic zone of the plastic hinge, is

A. $L/2$

B. $L/3$

C. $L/4$

D. $L/5$

ANS: B

Q No: 170

Pick up the correct statement from the following:

A. Hoop strain of the walls of a cylinder due to liquid is $(pd/2tE) (1 - 1/2m)$

B. Longitudinal strain in the walls of a cylinder due to liquid is $(pd/2 tE) (1/2 - 1/m)$

C. Volumetric change in the cylinder due to liquid is $(pd/2tE) (5/2 - 2/m)$

D. All the above

ANS: D

Q No: 171

The stiffness of the close coil helical spring is

A. $d^4N/8D^3n$

B. $d^4N/4D^3n$

C. $4D^3N/d^4n$

D. $8D^3N/d^4n$

ANS: A

Q No: 172

The ratio of the deflections of the free end of a cantilever due to an isolated load at $1/3$ rd and $2/3$ rd of the span, is

A. $1/7$

B. $2/7$

C. $3/7$

D. $2/5$

ANS: B

Q No: 173

The ratio of the length and diameter of a simply supported uniform circular beam which experiences maximum bending stress equal to tensile stress due to same load at its mid span, is

A. $1/8$

B. $1/4$

C. $1/2$

D. $1/3$

ANS: C

Q No: 174

The ratio of moments of inertia of a triangular section about its base and about a centroidal axis parallel to its base, is

A. 1.0

B. 1.5

C. 2.0

D. 3.0

ANS: D

Q No: 175

The ratio of shear stress and shear strain of an elastic material, is

A. Modulus of Rigidity

B. Shear Modulus

C. Modulus of Elasticity

D. Both A. and B.

ANS: D

Q No: 176

For permissible shear stress f_s , the torque transmitted by a thin tube of mean diameter D and wall thickness t , is

A. $(\pi/2) t f_s$

B. $(\pi/2) t f_s$

C. $D^2 t f_s$

D. $(\pi/4) f_s$

ANS: A

Q No: 177

At yield point of a test piece, the material

- A. Obeys Hooke's law
- B. Behaves in an elastic manner
- C. Regains its original shape on removal of the load
- D. Undergoes plastic deformation

ANS: D

Q No: 178

For the close coil helical spring of the maximum deflection is

- A. WD^3n/d^4N
- B. $2WD^3n/d^4N$
- C. $4W^2D^3n/d^4N$
- D. $8WD^3n/d^4N$

ANS: D

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