PH8151 - Engineering Physics

Dept. of Physics

Multiple Choice Questions (MCQ)

Regulations 2017 (Common to All)

UNIT I PROPERTIES OF MATTER

TOPIC 1.1 ELASTICITY

1. The property by which a body returns to its original shape after removal of the force is called __________
a) Plasticity
b) Elasticity
c) Ductility
d) Malleability

Answer: b
Explanation: When an external force acts on a body, the body tends to undergo some deformation. If the external force is removed and the body comes back to its original shape and size, the body is known as elastic body and this property is called elasticity.

2. The property of a material by which it can be beaten or rolled into thin plates is called __________
a) Malleability
b) Plasticity
c) Ductility
d) Elasticity

Answer: a
Explanation: A material can be beaten into thin plates by its property of malleability.

3. Which law is also called as the elasticity law?
a) Bernoulli's law
b) Stress law
c) Hooke's law
d) Poisson's law

Answer: c
Explanation: The hooke"s law is valid under the elastic limit of a body. It itself states that stress is proportional to the strain within the elastic limit.

4. The materials which have the same elastic properties in all directions are called __________
a) Isotropic
b) Brittle
c) Homogeneous
d) Hard

Answer: a
Explanation: Same elastic properties in all direction is called the homogenity of a material.

5. A member which does not regain its original shape after removal of the load producing deformation is said __________
a) Plastic
b) Elastic
c) Rigid
d) None of the mentioned

Answer: a
Explanation: A plastic material does not

regain its original shape after removal of load. An elastic material regain its original shape after removal of load.

6. The body will regain it is previous shape and size only when the deformation caused by the external forces, is within a certain limit. What is that limit?
a) Plastic limit
b) Elastic limit
c) Deformation limit
d) None of the mentioned

Answer: b
Explanation: The body only regain its previous shape and size only upto its elastic limit.

7. The materials which have the same elastic properties in all directions are called ___________
a) Isotropic
b) Brittle
c) Homogenous
d) Hard

Answer: a
Explanation: Isotropic materials have the same elastic properties in all directions.

8. As the elastic limit reaches, tensile strain ___________
a) Increases more rapidly
b) Decreases more rapidly
c) Increases in proportion to the stress
d) Decreases in proportion to the stress

Answer: a
Explanation: On reaching the tensile stress to the elastic limit after the proportionality limit, the stress is no longer proportional to the strain. Then the value of strain rapidly increases.

9. What kind of elastic materials are derived from a strain energy density function?
a) Cauchy elastic materials
b) Hypo elastic materials
c) Hyper elastic materials
d) None of the mentioned

Answer: c
Explanation: The hyper elastic materials are derived from a strain energy density function. A model is hyper elastic if and only if it is possible to express the cauchy stress tensor as a function of the deformation gradient.

10. What the number that measures an object's resistance to being deformed elastically when stress is applied to it?
a) Elastic modulus
b) Plastic modulus
c) Poisson's ratio
d) Stress modulus

Answer: a
Explanation: The elastic modulus is the ratio of stress to strain.

TOPIC 1.2 STRESS-STRAIN DIAGRAM AND ITS USES

1. The slope of the stress-strain curve in the elastic deformation region is ____________
a) Elastic modulus
b) Plastic modulus
c) Poisson's ratio
d) None of the mentioned

Answer: a
Explanation: The elastic modulus is the ratio of stress and strain. So on the stress strain curve, it is the slope.

2. What is the stress-strain curve?
a) It is the percentage of stress and stain
b) It is the relationship between stress and strain
c) It is the difference between stress and strain
d) None of the mentioned

Answer: b
Explanation: The relationship between stress

and strain on a graph is the stress strain curve. It represents the change in stress with change in strain.

3. Which point on the stress strain curve occurs after the proportionality limit?
a) Upper yield point
b) Lower yield point
c) Elastic limit
d) Ultimate point

Answer: c
Explanation: The curve will be stress strain proportional upto the proportionality limit. After these, the elastic limit will occur.

4. Which point on the stress strain curve occurs after the lower yield point?
a) Yield plateau
b) Upper yield point
c) Ultimate point
d) None of the mentioned

Answer: a
Explanation: The points on the curve comes in the given order,
A. proportionality limit
B. elastic limit
C. upper yield point
D. lower yield point
E. yield plateau
F. ultimate point
G. breaking point.

5. Which point on the stress strain curve occurs after yield plateau?
a) lower yield point
b) Upper yield point
c) Ultimate point
d) Breaking point

Answer: c
Explanation: After the yield plateau the curve will go up to its maximum limit of stress which is its ultimate point.

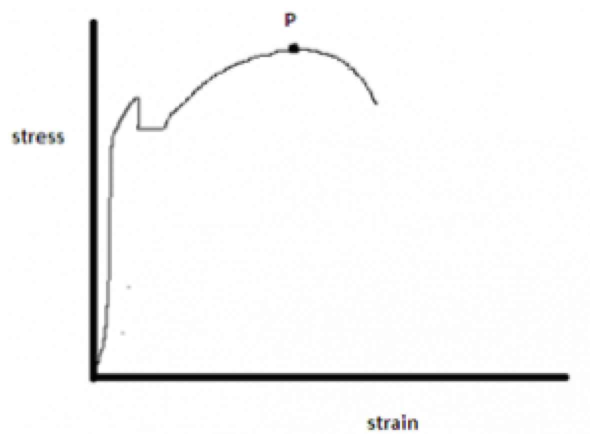
6. Which point on the stress strain curve occurs after the ultimate point?
a) Last point
b) Breaking point
c) Elastic limit
d) Material limit

Answer: b
Explanation: After the ultimate point the value of stress will reduce on increasing of strain and ultimately the material will break.

7. Elastic limit is the point ____________
a) up to which stress is proportional to strain
b) At which elongation takes place without application of additional load
c) Up to which if the load is removed, original volume and shapes are regained
d) None of the mentioned

Answer: c
Explanation: The elastic limit is that limit up to which any material behaves like an elastic material.

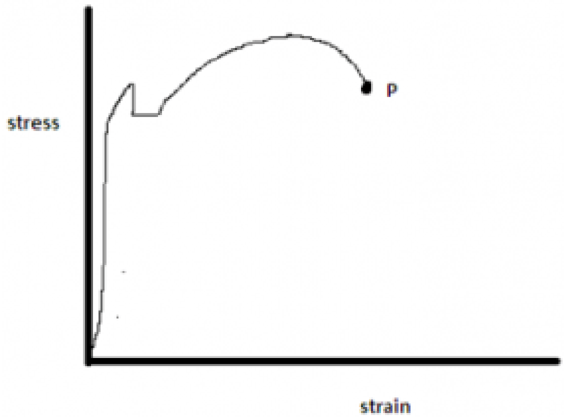
8. What is the point P shown on the stress strain curve?



a) Upper yield point
b) Yield plateau
c) Elastic limit
d) Ultimate point

Answer: d
Explanation: It is the point showing the maximum stress to which the material can be subjected in a simple tensile stress.

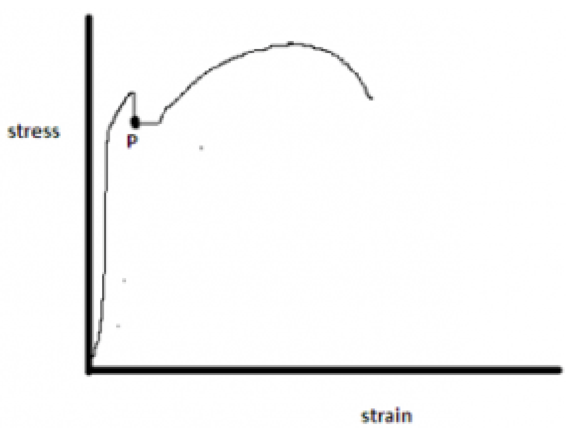
9. What is the point P shown in the stress-strain curve?



a) Lower yield point
b) Elastic limit
c) Proportionality limit
d) Breaking point

Answer: d
Explanation: The breaking point is the point where the material breaks. The breaking point will be the last point on the stress strain curve.

10. What is the point shown in the stress strain curve?



a) Elastic limit
b) Lower yield point
c) Yield plateau
d) Lower strain point

Answer: b
Explanation: It is the lower yield point at which the curve levels off and plastic deformation begins.

11. Where is the necking region?
a) The area between lower yield point and upper yield point
b) The area between the plastic limit and elastic limit
c) The area between the ultimate point and initial point
d) The area between the ultimate point and rupture

Answer: d
Explanation: Necking is a tensile strain deformation which is cased in after the ultimate amount of stress occurs in the material.

TOPIC 1.3 FACTORS AFFECTING ELASTIC MODULUS AND TENSILE STRENGTH

1. What is the elastic modulus of steel?
a) 69-79 GPa
b) 41-45 GPa
c) 190-217 GPa
d) 330-360 GPa

Answer: c
Explanation: Steel has an elastic modulus of 190-217 GPa. It has E higher than aluminum and magnesium alloys. But lower than tungsten and molybdenum alloys.

2. What is the elastic modulus of titanium alloys?
a) 150-170 GPa
b) 180-214 GPa
c) 80-130 GPa
d) 41-45 GPa

Answer: c
Explanation: Titanium alloys have the elastic modulus in the range of 80 to 130 GPa. It is greater than aluminum and magnesium alloys but lesser than steel.

3. What is the order of elastic modulus for Nickel alloys, Lead alloys, Molybdenum alloys, alumina?
a) Pb < Mo < Ni < Al_2O_3
b) Ni < Pb < Mo < Al_2O_3
c) Pb < Ni < Mo < Al_2O_3
d) Pb < Ni < Al_2O_3 < Mo

Answer: c
Explanation: Lowest elastic modulus is of Lead and its alloys of 14-18 GPa. Ni and Mo alloys have elastic modulus of 180-214 and 330-360 GPa respectively. Al_2O_3 has highest E among the four of 415 GPa.

4. What property enhances with a decrease in E?
a) Flexibility
b) Stiffness
c) Hardness
d) UTS

Answer: a
Explanation: The lower the elastic modulus of material, the more flexible it is. Bending of material becomes easier. On the other hand, stiffness decreases.

5. What is the unit of elastic modulus?
a) Mohs
b) GPa
c) Kg
d) N

Answer: b
Explanation: Elastic modulus is expressed in GPa. Mohs is the unit used for hardness. Stress is measured in MPa.

6. When applied stress is of shear type, the modulus of elasticity is known as ___
a) Bulk modulus
b) Modulus of resilience
c) Shear modulus
d) Stiffness

Answer: c
Explanation: When the type of stress applied is shear, E is known as shear modulus. It is also known as modulus of rigidity. Stiffness is measured in terms of E.

7. Which of the following tensile property is dimensionless?
a) Tensile stress
b) Elastic modulus
c) True strain
d) Toughness

Answer: c
Explanation: True strain is dimensionless property. Tensile strength and elastic modulus are measured in MPa and GPa respectively.

8. What is a factor which controls the elastic modulus?
a) Alloying
b) Heat treatment
c) Interatomic forces
d) Cold working

Answer: c
Explanation: On a constant temperature and pressure, E only is function of two factors. First is type of interatomic forces. Second is arrangement of atoms or crystal structure.

9. Stress should not exceed ___ when in service.
a) Yield strength
b) Tensile strength
c) Fracture strength
d) Toughness

Answer: a
Explanation: Above yield strength, material starts to deform plastically. It causes a change in dimensions and properties of a material. So material should be used below it.

10. Stress should not exceed ___ when in mechanical working
a) Yield strength
b) Tensile strength

c) Fracture strength
d) Toughness

Answer: b
Explanation: Mechanical working process consists of plastic deformation. So it is performed above yield strength. But it is limited below tensile strength so as to avoid fracture.

11. Ductility of material is its ability to flow plastically under compressive load.
a) True
b) False

Answer: b
Explanation: Ductility is a tensile property. It is studied under tensile loading. It is the ability to plastic flow without rupture.

12. Work per unit volume of the material is a known modulus of toughness.
a) True
b) False

Answer: a
Explanation: Toughness is measured by the amount of work per unit volume of the material under static loading. Work per unit volume of material is called modulus of toughness.

TOPIC 1.4 TORSIONAL STRESS AND DEFORMATIONS

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

Answer: d
Explanation: Modulus of elasticity in shear, torsion yield strength and modulus of rupture can all be determined by performing torsion test on material.

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

Answer: c
Explanation: The main job of weight head is to hold the job and measure the twisting moment.while twisting head holds the other end of job and applies twisting moment.

3. Which of the following is used to measure how much the specimen is twisted?
a) Micrometer
b) Clinometer
c) Troptometer
d) Tropometer

Answer: c
Explanation: Troptometer is an instrument which is used for measuring the angular distortion of the material. Mocrometer and vernier callipers are used to measure length. Tropometer measures amount of torsion for a bone.

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

Answer: a
Explanation: Torsional stress is given by the ratio of maximum twisting load and original are of cross section of the material. Therefore, torsional stress multiplied with original cross sectional gives us maximum twisting load.

5. Plastic deformation can only occur in case of torsional force.
a) True
b) False

Answer: b
Explanation: The above given statement is false as plastic deformation can occur in case of tensile, compressive and torsional load after a point. After this point, the body cannot recover its original shape.

6. What is the unit of polar moment of inertia?
a) m^2
b) m^5
c) m^3
d) m^4

Answer: d
Explanation: Polar moment of inertia denoted by J, is given by integration of radius square with respect to small area of cross-section. Hence the unit is $(m)(m)(m)^2$ which is equal to m^4.

7. Shear stress on a solid bar and hollow bar is same for given dimension.
a) True
b) False

Answer: b
Explanation: Shear stress for a hollow bar and a solid bar are different dimensions as the hollow bar has two dimensions, outer and inner radius because of which calculation is different than the solid bar which has only one diameter.

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

Answer: b
Explanation: When the torsion test is conducted in hot working, it is observed that for a slight change in torque on the given specimen the angle of twist increase fast as the material becomes soft at hot working temperature.

TOPIC 1.5 TWISTING COUPLE

1. Torque is __________ moment.
a) Twisting
b) Shear
c) Bending
d) Couple

Answer: a
Explanation: A cylindrical shaft is subjected to twisting moment or torque when a force is acting on the member tangentially at some radius in a plane of its cross section.

2. Twisting moment is a product of __________ and the radius.
a) Direction
b) Velocity
c) Force
d) Acceleration

Answer: c
Explanation: Twisting moment will be equal to the product of force and radius. When a shaft is subjected to a twisting moment, every cross section of the shaft will surely experience shear stress.

3. Torsion is denoted by __________
a) R
b) Q
c) T
d) N

Answer: c
Explanation: If the moment is applied in a plane perpendicular to the longitudinal axis of the beam (or) shaft it will be subjected to torsion. Torsion is represented or denoted by T.

4. The SI units for torsion is __________
a) N m
b) N

c) N/m
d) m

Answer: a
Explanation: As torsion is a product of perpendicular force and radius, the units will be N m.
Torque is also known as torsion or twisting moment or turning moment.

5. _____________ torsion is produced when twisting couple coincides with the axis of the shaft.
a) Exact
b) Pure
c) Nominal
d) Mild

Answer: b
Explanation: When a member is subjected to the equal and opposite twisting moment at its ends, then the member is said to be subjected under pure torsion. Pure Torsion is often produced when the axis of the twisting couple coincides with the axis of the shaft.

6. Which of the following is known as Re-entrant mouthpiece?
a) External Mouthpiece
b) Convergent Mouthpiece
c) Internal Mouthpiece
d) Cylindrical Mouthpiece

Answer: c
Explanation: According to the position, mouthpieces are classified as an external mouthpiece and internal mouthpiece. If the tube projects inside the tank, it is called an internal mouthpiece or re-entrant or borda's mouthpiece.

7. Micrometre contraction gauge is used to determine ___________
a) Cv
b) Cc
c) Ca
d) Cd

Answer: b
Explanation: The coefficient of contraction may be determined experimentally by measuring the radius of jet as vena contact with the help of micro meter contraction gauge. This method is not accurate because it is very difficult to measure the correct radius of jet.

8. What is the general value for coefficient of contraction?
a) 0.64
b) 0.67
c) 0.66
d) 0.7

Answer: a
Explanation: The ratio of the area of a jet at vena contracta to the area of orifice is known as the coefficient of contraction. The value of Cc varies from 0.61 to 0.69 for different orifices. Generally, for sharp edged orifice the value of Cc may be taken as 0. 64.

9. The Cd value for internal mouthpiece running free is __________
a) 0.6
b) 0.5
c) 0.7
d) 0.8

Answer: b
Explanation: The Cd value for internal mouthpiece running free is 0.5.

Type Of Mouthpiece	Value of Cd
External cylindrical mouthpiece	0.855
Internal mouthpiece running free	0.5
Internal mouthpiece running full	0.707

10. _______ is the velocity with which water reaches the notch or before it flows over it.
a) Velocity of contact
b) Velocity of moment

c) Velocity of approach
d) Velocity of head

Answer: c
Explanation: The velocity of approach is defined as the velocity with which water reaches the notch or weir before it flows over it. This velocity of approach creates an additional head "ha" equal to Va2 / 2g and effect head over the notch is increased to H+ha.

11. Which of the following formula was proposed by Bazin?
a) $m(2g)^{1/2} \times LH^{3/2}$
b) $m(2g)^{1/2} \times H^{3/2}$
c) $n(2g)^{1/2} \times LH^{4/3}$
d) $n(2g)^{1/2} \times LH^{3/2}$

Answer: a
Explanation: Bazin proposed the following formula for the discharge over rectangular weir:
$Q = m(2g)^{1/2} \times L\,H^{3/2}$.
Where m = 0.405 + 0.003/H.

12. For measuring low discharges _____________ notch is preferred.
a) Rectangular
b) Stepped
c) Trapezoidal
d) Triangular

Answer: d
Explanation: A triangular notch is preferred to a rectangular notch due to
i. The nappe emerging from a triangular notch has the same shape for all heads. As such the value for the triangular notch is constant for all heads.
ii. The expression for discharge for right angle triangle law not is very simple.

13. Which of the following is also known as V notch?
a) Trapezoidal
b) Stepped
c) Triangular
d) Sharp edged

Answer: c
Explanation: A triangular notch also called a v notch is of triangle shape with apex down. The expression of the discharge over triangular notch or weir is $Q = 8/15\ Cd\ (2g)^{1/2} \times H^{5/2}$.

14. Calculate the discharge over rectangular Weir of 3 metres length under the head of 400mm.Use Francis formula.
a) 1.268 m^3/s
b) 1.396 m^3/s
c) 1.475 m^3/s
d) 1.528 m^3/s

Answer: b
Explanation: Francis formula for discharge
$Q = 1.84\ LH^3/2$.
Given L = 3m & H = 0.4m
$Q = 1.84 \times 3 \times (0.4)^3/2$.
$Q = 1.396\ m^3/s$.

15. _____ converts mechanical energy into hydraulic energy.
a) Dynamo
b) Pump
c) Turbine
d) Generator

Answer: b
Explanation: A pump is a mechanical device which converts the mechanical energy into hydraulic energy. The hydraulic energy is in the form of pressure energy. The pumps are generally used for lifting liquid from a lower level to a higher level.

TOPIC 1.6 TORSION PENDULUM: THEORY AND EXPERIMENT

1. Torsional sectional modulus is also known as _________
a) Polar modulus
b) Sectional modulus
c) Torsion modulus
d) Torsional rigidity

Answer: a
Explanation: The ratio of polar moment of inertia to radius of section is called Polar modulus or Torsional section modulus. Its units are mm^3 or m^3 (in SI).

2. ________ is a measure of the strength of shaft in rotation.
a) Torsional modulus
b) Sectional modulus
c) Polar modulus
d) Torsional rigidity

Answer: c
Explanation: The polar modulus is a measure of the strength of shaft in rotation. As the value of Polar modulus increases torsional strength increases.

3. What are the units of torsional rigidity?
a) Nmm^2
b) N/mm
c) N-mm
d) N

Answer: a
Explanation: The product of modulus of rigidity (C) and polar moment of inertia (J) is called torsional rigidity. Torsional rigidity is a torque that produces a twist of one radian in a shaft of unit length.

4. The angle of twist can be written as _________
a) TL/J
b) CJ/TL
c) TL/CJ
d) T/J

Answer: c
Explanation: The angle of Twist = TL/CJ
Where T = Torque in Nm
L = Length of shaft
CJ = Torsional rigidity.

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

Answer: a
Explanation: In SI system, Power (P) is measured in watts (W) ; P = 2πNT/60
Where T = Average Torque in N.m
N = rpm
= 2πNT/ 45 1 watt = 1 Joule/sec = 1N.m/s.

6. Area of catchment is measured in ___________
a) mm^3
b) Km^2
c) Km
d) mm

Answer: b
Explanation: Catchment area can be defined as the area which contributes the surplus water present over it to the stream or river. It is an area which is responsible for maintaining flow in natural water bodies. It is expressed in square kilometres.

7. ______ catchment area is a sum of free catchment area and intercepted catchment area.
a) Total
b) Additional
c) Combined
d) Overall

Answer: c
Explanation: Combined catchment area is defined as the total catchment area which contributes the water in to stream or a tank. Combined Catchment area = Free catchment area + intercepted catchment area.

8. ___________ has steep slopes and gives more run off.
a) Intercepted Catchment Area
b) Good Catchment Area
c) Combined Catchment Area
d) Average Catchment Area

Answer: b
Explanation: Good catchment area consists of hills or rocky lands with steep slopes and little vegetation. It gives more run off.

9. How many number of rain gauge stations should be installed an area between 250 to 500 km^2.
a) 2
b) 4
c) 3
d) 5

Answer: c
Explanation: 3 number of rain gauge stations should be installed an area between 250 to 500 km^2.

Area of Basin(Km^2)	Number of Rain gauge stations
< 125	1
125 – 250	2
250 – 500	3

10. Trend of rainfall can be studied from _______
a) Rainfall graphs
b) Rainfall records
c) Rainfall curves
d) Rainfall cumulatives

Answer: b
Explanation: Rainfall records are useful for calculating run off over a basin. By using rainfall records estimate of design parameters of irrigation structures can be made. The maximum flow due to any storm can be calculated and predicted.

11. Estimation of run off "R" is 0.85P-30.48. The above formula was coined by _____
a) Lacey
b) Darcy
c) Khosla
d) Ingli

Answer: d
Explanation: Run off can be estimated by
R= 0.85P-30.48
Where R = annual runoff in mm
P = annual rainfall in mm.

12. Monsoon duration factor is denoted by ________
a) P
b) S
c) F
d) T

Answer: c
Explanation: Monsoon duration factor is denoted by F.

Class of Monsoon	Monsoon Duration Factor (F)
Very Short	0.5
Standard length	1.0
Very long	1.5

13. Runoff coefficient is denoted by _______
a) P
b) N
c) K
d) H

Answer: c
Explanation: The runoff coefficient can be defined as the ratio of runoff to rainfall. Rainfall and runoff can be interrelated by runoff coefficient.
R = KP
K = R/P [K = is a runoff Coefficient depending on the surface of the catchment area].

14. _________ is a graph showing variations of discharge with time.
a) Rising limb graph

b) Crest graph
c) Hydraulic graph
d) Gauge graph

Answer: c
Explanation: Hydrograph is a graph showing variations of discharge with time at a particular point of the stream. The hydrograph shows the time distribution of total run off at a point of measurement. Maximum flood discharge can also be calculated by using hydrograph.

15. Calculate the torque which a shaft of 300 mm diameter can safely transmit, if the shear stress is 48 N / mm^2.
a) 356 kNm
b) 254 kNm
c) 332 kNm
d) 564 kNm

Answer: b
Explanation: Given, the diameter of shaft D = 300 mm
Maximum shear stress fs = 48 N/mm^2.
Torque = T = $\pi/16$ fs D^3
= 254469004.9 Nmm
= 254 kNm.

TOPIC 1.7 BENDING OF BEAMS. BENDING MOMENT

1. What is the bending moment at end supports of a simply supported beam?
a) Maximum
b) Minimum
c) Zero
d) Uniform

Answer: c
Explanation: At the end supports, the moment (couple) developed is zero, because there is no distance to take the perpendicular acting load. As the distance is zero, the moment is obviously zero.

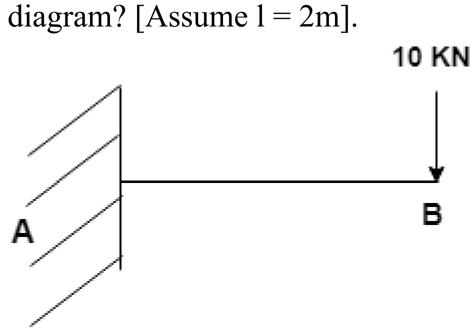
2. What is the maximum shear force, when a cantilever beam is loaded with udl throughout?
a) w×l
b) w
c) w/l
d) w+l

Answer: a
Explanation: In cantilever beams, the maximum shear force occurs at the fixed end. In the free end, there is zero shear force. As we need to convert the udl in to load, we multiply the length of the cantilever beam with udl acting upon. For maximum shear force to obtain we ought to multiply load and distance and it surely occurs at the fixed end (w×l).

3. Sagging, the bending moment occurs at the _____ of the beam.
a) At supports
b) Mid span
c) Point of contraflexure
d) Point of emergence

Answer: b
Explanation: The positive bending moment is considered when it causes convexity downward or concavity at top. This is sagging. In simply supported beams, it occurs at mid span because the bending moment at the supports obviously will be zero hence the positive bending moment occurs in the mid span.

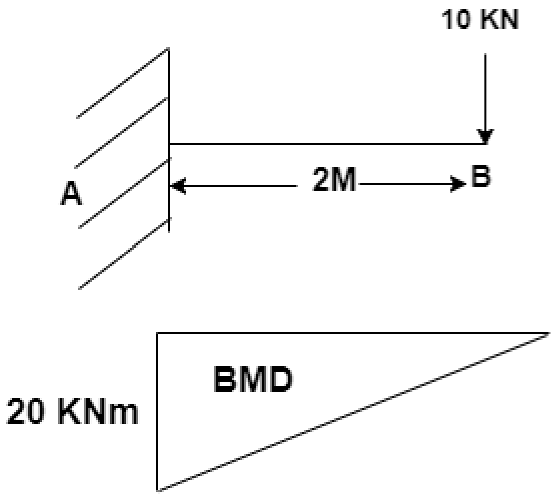
4. What will be the variation in BMD for the diagram? [Assume l = 2m].



a) Rectangular
b) Trapezoidal

c) Triangular
d) Square

Answer: c
Explanation: At support B, the BM is zero. The beam undergoes maximum BM at fixed end.
By joining the base line, free end and maximum BM point. We obtain a right angled triangle.

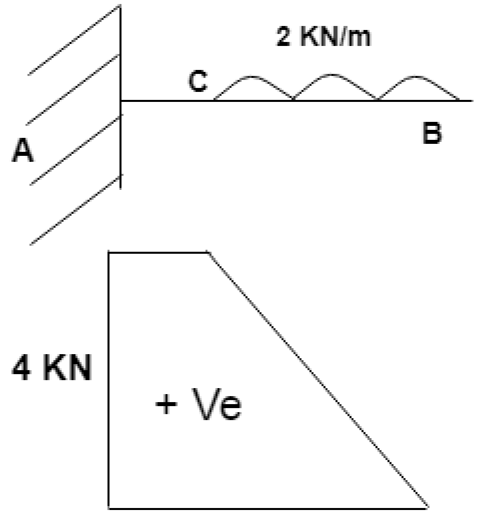


5. What is the maximum bending moment for simply supported beam carrying a point load "W" kN at its centre?
a) W kNm
b) W/m kNm
c) W×l kNm
d) W×l/4 kNm

Answer: d
Explanation: We know that in simply supported beams the maximum BM occurs at the central span.
Moment at A = Moment at B = 0
Moment at C = W/2 × l/2 = Wl/ 4 kNm (Sagging).

6. How do point loads and udl be represented in SFD?
a) Simple lines and curved lines
b) Curved lines and inclined lines
c) Simple lines and inclined lines
d) Cant represent any more

Answer: c
Explanation: According to BIS, the standard symbols used for sketching SFD are
Point load = ________
Udl load = \



7. ________ curve is formed due to bending of over hanging beams.
a) Elastic
b) Plastic
c) Flexural
d) Axial

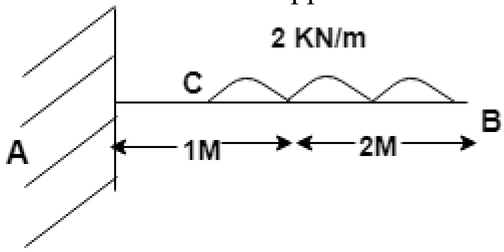
Answer: a
Explanation: The line to which the longitudinal axis of a beam bends or deflects or deviates under given load is known as elastic curve on deflection curve. Elastic curve can also be known as elastic line or elastic axis.

8. The relation between slope and maximum bending moment is ________
a) Directly proportion
b) Inversely proportion
c) Relative proportion
d) Mutual incidence

Answer: b
Explanation: The relationship between slope and maximum bending moment is inversely proportional because, For example in simply supported beams slope is maximum at supports and zero at midspan of a

symmetrically loaded beam where as bending moment is zero at supports and maximum at mid span. Hence we conclude that slope and maximum bending moment are inversely proportional to each other in a case of the simply supported beam.

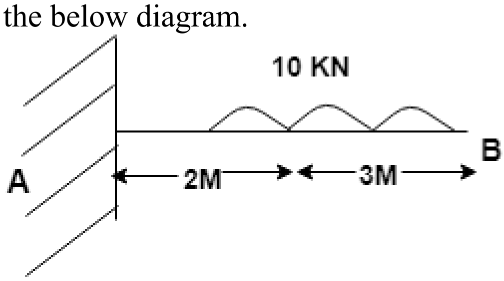
9. What is the SF at support B?



a) 5 kN
b) 3 kN
c) 2 kN
d) 0 kN

Answer: d
Explanation: Total load = 2×2 = 4kN
Shear force at A = 4 kN (same between A and C)
Shear force at C = 4 kN
Shear force at B = 0 kN
Maximum SF at A = 4 kN.

10. Where do the maximum BM occurs for the below diagram.



a) -54 kNm
b) -92 kNm
c) -105 kNm
d) – 65 kNm

Answer: c
Explanation: Moment at B = 0
Moment at C = – (10 × 3) × (3/2)
= – 45 kNm
Moment at A = – (10 × 3) × (1.5 + 2)
Maximum BM at A = – 105 kNm
= 105 Nm (hogging).

TOPIC 1.8 CANTILEVER: THEORY AND EXPERIMENT.

1. The ratio of maximum deflection of a beam to its ___________ is called stiffness of the beam.
a) Load
b) Slope
c) Span
d) Reaction at the support

Answer: c
Explanation: The stiffness of a beam is a measure of it's resistance against deflection. The ratio of the maximum deflection of a beam to its span can be termed as stiffness of the beam.

2. Stiffness of the beam is inversely proportional to the _____ of the beam.
a) Slope
b) Support reaction
c) Deflection
d) Load

Answer: c
Explanation: Stiffness of a beam is inversely proportional to the deflection. Smaller the deflection in a beam due to given external load, greater is its stiffness.

3. The maximum ____ should not exceed the permissible limit to the span of the beam.
a) Slope
b) Deflection
c) Load
dl Bending moment

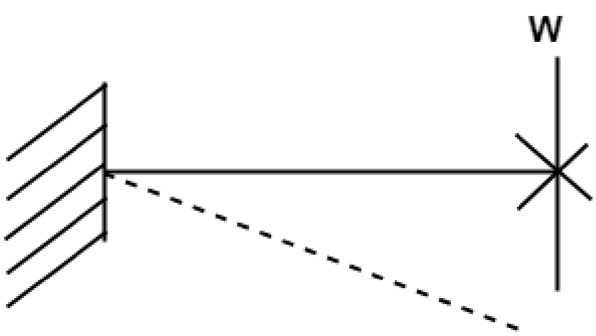
Answer: b
Explanation: The maximum deflection of a loaded beam should not exceed the permissible limit in relation to the span of a beam. While designing the beam the designer

should be keep in mind that both strength and stiffness criteria.

4. In cantilever beam the deflection occurs at ______
a) Free end
b) Point of loading
c) Through out
d) Fixed end

Answer: a
Explanation: Deflection can be defined as the perpendicular displacement of a point on straight access to the curved axis. In cantilever beams, the maximum deflection occurs at free end.

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



a) $Wl^3/2EI$
b) $Wl^3/3EI$
c) $Wl^3/4EI$
d) $Wl^2/2EI$

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

6. In an ideal fluid, the ____________ stresses are pretend to be absent.
a) Bending
b) Shearing
c) Tensile
d) Compressive

Answer: b
Explanation: An ideal fluid is a fluid where there is no resistance to the deformation. Ideal Fluids are those Fluids which have no viscosity surface tension. The shear stress is also absent. This fluid is also called as perfect fluid.

7. Air and water are the examples of ___________
a) Non Newtonian fluids
b) Vortex fluids
c) Real fluids
d) Ideal fluids

Answer: d
Explanation: The ideal Fluids are imaginary fluids in nature, they are incompressible. These fluids possess low viscosity. Air and water are considered as ideal fluids.

8. _______ fluids are practical fluids
a) Ideal
b) Real
c) Vortex
d) Newtonian

Answer: b
Explanation: These fluids possess properties such as viscosity, surface tension. They are compressible in nature. The certain amount of resistance is always offered by the fluids, they also possess shear stress. They are also known as practical fluids.

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

Answer: a
Explanation: The specific weight (weight density) of a fluid is weight per unit volume.

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

10. The inverse of specific weight of a fluid is __________
a) Specific gravity
b) Specific Volume
c) Compressibility
d) Viscosity

Answer: b
Explanation: Specific volume is the volume of the fluid by Unit Weight it is the reciprocal of specific weight is denoted by "v". SI units are m^3/N.
v= 1/specific weight.

11. Calculate the specific gravity of mercury.
a) 12.5
b) 14.7
c) 13.6
d) 11.8

Answer: c
Explanation: The specific gravity of any fluid is the ratio of the specific weight of fluid by specific weight of water. For mercury, the specific weight is 133416 N/m^3. For water, w = 9810 N/m^3.
S = 133416/9810
S= 13.6.

12. Specific gravity of water is __________
a) 0.8
b) 1
c) 1.2
d) 1.5

Answer: b
Explanation: The specific gravity is also called as relative density. It is dimensionless quantity and it has no units. The specific gravity of water is the ratio of specific weight of fluid to specific weight of water, as both the numerator and denominator are same. The value is 1.

13. Compute the maximum deflection at free end of a cantilever beam subjected to udl for entire span of l metres.
a) $wl^4/8EI$
b) $wl^4/4EI$
c) $wl^3/8EI$
d) $wl^2/6EI$

Answer: a
Explanation: The slope at free end = A/EI = $wl^3/6EI$
Maximum deflection at free end is Ax/EI; [x= ¾ l] y= $wl^3/6EI \times ¾ l = wl^4/8EI$.

14. Calculate the maximum deflection of a cantilever beam with udl on entire span of 3m the intensity of you udl be 25 kN/m. Take EI as 4000 kN/m^2.
a) 0.052m
b) 0.063m
c) 0.076m
d) 0.09m

Answer: b
Explanation: For cantilever beams with udl on entire span, the maximum deflection = $wl^4/8EI$
$y = wl^4/8EI = 25 \times 3^4/ 8 \times 4000 = 0.063m$.

15. Which of the following is not an example of Malleability?
a) Wrought Iron
b) Ornamental silver
c) Torsteel
d) Ornamental gold

Answer: c
Explanation: Torsteel is an example of mechanical property ductility. The ductility is a property of a material by which material can be fractured into thin wires after undergoing a considerable deformation without any rupture.

TOPIC 1.9 UNIFORM AND NON-UNIFORM BENDING: THEORY AND EXPERIMENT

TOPIC 1.10 I-SHAPED GIRDERS

1. A beam section is provided on the basis of (i) section modulus, (ii) deflection, (iii) shear
a) i, ii
b) ii, iii
c) i, iii
d) i, ii and iii

Answer: d
Explanation: A beam section is provided on the basis of (i) section modulus, (ii) deflection, (iii) shear. The beam should be economical with furnishing required modulus of section.

2. Which of the following is not correct?
a) Angles and T section are strong in bending
b) Channels can be used only for light loads
c) I sections are most efficient and economical shapes
d) I section with cover plates are provided when large section modulus is required

Answer: a
Explanation: Angles and T section are weak in bending. Channels can be used only for light loads. I sections (rolled and built-up) are most efficient and economical shapes. I section with cover plates are provided when large section modulus is required. Generally, ISLB or ISMB are provided in such cases.

3. Local buckling can be prevented by
a) limiting width-thickness ratio
b) increasing width-thickness ratio
c) changing material
d) changing load on member

Answer: c
Explanation: Local buckling of compression members of beam causes loss of integrity of beam cross section. It is a function of width-thickness ratio and can be prevented by limiting width-thickness ratio.

4. Which of the following is true?
a) in case of rolled section, less thickness of plate is adopted to prevent local buckling
b) for built-up section and cold formed section, longitudinal stiffeners are not provided to reduce width to smaller sizes
c) local buckling cannot be prevented by limiting width-thickness ratio
d) in case of rolled section, high thickness of plate is adopted to prevent local buckling

Answer: d
Explanation: In case of rolled section, higher thickness of plate is adopted to prevent local buckling. Local buckling cannot be prevented by limiting width-thickness ratio. For built-up section and cold formed section, longitudinal stiffeners are provided to reduce width to smaller sizes.

5. Which of the following is not true?
a) only plastic section can be used in intermediate frames
b) slender sections are preferred in hot rolled structural steelwork
c) compact sections can be used in simply supported beams
d) semi-compact sections can be used for elastic designs

Answer: b
Explanation: Only plastic section can be used in intermediate frames which form collapse mechanism. Compact sections can be used in simply supported beams which fail after reaching Mp at one section. Semi-compact sections can be used for elastic designs where section fails after reaching My at extreme fibres. Slender sections are not preferred in hot rolled structural steelwork, but they are extensively used in cold formed members.

Answer: b
Explanation: When there is an eccentric load it means that the load is at some distance from the axis. This causes compression in one side and tension on the other. This causes bending stress.

4. What is the expression of the bending equation?
a) $M/I = \sigma/y = E/R$
b) $M/R = \sigma/y = E/I$
c) $M/y = \sigma/R = E/I$
d) $M/I = \sigma/R = E/y$

Answer: a
Explanation: The bending equation is given by $M/I = \sigma/y = E/R$
where
M is the bending moment
I is the moment of inertia
y is the distance from neutral axis
E is the modulus of elasticity
R is the radius.

5. On bending of a beam, which is the layer which is neither elongated nor shortened?
a) Axis of load
b) Neutral axis
c) Center of gravity
d) None of the mentioned

Answer: b
Explanation: When a beam is in bending the layer in the direction of bending will be In compression and the other will be in tension. One side of the neutral axis will be shortened and the other will be elongated.

6. The bending stress is ____________
a) Directly proportional to the distance of layer from the neutral layer
b) Inversely proportional to the distance of layer from the neutral layer
c) Directly proportional to the neutral layer
d) Does not depend on the distance of layer from the neutral layer

Answer: a
Explanation: From the bending equation $M/I = \sigma/y = E/R$
Here stress is directly proportional to the distance of layer from the neutral layer.

7. Consider a 250mmx15mmx10mm steel bar which is free to expand is heated from 15C to 40C. what will be developed?
a) Compressive stress
b) Tensile stress
c) Shear stress
d) No stress

Answer: d
Explanation: If we resist to expand then only stress will develop. Here the bar is free to expand so there will be no stress.

8. The safe stress for a hollow steel column which carries an axial load of 2100 kN is 125 MN/m^2. if the external diameter of the column is 30cm, what will be the internal diameter?
a) 25 cm
b) 26.19cm
c) 30.14 cm
d) 27.9 cm

Answer: b
Explanation: Area of the cross section of column = $\pi/4\ (0.30^2 - d^2)\ m^2$
Area = load / stress.
So, $\pi/4\ (0.30^2 - d^2)\ m^2 = 21 / 125$
d = 26.19cm.

Sanfoundry Global Education & Learning Series – Strength of Materials.

UNIT II WAVES AND FIBER OPTICS