

KSEB Sub Engineer Model Exam



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1. If σ_s is the shear stress in the bar and τ_{bd} is the design bond stress, then the development length of the diameter ϕ of

A $4\phi\sigma_s$

B $\frac{\phi\sigma_s}{4\tau_{bd}}$

C $\frac{2\phi\sigma_s}{3\tau_{bd}}$

D $\frac{\phi\sigma_s}{3\tau_{bd}}$

Solution

- DEVELOPMENT LENGTH
- Development length is the minimum length of bar which must be embedded in concrete beyond any section to develop by bond (between the concrete and steel), a force equal to the total tensile force in the bar at that section.
- Development length is represented by a symbol L_d and it is expressed in terms of the diameter of the bar.

$$L_d = \frac{\phi\sigma_s}{4\tau_{bd}}$$

2. Trimmed size of 'A1' drawing paper

A 210 mm x 297 mm

B 420 mm x 594 mm

C 594 mm x 841 mm

D 297 mm x 420 mm

Solution

- Trimmed size of A1 paper is 594 x 841mm.
- Size of drawing sheets: While working or handling, the papers are liable to tear on the edges. So slightly large size (untrimmed) sheets are preferred.
- They are trimmed afterwards. IS:10811:1983 lays down such as designation of preferred trimmed and untrimmed sizes.

3. The command used in Auto Cad, for shorten object using other object :

A Trim

B Erase

C Delete

D None of these

Solution

- To trim an object:
- Type tr in the command line.
- Optionally select the line(s) you want to trim (otherwise all objects are used, which is fine in most cases).
- [enter]; select the objects to trim.

4. In a singly reinforced beam section depth of actual N.A is more than the critical N.A, the section is known as :

- A Balanced section
- B Under reinforced section
- C Over reinforced section
- D Critical section

Solution

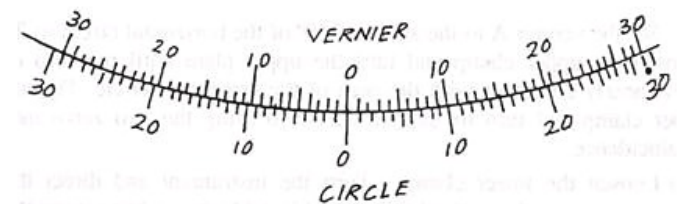
- A balanced sections is that in which stress in concrete and steel reach their permissible value at the same time.
- In an under-reinforced concrete beam, actual depth of neutral axis is less than the critical depth of neutral axis.
- In an over reinforced beam the quantity of steel is increased in the tension side of the beam thus the neutral axis shifts towards the reinforcement.

5. In double Vernier theodolite :

- A Main scales are marked in one direction
- B Main scales are marked in both directions
- C Attached single vernier
- D One single vernier is marked

Solution

- With a simple vernier, readings can be taken in one direction only.
- A double vernier is required when the graduations on main scale are marked in both directions from the common zero, such as in Abney's level.
- In a double vernier, two simple verniers are placed end to end forming one scale with the zero in the centre.
- One is used for readings in the clockwise direction and the other for the readings in the anticlockwise direction.



6. An optical instrument used in modern surveying, archeology, investigation and for military service etc. is :

A theodolite

B total station

C dumpy level

D prismatic compass

Solution

- **Theodolite** is the instrument used for measuring horizontal and vertical angles.
- An optical instrument used in modern surveying, archeology, investigation and for military service etc. is **total station**.
- **Total station** is the combination of *electronic theodolite and EDM(Electronic Distance Measurement)*.
- The **dumpy level** is an optical surveying leveling instrument .
- A **prismatic compass** is a navigation and surveying instrument which is extensively used to find out the bearing of the traversing and included angles between them.

7. The mechanical efficiency of an impulse turbine is :

A

Ratio of actual work available at turbine to the energy imparted to the wheel

B

Ratio of actual power produced by the turbine to the energy actually supplied by the turbine

C

Ratio of work done on the wheel to the energy of jet

D

None of above

Solution

- The mechanical efficiency of an impulse turbine is the ratio of the actual work available at the turbine to the energy imparted to the wheel.
- The overall efficiency of an impulse turbine is the ratio of the actual power produced by the turbine to the energy actually supplied by the turbine.

8. Francis turbine is _____.

A

Impulse turbine

B

Radial flow impulse turbine

C

Axial flow turbine

D

Inward radial flow reaction turbine

Solution

- Francis turbines are medium head and medium flow turbines.
- Francis turbines are inward mixed flow type reaction turbines.
- In the modern Francis turbine water enters the runner of the turbines in radial direction and leaves in the axial direction at the outlet of the runner.

9. The water required for irrigation is supplied in accordance with the crop requirements through out the crop period is

- A Lift irrigation
- B Inundation irrigation
- C Storage irrigation
- D Perennial irrigation

Solution

- The water required for irrigation is supplied in accordance with the crop requirements through out the crop period is perennial irrigation.
- This system supply water to the crops through a canal distribution system that takes off from a weir or a reservoir.

10. The main function of a diversion head works of a canal from a river is

- A To remove slit
- B To store water
- C To control floods
- D To raise water level

Solution

Diversion head works

- Weir or barrage is constructed across a perennial river to raise water level and to divert the water to canal, is known as diversion head work.
- Flow of water in the canal is controlled by canal head regulator.

Objective of diversion head work

- It raises the water level on its upstream side.
- It regulates the supply of water into canals.
- It controls the entry of silt into canals

11. Hydraulic energy is converted into another form of energy by hydraulic machines. What form of energy is that?

A Mechanical Energy

B Electrical Energy

C Nuclear Energy

D Elastic Energy

Solution

- Hydraulic machines firstly convert the energy possessed by water into mechanical energy.
- Later it can be transformed into electrical energy.

12. Which of the following scales is an enlarging scale?

A 5 : 1

B 1 : 1

C 0.5 : 1

D 1 : 5

Solution

- Enlarging scale means that the drawing is larger than the actual object.
- Hence the representative fraction will be greater than unity.
- For reducing scale the representative fraction is less than unity.
- Here, 5:1 is an enlarging scale.
- The representative fraction 5:1 indicates that the dimension of the drawing is five times larger than of the actual object.

13. Mid ordinate of a simple circular curve is given by

A $R(1 - \cos\Delta/2)$

B $R(1 - \sec\Delta/2)$

C $R(\cos\Delta/2 - 1)$

D $R(\sec\Delta/2 - 1)$

Solution

- The ordinate joining the midpoint of curve and long chord is called mid ordinate.
- It is also known as versed sine of curve given by $R \text{versin}\Delta/2$

14. The tacheometric method of contouring is suitable for

A When a contoured map of a hill

B When the area is not very extensive

C In surveying of road or railways

D All of the above

Solution

- Tacheometric method is also called radial line method.
- In this method, a number of radial lines are set out at known angular interval at each station.
- The contour of desired values are then located by interpolation.

15. The floors below ground floor is called

A Upper floor

B Sky floor

C Cellar

D Plinth

Solution

- Horizontal solid construction which subdivide the vertical structure is called floor.
- Exposed top surface of a floor is called flooring.
- The floors above ground floor is called upper floor.
- The floors below ground floor is called basement floor or cellar.

16. Rock formed by cooling of magma takes place at earth's surface

A Basalt

B Dolerite

C Granite

D All of the above

Solution

- Rock formed by cooling of magma takes place at earth's surface Volcanic rock.
- Cooling rate of magma is very rapid
- Volcanic rock have extremely fine grained structure
- Eg : Basalt, trap

17. Tool used for rough dressing of stone is

A Spirit level

B Plumb bob

C Spall hammer

D Scabbling hammer

Solution

- Spall hammer - used for rough dressing of stone.
- Spirit level – to check horizontality.
- Plumb bob – to check verticality.
- Scabbling hammer – to remove bushings.

18. Pourable form of slaked lime is called

A Milk

B Chalk

C Milk of lime

D Lime stone

Solution

- Process of converting quick lime to its hydrated form is called slaking.
- $Ca(OH)_2$ is called Water lime or Slaked lime.
- Pourable form of slaked lime is called Milk of lime.

19. Cause of dampness in buildings is

A Moisture rising up the walls from ground

B Poor drainage at the building site

C Rain beating against external walls

D All of the above

Solution

- Causes of dampness
 - Moisture rising up the walls from ground
 - Rain travel from wall tops
 - Rain beating against external walls
 - Poor drainage at the building site
 - Defective construction

20. _____ is the process of forcing the cement grout under pressure into cracks, voids, fitters present in structural components.

A Calcination

B Cementation

C Pointing

D Plastering

Solution

- Cementation is the process of forcing the cement grout (mix of cement, sand, water) under pressure into cracks, voids, fitters present in structural components/ground.
- All the components of a structure in general and foundation, which are liable to moisture penetration are consolidated and so made water resistant by this process.

21. The aggregate used in the preparation of mortar is termed as

A Matrix

B Adulterants

C Mortar

D Concrete

Solution

- The term mortar is used to describe the paste obtained by the addition of water in the mixture of binding material like cement or lime and aggregates like sand.
- The binding material used in the preparation of mortar is termed as matrix.
- The aggregate used in the preparation of mortar is termed as adulterants.

22. Marks or signs placed by chips on the finished surface of timber is

A Torn grain

B Diagonal grain

C Chip mark

D Wane

Solution

- Chip Mark : Marks or signs placed by chips on the finished surface of timber.
- Diagonal Grain : Formed due to improper sawing.

23. A brick laid vertically with the long narrow side of the brick exposed.

A Stretcher

B Soldier

C Sailor

D Header

Solution

- Stretcher: A brick laid with its long narrow side exposed.
- Header: A brick laid flat with its width at the face of the wall.
- Soldier: A brick laid vertically with the long narrow side of the brick exposed.
- Sailor: A brick laid vertically with the broad face of the brick exposed.

24. Type of scaffolding provided when there is no proper hard ground is available for the standard to rest.

A Suspended scaffolding

B Cantilever scaffolding

C Trestle scaffolding

D All of the above

Solution

- Cantilever scaffolding is provided when there is no proper hard ground is available for the standard to rest.
- Cantilever scaffolding is also called as Needle scaffolding.

25. _____ level combines good features of both dumpy level and Y - level.

A Reversible level

B Cushing level

C Tilting level

D Automatic level

Solution

- In Reversible level, the telescope can be withdrawn from the socket and reversed.
- The telescope is pushed into the socket and the screw is tightened , the level act as dumpy level.

26. The item does not included in plinth area

A Courtyard

B Open areas

C Cantilever projections

D All of the above

Solution

- Plinth area is the built up covered area of a building.
- Plinth offsets, courtyard, open areas, balconies, cantilever projections are not included in the plinth area.

27. _____ is not included in floor area.

A Kitchen

B Veranda

C Sill of doors

D All of the above

Solution

- Floor area is the total area of floors in between walls.
- It consists of floor of all rooms, veranda, passages, entrance hall, kitchen, store room, etc.
- Sill of doors is not included in floor area.

28. Kaplan turbine is operated under _____.

A Low head and high discharge

B High head and low discharge

C Medium head and high discharge

D Medium head and medium discharge

Solution

- Based on heads and discharges, turbines are classified into Pelton, Francis or Kaplan.
- Kaplan has low head and high discharge.

29. As per NBC, group J buildings belong to

A Education

B Industrial

C Storage

D Hazardous

Solution

Group	Type of Building
A	Residential
B	Education
C	Institutional
D	Assembly
E	Business
F	Mercantile
G	Industrial

Group	Type of Building
H	Storage
J	Hazardous

30. **Base period of a crop is**

A The time interval from sowing to harvesting.

B **The time interval from first watering at the time of sowing to last watering done before harvesting.**

C The duration when the crop has grown few centimetres and harvesting.

D None of these

Solution

- The time interval from first watering at the time of sowing to last watering done before harvesting is called base period.
- It is expressed in days.
- The time interval from sowing to harvesting is called crop period.
- Crop period is greater than base period.

31. **A theodolite is called a transit theodolite, when its telescope can be revolved through a complete revolution about its**

A Vertical axis in an inclined plane

B Horizontal axis in an inclined plane

C Vertical axis in a horizontal plane

D **Horizontal axis in a vertical plane**

Solution

- Theodolites may be classified into as:
 - Transit theodolite: A theodolite is said to be transit one when its telescope can be revolved through 180 degree in a vertical plane about its horizontal axis, thus directing the telescope in the exact opposite direction.
 - Non transit theodolite: A theodolite is said to be non-transit one when its telescope cannot be revolved through 180 degree in a vertical plane about its horizontal axis.
- Therefore in a transit theodolite, the line of sight can be reversed by revolving the telescope through 180 degree in vertical plane.

32. An orthographic projection map is a map projection of

A Sphere

B Earth

C Cartography

D Top view

Solution

- Like the stereographic projection and gnomonic projection, orthographic projection is a perspective (or azimuthal) projection, in which the sphere is projected onto a tangent plane or secant plane.
- The point of perspective for the orthographic projection is at infinite distance.
- It depicts a hemisphere of the globe as it appears from outer space, where the horizon is a great circle.
- The shapes and areas are distorted, particularly near the edges.

33. The rate of hydration and hydrolysis of cement depends upon its

A Soundness

B Fineness

C Setting time

D Tensile strength

Solution

- During use of cement in structure water is mixed with cement.
- A chemical reaction takes place between water and cement and it's called hydration.
- The strength of cement concrete or mortar develops with hydration. More the rate of hydration faster development of strength.
- Finer cement higher the rate of hydration and so faster the development of strength.
- This is because finer cement offers great surface area of particles of hydration. At the same time rate of development of heat due to hydration also increases.

34. Carpet area means _____.

A Plinth area minus area occupied by wall

B Total floor area minus circulation area

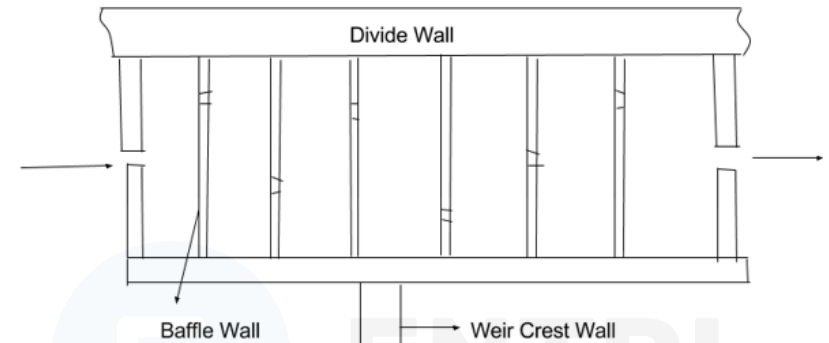
C Area above plinth level

D Plot area of the site

Solution

- Carpet area of building is the useful area or liveable area or lettable area.
- This is the total floor area minus the circulation area, verandahs, corridors, passages, staircase, lifts, entrance hall, etc. and minus other non-usable areas as sanitary accommodations (bath and W.Cs.), air conditioning room etc.

35. What does the diagram represent?



A Divide wall

B Plan of fish ladder

C Scouring sluices

D Canal head regulator

Solution

- The figure represents the plan of a fish ladder installed in the channel, where the water comes to the channel from end and leaves it at the other end.
- Baffle walls are also provided in the path to control the silt and sediment load and also the velocity of the flow, thus helping the fish.

36. If the crushing load of a column is 3000 kN and the Euler's load is 2000 kN, then the Rankine's load is

A 1200 kN

B 3000 kN

C 2000 kN

D 1000 kN

Solution

- $\frac{1}{P_R} = \frac{1}{P_C} + \frac{1}{P_E}$, where P_R is the Rankine's load, P_C is the crushing load, P_E is the Euler's load.
- $P_C = 3000 \text{ kN}$, $P_E = 2000 \text{ kN}$
- $\therefore \frac{1}{P_R} = \frac{1}{P_C} + \frac{1}{P_E} = \frac{1}{3000} + \frac{1}{2000} = \frac{5}{6000}$
 $\Rightarrow P_R = 1200 \text{ kN}$

37. The linear method of laying out a simple circular curve is:

A Rankine's method of deflection angle

B Two theodolite method

C Tacheometric method

D Chain and tape method

Solution

- Rankine's method, two theodolite method and tacheometric method are angular method.
- Hence option (D) is the answer.

38. Which of the following is a medium head turbine?

A Kaplan Turbine

B Francis Turbine

C Pelton Wheel

D All of the above

Solution

Classification of Turbine based on water head:

Head	Head in meter	Turbine used
Low	<30m	Kaplan Turbine
Medium	30m-200m	Francis Turbine
High	>200m	Pelton Wheel

Based on Action of Water

- Impulse turbine- Pelton Wheel
- Reaction Turbine- All other turbines

39. The intensity of irrigation is the

- A Percentage of gross command area to be irrigated annually.
- B Percentage of culturable command area to be irrigated annually.
- C Percentage of minimum land area to be irrigated annually.
- D Percentage of total land area to be irrigated annually.

Solution

- Gross command area is the total area that can be irrigated by a canal system if unlimited quantity of water is available.
- Culturable command area is the portion of gross command area that can be effectively used for cultivation.
- The intensity of irrigation is the percentage of culturable command area to be irrigated annually.

40. As per IS 456, 'pedestal' is a vertical compression member whose effective length is

- A Less than two times its least lateral dimension
- B Less than three times its least lateral dimension
- C Less than four times its least lateral dimension
- D Less than twelve times its least lateral dimension

Solution

- Pedestal is a vertical compression member whose effective length does not exceed three times of its least horizontal dimension .
- Column is a vertical compression member whose unsupported length shall not exceed sixty times of least lateral dimension if restrained at the two ends.

41. During the process of hydration of cement, due to increase in di calcium silicate content in cement clinker

- A Does not change
- B Decreases
- C Initially decreases and then increases
- D Increases

Solution

- Raising of C_2S content renders clinker harder to grind, reduces esrly strength.
- It also decreases resistance to freezing and thawing at early ages and decreases the heat of hydration.
- Dicalcium silicate is an important constituent of Portland cement clinker (comprising 10%–40% by weight of the phases present).

42. The batching tolerance for aggregates as per IS 456 is

- A $\pm 1\%$
- B $\pm 2\%$
- C $\pm 3\%$
- D $\pm 4\%$

Solution

- The accuracy of the measuring equipment shall be within $\pm 2\%$ of the quantity of cement being measured.
- The accuracy of the measuring equipment shall be within $\pm 3\%$ of the quantity of aggregate, admixtures and water being measured.

43. The test which is conducted to find out the workability of stiff concrete mix having very low workability is

A Compaction test

B Slump test

C Vee-bee test

D All of these

Solution

- Depending upon the water cement ratio in the concrete mix, the workability may be determined by the following three methods.
 - Slump test - This method is suitable only for the concrete of high workability.
 - Compaction factor test - This method is adopted for determining the workability of concrete mix in laboratories. It gives fairly good results for concrete of low workability.
 - Vee-bee consistometer test - This method is suitable for dry concrete having very low workability.

44. Which of the following types of survey is not based on the object of survey

A Engineering survey

B Geological survey

C Military survey

D Astronomical survey

Solution

- Survey are classified based on objective are Engineering survey, Military survey, Mine survey, Geological survey, Archeological survey
- Astronomical survey is a general map or image of a region of the sky which takes a specific observational target

45. Flow diagram consists of activities and events connected logically and sequentially is

A Activity

B Network

C Event

D Bar chart

Solution

- Network is a flow diagram consists of activities and events connected logically and sequentially.
- Activities: Actual performance of the task, consumes time and resources.

46. The work content required to be achieved to accomplish an event is called

A Event

B Activity

C Network

D Bar chart

Solution

- The work content required to be achieved to accomplish an event is called activity.
- Event: The start or completion of task, do not consume time and resources.

47. CPM is

A Probabilistic approach

B Deterministic approach

C Both of the above

D None of the above

Solution

- CPM is deterministic approach.
- One time estimate is made for activity completion.
- It is used for repetitive works.

48. Slack greater than zero, then the event is

A Subcritical event

B Critical event

C Super critical event

D All of the above

Solution

- Slack greater than zero, then the event is subcritical event.
- Slack is equal to zero, then the event is critical event.
- Slack less than zero, then the event is super critical event.

49. 3 time estimates of activities are in

A CPM

B PERT

C Both of the above

D CADD

Solution

- 3 time estimates of activities are in PERT.
- Only 1 time estimate is possible in CPM.

50. Incidental expenses of miscellaneous character which cannot be classified under any distinct item sub-head, yet certain to the work as a whole is called

A Work charged establishments

B Centage charge

C Contingencies

D Schedule of rate

Solution

- The term 'Contingencies; indicates incidental expenses of miscellaneous character which cannot be classified under any distinct item sub-head, yet certain to the work as a whole.
- In a detailed estimate the provision for contingencies is, usually 3 to 5 %
- 5% to 10% is added as contingencies in approximate estimate.

51. It contains the detailed description of all workmanship and materials which are required to complete an engineering project

A Schedule of rate

B Specifications

C Assignment

D Data book

Solution

- Specifications contains the detailed description of all workmanship and materials which are required to complete an engineering project.
- Specifications have to be furnished seperately with drawings.

52. Earthwork is measured by using

A Trapezoidal formula

B Prismoidal formula

C Simpson's formula

D All of the above

Solution

- Earthwork is measured by using
 - Trapezoidal formula
 - Prismoidal formula
 - Simpson's formula
 - Mid section formula

53. What kind of turbines change the pressure of water entering into it

A Reaction turbine

B Impulse turbine

C Reactive turbine

D Kinetic turbine

Solution

Reaction turbine which act on water try to change the pressure of water through its motion

Reaction turbines are the turbines that use the pressure as well as the velocity of the moving water to rotate.

54. The ratio of manometric head to the head imparted by impeller to the water is:

A Mechanical efficiency

B Overall efficiency

C Manometric efficiency

D None of the above

Solution

- Manometric efficiency:-The ratio of manometric head to the head imparted by impeller.
- Mechanical efficiency :-The ratio of power delivered by the impeller to the liquid to the power input to the shaft.
- Overall efficiency:-Ratio of power output of the pump to power input to the pump or shaft.

55. _____ is connected with the inlet of the impeller and the other end is dipped into the sump of water.

A Casing

B Impeller

C Suction pipe

D Delivery pipe

Solution

- Suction pipe is connected with the inlet of the impeller and the other end is dipped into the sump of water.
- At the water end, it consists of foot valve and strainer.
- The foot valve is a one way valve that opens in the upward direction.
- The strainer is used to filter the unwanted particle present in the water to prevent the centrifugal pump from blockage.

56. Otto cycle is a constant _____ cycle.

A Temperature

B Pressure

C Volume

D None of these

Solution

- Otto cycle is also called constant volume cycle
- Otto cycle consist of four processes :
 1. Reversible adiabatic compression of air.
 2. Heat addition at constant volume.
 3. Reversible adiabatic expansion of air.
 4. Heat rejection at constant volume.

57. Which of the following are disadvantages of external combustion engine ?

A High fuel loss when engine is not running

B Temperature produced inside the cylinder is too high

C Only liquid fuels can be used

D Both B and C

Solution

- In external combustion engine fuel has to be burn even when the engine is not running for small halts.
- Temperature inside the cylinder is comparatively low.
- Solid or liquid fuels can be used to form steam.

58. In limit state design of reinforced concrete, the deflection is computed using

A Initial tangent modulus

B Secant modulus

C Tangent modulus

D Short and long term values of Young's modulus

Solution

- The short term deflections may be calculated using the short term modulus of elasticity of concrete and effective moment of inertia.
- For long term deflections, the long term modulus $E_{ce} = \frac{E_c}{1+\theta}$ is used, where θ is creep coefficient.
- So, D is the correct option.

59. Hydration of cement is chemical reaction of cement with_____.

A Base

B Acid

C Salt and acid

D Water

Solution

- As water comes into contact with cement particles, hydration reactions immediately starts at the surface of the particles.
- It is an exothermic reaction i.e., heat is released during the process.
- The resultant product of this reaction is hardened cement.

60. Which type of combustion chamber is implemented in modern diesel engines?

A Hemispherical chamber

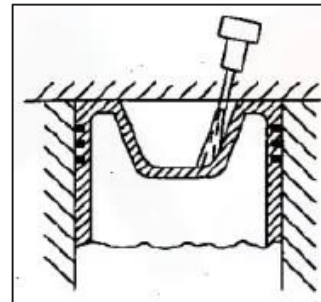
B Cylindrical chamber

C Toroidal chamber

D None of the above

Solution

- In a few modern diesel engines, Cylindrical combustion chambers was implemented.
- The shape of the combustion chamber is truncated cone with the base angle of 30 degrees.



61. A free bar of length l is uniformly heated from 0°C to a temperature $t^\circ\text{C}$, α is the coefficient of linear expansion and E is the modulus of elasticity. The stress in the bar is

A $\alpha t E$

B $\frac{\alpha t E}{2}$

C Zero

D None of these

Solution

- Since the bar is free to expand, no stresses will be developed in the bar.
- If the bar is constrained, stress produced due to change in temperature is, $\sigma = \alpha t E$.
- When the temperature of a material changes, there will be corresponding change in dimension.

62. When a body is subjected to two equal and opposite pulls, as a result of which the body tends to extent its length, the stress strain induced is

A Compressive stress, compressive strain

B Tensile stress, tensile strain

C Tensile stress, compressive strain

D Compressive stress, tensile strain

Solution

- When a body is subjected to two equal and opposite pulls, as a result of which the body tends to extent its length, the stress strain induced is tensile stress and tensile strain.
- When a body is subjected to two equal and opposite pushes, as a result of which the body tends to reduce its length, the stress strain induced is compressive stress and compressive strain.
- When a body is subjected to two equal and opposite forces, acting tangentially across the resisting section, as a result of which the body tends to shear off across the section, the stress and strain induced is shear stress and shear strain.

63. Two bars of different materials and same size are subjected to the same tensile force. If the bars have unit elongation in the ratio of 3:6, then the ratio of modulus of elasticity of the two materials will be

A 1:1

B 1:2

C 3:8

D 2:1

Solution

- Elongation, $\delta L = \frac{PL}{AE}$
- $\delta L \propto \frac{1}{E}$
- $E_1 : E_2 = 2 : 1$

64. A simply supported beam is subjected to a couple at a section within its span. It will produce

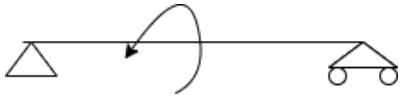
A SF diagram of zero magnitude

B Uniformly varying triangular BM diagram

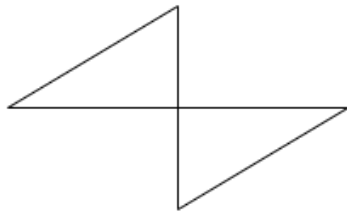
C Sudden change in sign of BM at the point of application of the couple.

D Maximum bending moment at support

Solution



SFD



BMD

65. The maximum positive bending moment in a fixed beam of span 8m and subjected to a central point load of 120 kN is (in kN-m)

A 240 kN-m

B 80 kN-m

C 120 kN-m

D 720 kN-m

Solution

- The maximum positive bending moment = $\frac{WL}{8}$
- $W = 120 \text{ kN}$, $L = 8 \text{ m}$
- $BM = \frac{120 \times 8}{8} = 120 \text{ kN-m}$.

66. For the same span and loading conditions, the maximum bending moment in a fixed beam compared to a simple supported one, shall be

A Higher

B Lower

C Equal

D None of the above

Solution

- Fixed beam with udl, $BM_{max} = \frac{wl^2}{12}$.
- Simply supported beam with udl, $BM_{max} = \frac{wl^2}{8}$.
- BM of fixed beam is less than BM of simply supported beam.

67. 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, the bending moment curve is a parabola

C For a load varying linearly, the shear force curve is a parabola

D All of the above

Solution

Loading	Shear force	Bending moment
Point load	Constant	Linear
UDL	Linear	Parabola
UVL	Parabola	Cubic parabola

68. Simply supported end in original beam converted to ___ in conjugate beam

A Fixed end

B Simply supported end

C Free end

D Cantilever

Solution

Original beam	Conjugate beam
Fixed end	Free end
Free end	Fixed end
Simply supported end	Simply supported end
Deflection	Bending moment
Slope	Shear force

69. Actual depth of neutral axis in a singly reinforced beam is:

A $x_u = \frac{0.87f_y A_{st}}{0.36f_{ck}b}$

B $x_u = \frac{0.36f_{ck}b}{0.87f_y A_{st}}$

C $x_u = \frac{0.36f_y A_{st}}{0.87f_{ck}b}$

D $x_u = \frac{0.87f_{ck}b}{0.36f_y A_{st}}$

Solution

- The depth of neutral axis can be obtained by considering the equilibrium of the normal forces.
- Resultant force of compression = $0.36f_{ck}x_u b$
- Resultant force of tension = $0.87f_y A_{st}$
- Force of compression should be equal to force of tension \Rightarrow
 $0.36f_{ck}x_u b = 0.87f_y A_{st}$
- Thus we get the value of depth of neutral axis $\Rightarrow x_u = \frac{0.87f_y A_{st}}{0.36f_{ck}b}$

70. A simply supported beam of span 8 m has a point load of 4 kN at a distance of 2 m from left end A and point load of 4kN at a distance of 4m from left end A. What will be the support reaction at B?

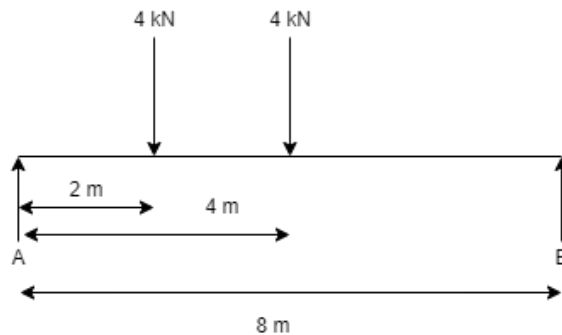
A 1 kN

B 2 kN

C 3 kN

D 4 kN

Solution



- $\sum M_A = 0$
- $(2 \times 4) + (4 \times 4) - (8 \times R_B) = 0$
- $R_B = 3kN$

71. 1kg mass will have a weight of

A 9.8 erg

B 0.98 N

C 9.8 N

D 1 N

Solution

- If an object of 1kg falls with an acceleration of $9.81m/s^2$ then the magnitude of the force is given as, $F = ma = (1kg) 9.81m/s^2 = 9.8$ N.
- 1kg mass will have a weight of 9.8N.
- Mass (m): amount of matter in a body.
- Weight (W); measure of the force of gravity acting on a body.

72. ____ gives the concept of inertia.

A Newton's law of gravitation

B Newton's 1st law

C Law of transmissibility of forces

D Newton's 2nd law

Solution

Newton's 1st law

- A body in rest remains rest or a body in motion in a straight line remains in motion unless it is acted by an external agency on it.
- This leads to the definition of force as the external agency which changes or tends to change the state of rest or uniform linear motion of the body.
- Gives the concept of inertia.

73. What is the force applied on a body with 5 kg of mass and an acceleration of $7m/s^2$?

A 35 N kgm/s

B 3.5 N

C 35 N

D 35 kg

Solution

- According to the second law of motion, the force on a body is equal to the rate change of its momentum.
- On simplifying we get, $F = ma$.
- Therefore, Force = $5 \times 7 = 35$ N.

74. Parallelogram law states that:

A

If two forces acting simultaneously on a particle be represented by the two adjacent sides of a parallelogram in magnitude and direction, then their resultant may be represented in magnitude and direction by the side of the parallelogram

B

If two forces acting simultaneously on a particle be represented by the two adjacent sides of a parallelogram in magnitude and direction, then their resultant may be represented in magnitude and direction by the diagonal of the parallelogram

C

If two forces acting simultaneously on a particle be represented by the two adjacent sides of a parallelogram in magnitude and direction, then their equilibrant may be represented in magnitude and direction by the diagonal of the parallelogram

D

None of the above

Solution

- Parallelogram law: if two forces acting simultaneously on a particle be represented by the two adjacent sides of a parallelogram in magnitude and direction, then their resultant may be represented in magnitude and direction by the diagonal of the parallelogram
- When equilibrant is added to the force system, the sum of all of the forces is equal to zero.

- Body is said to be in equilibrium if the resultant of all forces acting on it is zero.

75. **The forces, which meet at one point, but their lines of action do not lie on the same plane, are known as**

- A Coplanar concurrent forces
- B Coplanar non-concurrent forces
- C **Non-coplanar concurrent forces**
- D Non-coplanar non-concurrent forces

Solution

- Coplanar forces. The forces, whose lines of action lie on the same plane, are known as coplanar forces.
- Collinear forces. The forces, whose lines of action lie on the same line, are known as collinear forces.
- Concurrent forces. The forces, which meet at one point, are known as concurrent forces.
- Coplanar concurrent forces. The forces, which meet at one point and their lines of action also lie on the same plane, are known as coplanar concurrent forces.
- Coplanar non-concurrent forces. The forces, which do not meet at one point, but their lines of action lie on the same plane, are known as coplanar non-concurrent forces.

- Non-coplanar concurrent forces. The forces, which meet at one point, but their lines of action do not lie on the same plane, are known as non-coplanar concurrent forces.
- Non-coplanar non-concurrent forces. The forces, which do not meet at one point and their lines of action do not lie on the same plane, are called non-coplanar non-concurrent forces.

76. Unit of moment is

A kg-m/s

B Ns

C N-m/s

D Nm

Solution

Moment

- Product of the applied force and the perpendicular distance from the point to the line of action of force.
- $M = F \times d$.
- Unit: Nm.

RCC - Limit state design

77. In the limit state design method of concrete structures, the recommended partial material safety factor(γ_m) for steel according to IS:456-2000 is [2004]

A 1.5

B 1.15

C 1.00

D 0.87

Solution

- As per IS 456:2000[Clause 36.4.2.1 page-68] The partial factor of safety for materials are
- 1.5 → Concrete
- 1.15 → Steel

78. The maximum value of frictional force, which comes into play, when a body just begins to slide over the surface of the other body, is known as

A Static friction

B Dynamic friction

C Limiting friction

D Rolling friction

Solution

- The maximum value of frictional force, which comes into play, when a body just begins to slide over the surface of the other body, is known as limiting friction.
- The friction observed by a body at rest is known as static friction.
- The friction observed by a body, when in motion is known as dynamic friction.

79. The point, at which the total area of a plane figure is assumed to be concentrated, is called

A Centre of gravity

B Centroid

C Centre

D Null point

Solution

- The point, at which the total area of a plane figure (such as rectangle, triangle, square, quadrilateral, circle etc) is assumed to be concentrated, is called the centroid of that area.
- Centre of gravity of a body is defined as the point through which the whole weight of the body acts.
- A body can have only one centre of gravity for all positions of the body.

80. The equation, $I = I_{xx} + Ah^2$, deals with

A Parallel axis theorem

B Perpendicular axis theorem

C Both of the above

D Momentum theory

Solution

- Parallel axis theorem: The moment of inertia of a lamina about any axis in the plane of the lamina is equal to the moment of inertia about its centroidal axis parallel to the given axis **plus** the product of area and square of the perpendicular distance.
- Parallel axis theorem formula: $I = I_{xx} + Ah^2$
- Where,
 - I = moment of inertia of the body.
 - I_{xx} = moment of inertia about the xx axis.
 - A = Area of the body.
 - h^2 = square of the distance between the two axis between the two axis.

81. A capillary rise in a glass tube when immersed in oil having surface tension 0.0825 N/m at 20° C and specific gravity of 0.96 is 6.25 mm. Find the diameter of glass tube

A 2.70 mm

B 8.84 mm

C 5.60 mm

D 15.84mm

Solution

- Capillary rise, $h = \frac{4\sigma \cos\theta}{\rho g D}$
- Where,

σ = Surface tension of fluid at 20° C.

$\sigma = 0.0825$ N/m

$\theta = 0^\circ$

ρ = Density of fluid (kg/m^3) = 0.96×10^3 .

D = Diameter of the glass tube.

h = height of capillary rise/fall = 6.25×10^{-3} m

$$\bullet D = \frac{4\sigma \cos\theta}{\rho gh} = \frac{4 \times 0.0825 \times 1}{0.96 \times 10^3 \times 9.81 \times 6.25 \times 10^{-3}} = 5.60 \text{ mm.}$$

82. Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I

A. Concentrated sugar solution

B. Sewage sludge

C. Blood

D. Air

List-II

1. Dilatant fluid

2. Bingham plastic fluid

3. Pseudo-plastic fluid

4. Newtonian fluid

A A-1,B-2,C-3,D-4

B A-1,B-3,C-2,D-4

C A-4,B-2,C-3,D-1

D A-2,B-1,C-3,D-4

Solution

- Newtonian fluids: Air, water, mercury, glycerine, kerosene and other engineering fluids under normal circumstances.
- Pseudoplastic: Fine particle suspension, gelatine, blood, milk, paper pulp, polymeric solutions such as rubbers, paints.
- Dilatant fluids: Ultra fine irregular particle suspension, sugar in water, aqueous suspension . of rice starch, quicksand, butter, printing ink.
- Ideal plastics or Bingham fluids: Sewage sludge, drilling muds.
- Viscoelastic fluids: Liquid solid combination in pipe flow, bitumen, tar, asphalt, polymerized fluids with drag reduction features.
- Thixotropic: Printer's ink, crude oil, lipstick, certain paints and enamels.
- Rheoplectic fluids: Very rare liquid-solid suspensions, gypsum suspension in water and bentonite solutions.

83. The rise of liquid of specific weight γ and surface tension σ in a capillary tube of radius r is given by

A $\frac{4\sigma}{r\gamma}$

B $\frac{r\gamma}{2\sigma}$

C $\frac{2\sigma}{r\gamma}$

D $\frac{\gamma}{2r\sigma}$

Solution

- Capillary rise, $h = \frac{4\sigma}{\rho g d}$
- Diameter, $d = 2r$
- Specific weight $\gamma = \rho g$
- Capillary rise, $h = \frac{4\sigma}{\gamma \times 2r} = \frac{2\sigma}{r\gamma}$

84. These are the devices used for measuring the pressure at a point in a liquid by balancing the column of the liquid by the same or another column of liquid.

A Venturimeter

B Manometer

C Venturi flume

D All of the above

Solution

- The pressure of a liquid is measured by manometer.
- These are the devices used for measuring the pressure at a point in a liquid by balancing the column of the liquid by the same or another column of liquid.
- Manometers are classified as
 1. Simple manometer
 2. Differential manometer

85. Measurement of pressure difference between two points is generally done by using

A Venturimeter

B Pitot tube

C Differential manometer

D None of the above

Solution

- Venturimeter: measures flow rate.
- Pitot tube: measures velocity at a point.
- Differential manometer: measures pressure difference between two points.

86. The intensity of pressure at a point in a fluid is the same in all the directions, only when ____

- A The fluid is frictionless and incompressible
- B The fluid is frictionless
- C There is no motion of one fluid layer relative to an adjacent layer
- D The fluid has zero viscosity and fluid is in motion

Solution

- According to Pascal's law, the pressure or intensity of pressure at a point in a static fluid is equal in all directions.
- This law is valid for the cases of fluid flow where shear stresses do not exist.
- The intensity of pressure at a point in a fluid is the same in all the directions, only when there is no motion of one fluid layer relative to an adjacent layer.

87. At a certain point, the absolute pressure and atmospheric pressure is given by 850 mm of Hg and 700 mm of Hg respectively. What is the value of gauge pressure (mm of Hg) at that point ?

- A 50
- B 100
- C 150
- D 1550

Solution

- Absolute pressure, $P_{abs} = 850$ mm of Hg
- Atmospheric pressure, $P_{atm} = 700$ mm of Hg
- Gauge pressure, $P_{gauge} = P_{abs} - P_{atm} = 850 - 700 = 150$ mm of Hg .

88. At a fixed position, if fluid properties and flow parameters do not change with time then it is a

A Steady flow

B Unsteady flow

C Non uniform flow

D Uniform flow

Solution

- At a fixed position, if fluid properties and flow parameters do not change with time then it is a steady flow.
- If fluid properties and flow parameters changes with time at a fixed position then it is called unsteady flow.
- The flow is defined as uniform flow when in the flow field the velocity and other hydrodynamic parameters do not change from point to point at any instant of time.

89. Flow in a tapering pipe with constant velocity at the inlet is an example for

A Steady uniform flow

B Steady non-uniform flow

C Unsteady uniform flow

D Unsteady non-uniform flow

Solution

- Steady uniform flow: flow of water in a pipe of constant diameter at a constant velocity.
- Steady non-uniform flow: flow in a tapering pipe with constant velocity at the inlet.
- Unsteady uniform flow: a pipe of constant diameter connected to a pump pumping at a constant rate which is then switched off.
- Unsteady non-uniform flow: waves in a channel.

90. Overall efficiency of Pelton turbine is 75%. If the mechanical efficiency is 88%, what is its hydraulic efficiency?

A 72.3%

B 85.2%

C 81.3%

D 79.6%

Solution

The overall efficiency of a Pelton turbine,

$$\eta_o = \eta_h \times \eta_m$$

$$0.75 = \eta_h \times 0.88$$

$$\therefore \eta_h = \frac{0.75}{0.88} = 0.852 = 85.2$$

91. Which of the following is an advantage of centrifugal pump over reciprocating pump ?

A Discharge capacity is small

B Used for low viscous fluids

C Gives uniform flow and continuous flow

D None of the above

Solution

- Advantages of centrifugal pump over reciprocating pump are :
 - High discharge capacity.
 - Used for lifting high viscous fluids.
 - Gives uniform flow and continuous flow.
 - Less running and maintenance cost.

92. In thermodynamics, work done on the system is taken to be _____.

A Positive

B Negative

C Zero

D Unpredictable

Solution

- In thermodynamics, work done on the system is taken to be negative.
- Work done by the system is taken to be positive.

93. Match the following.

Types of cement	Characteristics
A. High early strength	1. Pozzolanic cement
B. Lining of canals	2. Rapid hardening cement
C. Frost and acid resistance	3. Sulphate resisting cement
D. Marine structure	4. High alumina cement

A A - 1, B - 4, C - 3, D - 2

B A - 1, B - 3, C - 4, D - 2

C A - 2, B - 3, C - 4, D - 1

D A - 2, B - 4, C - 3, D - 1

Solution

- Pozzolanic cement evolves less heat during setting, therefore it is used for mass concreting like marine structures.
- Rapid hardening cement attains high strength in early days.
- Sulphate resisting cement is used for structures likely to be damaged by severe alkaline conditions such as canal lining, culverts, siphon etc.

- High alumina cement is not affected by frost and resists the action of acids in a better way.

94. Carpet area of residential building is takes as

- A 20 to 65% of floor area
- B 50 to 65% of plinth area
- C 10 to 65% of plinth area
- D 20 to 65% of plinth area

Solution

- Carpet area of building is the useful area or liveable area or lettable area. This is the total floor area minus the circulation area, verandahs, corridors, passages, staircase, lifts, entrance hall, etc. and minus other non- usable areas as sanitary accommodations (bath and W.Cs.), air conditioning room etc.
- For office building carpet area is the useable area and for residential building carpet area is the liveable area and should exclude the kitchen, pantry, stores, and similar other room which are not used for living purposes.
- The carpet area of a building for any storey shall be the floor area excluding the following:
 - (a) Sanitary accommodation
 - (b) verandahs

- (c) corridors and passages
- (d) kitchen and pantries
- (e) stores in domestic buildings
- (f) entrance hall and porches

95. The number of folding methods for folding of various sizes of drawing sheets is :

A 1

B 2

C 3

D 4

Solution

- The final size of the folded print in method 1 will be 297mm x 190 mm, while that in method 2 will be 297 mm x 210 mm.
- In either case, the title block is visible at the top of the folded print.
- When prints are to be stored and preserved in cabinets they are folded by method 2.

96. Carnot cycle consists of:

- A** Two constant volume and two reversible adiabatic processes
- B** Two isothermal and two reversible adiabatic processes
- C** Two constant pressure and two reversible adiabatic processes
- D** One constant volume, one constant pressure and two reversible adiabatic processes

Solution

- A Carnot cycle is defined as an ideal reversible closed thermodynamic cycle.
- The four stages in the Carnot cycle:
 - Stage 1: Isothermal expansion under heat input Q_1 ,
 - Stage 2: Adiabatic expansion accompanied by a fall in temperature T_1 to T_2 ,
 - Stage 3: Isothermal compression, Q_2 exhausted,
 - Stage 4: Adiabatic compression accompanied by an increase in temperature T_2 to T_1 .

97. The Diesel cycle consists of:

- A** Two reversible isotherms and two reversible isobars
- B** One reversible isochore and two reversible adiabatics and one reversible isobar
- C** One reversible isotherm and two reversible isochores and one reversible isobar
- D** Two reversible isobars and two reversible adiabatics

Solution

- The Diesel cycle is a combustion process of a reciprocating internal combustion engine.
- In it, fuel is ignited by heat generated during the compression of air in the combustion chamber, into which fuel is then injected.
- Hence an air-standard diesel cycle consists of one constant pressure, one constant volume and two adiabatic processes.

98. Which of the following is not a part of diversion head works?

A Barrage

B Divide wall

C Head regulator

D Guide bank

Solution

Components of diversion head works

- Barrage/weir
- Under sluices
- Fish ladder
- Divide wall
- Canal head regulator
- Silt excluder
- Silt extractor

River training works

- Guide bank
- Embankments
- Groynes

- Cut off channels

99. As compared to gravity dams, earthen dams

- A Less seepage
- B Are less susceptible for failure
- C Requires less skilled labour
- D All of these

Solution

Earthen dams

- Earth dams are made of soil.
- Suitable on almost any foundation.
- Requires less skilled labour.
- More susceptible to failure.
- More seepage.

100. Which command in Auto CAD is used to split polyline ?

- A Explode
- B Extrude
- C Block
- D Divide

Solution

- Explode - Used to split polyline, multi lines etc.
- Extrude - Create a 3D solid from an object that encloses an area.
- Divide - Indicates the division of an entity in equal parts.



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(<https://play.google.com/store/apps/details?id=me.entri.entri.me>).