MEGA MOCK CHALLENGE

BYJU'S EXAM PREP

# DSSSB JE

## Civil Engineering

## Live Mock Test

(June 24th - June 25th 2022)

## Questions & Solutions

1. The volume of atmosphere moisture is 12900 $km^3$ and the flow rate of precipitation is 577000 $km^3$/yr. Find the residence time of moisture?

   A. 10.4 days
   B. 9.6 days
   C. 8.2 days
   D. 7.5 days

Ans. C

Sol. Storage of water in form of moisture S = 12900 $km^3$

Flow of water as precipitation Q = 577000 $km^3$/yr

So, the residence time is $T_r = \frac{S}{Q} = \frac{12900}{577000}$ = 0.022 year = 8.2 days

2. Hyetograph shows the variation of

   A. Cumulative rainfall with time
   B. Rainfall intensity with time
   C. Rainfall depth over an area
   D. Rainfall intensity with the cumulative rainfall

Ans. B

Sol. A hyetograph is a graphical representation of the distribution of rainfall intensity over time. For instance, in the 24-hour rainfall distributions as developed by the soil conservation service, rainfall intensity progressively increases until it reaches a maximum and then gradually decreases.

3. Fresh sludge has moisture content of 99% and after thickening, its moisture content is reduced to 96%. The reduction in volume of sludge is:

   A. 3%
   B. 5%
   C. 75%
   D. 97%

Ans. C

Sol. $V_1(100 - P_1) = V(100 - P)$

$$\frac{V_1}{V} = \frac{100 - 99}{100 - 96} = \frac{1}{4} = 0.25$$

Volume reduction = $\frac{V - V_1}{V} \times 100$ = 75 %

4. If the capillary rise of water in a 1 mm diameter tube is 3 cm, the height of capillary rise of water in a 0.2 mm diameter tube in centimeter will be

   A. 1.5
   B. 7.5
   C. 15
   D. 75

Ans. C

Sol. Capillary rise (h)=4σcos/γd

$h \alpha 1/d$

$h_1/h_2 = d_2/d_1$

$h_2 = 15$

5. What is the combined correction for curvature and refraction for a distance of 7000 m?

A. 2.55 m
B. -2.55 m
C. +3.3 m
D. -3.3 m

Ans. D

Sol. The combined correction for curvature and refraction is given by,

$C_c = -0.0673\ d^2$ where d is in km

$C_c = -0.0673 \times 7^2$

$C_c = -3.29$ m

The closest option is -3.3

6. The maximum efficiency of BOD removal is achieved in which of the following?

A. Oxidation ditch
B. Oxidation ponds
C. Aerated lagoons
D. Trickling filter

Ans. A

Sol. The main advantage of oxidation ditch is the ability to achieve removal performance objective with low operational requirement and maintenance costs.

BOD removal for various units is given below:

Oxidation Ditch - 98%

Oxidation pond - 90%

Aerated lagoons - 65-90%

7. Shingle is

A. water bound pebbles
B. disintegrated laterite
C. crushed granite
D. None of these

Ans. A

Sol. Shingle is water-bound pebble found usually along beaches and natural water bodies. It is used as a roofing material, surfacing of the boundary walls, filling, etc.

Murrum is formed from disintegrated laterite.

8. The quantity cement concrete damp-proofing course is measured in terms of _____.

A. m
B. $m^2$
C. $m^3$
D. lump sum

Ans. B

Sol. In damp proofing course these types of materials are used:

Stones, slates, cement concrete, blocks, terracotta blocks, dense cement concrete, asbestos cement concrete sheets etc. the cement concrete measured with the unit of $m^2$.

9. The trap which is provided to disconnect the house drain from the street sewer is called _____.

A. Master trap
B. Intercepting trap
C. Interception manhole
D. All the above

Ans. D

Sol.

- In plumbing, a trap is a device which has a shape that uses a bending path to capture water to prevent sewer gases from entering buildings, while allowing waste to pass through.

- Intercepting trap is provided into the Interceptor Manhole (Interceptor Chamber).
- An Interceptor manhole is provided at the intercept of building sewer and Public sewer. Intercepting trap is provided to prevent the foul gases entering into the building sewer by providing the water seal. It has deep water seal of 100 mm depth and it also prevents entry of bugs and insects from sewer line to building sewer.

10. Which of the following area is NOT included in the plinth area of the building?

A. Area of the loft

B. Area of barsati at terrace level

C. Cornices

D. All of the above

Ans. D

Sol. Plinth area is the covered built-up area measured at the floor level of any storey or at the floor level of the basement. Plinth area is also called as built-up area and is the entire area occupied by the building including internal and external walls. Plinth area is generally 10-20% more than carpet area.

As per IS3861:2002, Plinth area does not include:

Loft, cornice, sun breaker, open platform, terrace, mumty, towers, turrets, etc.

11. As per Lacey's regime equation, what is the flow velocity proportional to?

A. $(Qf^2)^{1/3}$ B. $(Qf^2)^{1/6}$

C. $Q/f^2$ D. $(Q/f^2)^{1/6}$

Ans. B

Sol. Flow velocity $v = (Qf^2/140)^{1/6} = 10.8\ R^{2/3}S^{1/2}$

Where $f = 1.76\sqrt{d_{mm}}$

The average particle size is determined from sieve analysis.

12. As per ISI, rolled steel beam sections are classified into _____.

A. two series B. three series

C. four series D. five series

Ans. D

Sol. The rolled steel beam sections are classified in to five series.

- Indian standard junior beam (ISJB)
- Indian standard light beam (ISLB)
- Indian standard medium weight beam (ISMB)
- Indian standard wide flange beam (ISWB)
- Indian standard Heavy weight beam (ISHB)

13. If aggregate size of 50 – 40 mm is to be tested for finding out the portion of elongated aggregates using length gauge, the slot length of the gauge should be

A. 81 mm B. 45 mm

C. 53 mm D. 90 mm

Ans. A

Sol. Slot length for elongated aggregate = 1.8 x mean dimension

= 1.8 x $(\frac{50+40}{2})$

Slot length for elongated aggregate = 81 mm

Note = for flakiness index, the slot size = 0.6 x mean dimension

14. For a reinforced concrete pedestal, its length should_____

A. Exceed three times the lateral dimension of pedestal'

B. Exceed five times the lateral dimension of the pedestal

C. Not exceed five times the lateral dimension of pedestal'

D. Not exceed three times the lateral dimension of the pedestal

Ans. D

Sol. Pedestal is a vertical compression member whose effective length $l_{eff}$ does not exceed three times of its least horizontal dimension.

15. Pick up the correct statement from the following

A. Water enables chemical reaction to take place with cement

B. Water lubricates the mixture of gravel, sand and cement

C. Only a small quantity of water is required for hydration of cement

D. All option are correct

Ans. D

Sol. Water reacts with cement and yields C-S-H Gel which is responsible for its cementing Properties.
Water works as a lubricant in concrete, Provides workability to it. Cement in total requires 23% water by Weight for its complete hydration but about 15% of the water is entrapped in the voids Of the cement particles hence total water is Required for complete hydration of cement Is approx. 38%.

16. The distress not caused in localised form is?

A. Pot Hole

B. Isolated crack stress

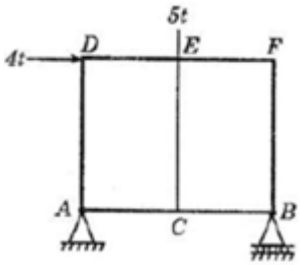
C. Localised depression

D. Liquefaction

Ans. D

Sol. The Liquefaction is a phenomenon that occurs in the sand, particularly during monsoon and heavy floods.

17. The force in BF of the truss shown in figure below, Force 5t acts downward at E, member AC,CB,BF,FE,ED,DA is of same length.




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

Ans. D

Sol. assume AC=AB=AD=L

Support reactions

$R_A+R_B=5t$

$\sum M_A=0, 4t\times L+5t\times L-R_B\times 2L=0$ , $R_B=4.5t$(Upward)

Therefore compression.

18. Which one of the following statements provides the best argument that direct shear tests are not suited for determining shear parameters of clay soil?

A. Failure plane is not the weakest plane
B. Pore pressures developed cannot be measured
C. Satisfactory strain levels cannot be maintained
D. Adequate consolidation cannot be ensured

Ans. A

Sol. The predetermined failure plane may not be the weakest plane. This is the most important limitation of direct shear test.

**Other Limitation of direct shear test:**

i) There is no mechanism to measure pore pressure and no control over drainage condition hence not suitable for clay

ii) The stress distribution on failure plane is not uniform

iii) Stress condition are know only at failure hence difficult to draw Mohr circle.

19. What is Hydrological Cycle?

A. Processes involved in the transfer of moisture from sea to land.
B. Processes involved in the transfer of moisture from sea back to sea again
C. Processes involved in the transfer of water from snowmelt in mountains to sea.
D. Processes involved in the transfer of moisture from sea to land and back to sea again

Ans. D

Sol. Most of the earth's water sources such as rivers, lakes, oceans, ground water etc. get their supplies from rain, while the rain water in itself is derived from the evaporation from these sources. Water is infact lost to the atmosphere as vapour from the earth, which is then precipitated back in the form of rain, snow, hail, dew, sleet and frost etc. This evaporation and precipitation continues forever and thereby, a balance is maintained between the two. This process is called as hydrologic cycle.

20. Pickup the incorrect statement

A. Specific gravity of tar is in the range of 1.1 to 1.25

B. Minimum specified flash point of bitumen used for road contruction is 175°C

C. Maximum water content in the bitumen ≤ 2% by weight

D. None of the above

Ans. C

Sol. The maximum water content in the bitumen ≤ 0.2% by weight

21. A fluid whose viscosity does not change with the rate of deformation or shear strain is known as:

A. Real fluid

B. Newtonian fluid

C. Ideal fluid

D. Non-Newtonian fluid

Ans. B

Sol. Viscosity is constant means the graph show a straight line passing through origin. And this is the property of Newtonian Fluid.

22. The correction due to refraction for a distance of 1000 m is

A. 0.0673 m

B. 0.673 m

C. 11.20 m

D. 0.0112 m

Ans. D

Sol. Distance, d = 1000 m or 1 km

The correction due to refraction, $C_r = 0.0112d^2$

$$C_r = 0.0112 \times 1^2$$

$C_r$ = 0.0112 m

23. Calculate the equivalent radius (cm) of the resisting section of 20 cm slab, if the ratio of radius of wheel load distribution to the thickness of the slab is greater than 1.724

A. 20

B. 35.6

C. 40

D. 40.9

Ans. A

Sol. Equivalent radius of resisting section,

Ifa /h >1.724

Then equivalent radius, b = a

Given, a = 20 cm

» b = 20 cm.

If a /h<1.724

Then equivalent radius, $b = \sqrt{(1.6a^2+h^2)} - 0.675h$

Where h is thickness of slab.

24. A catchment has 4 non-recording raingauges installed. The allowable error of this catchment is 10% and coefficient of variation is 30, then find out the additional no of non-recording raingauges that are needed to be installed.

A. 3 B. 4

C. 5 D. 6

Ans. B

Sol.

$$N = \left(\frac{C_v}{\epsilon}\right)^2 = \left(\frac{30}{10}\right)^2 = 9$$

At least 10% raingauges should be of recording type.

Total number of raingauges required = 9

Number of recording rain gauges = 10% of 9 = 0.9 ~ 1

Total additional required = 9 - 4 = 5

One of these additional raingauges will be of recording type.

Additional non recording raingauges = 5 – 1 = 4

25. A jet of water issuing from a nozzle with a velocity 20 m/s hits a flat plate moving away from it at 10 m/s. The cross- sectional area of the jet is 100 $cm^2$. What is the force on the plate?

A. 100 N B. 10 N

C. 10000 N D. 1000 N

Ans. D

Sol. Force = $F_x = \rho a(V-U)^2$

Force = $F_x = 1000 \times (100 \times 10^{-4}) \times 100$

Force = $F_x = 1000$ N

26. For a continuous slab supported at ends and carried over intermediate beams

A. Max. sagging B.M. for the end spans = + (wl2)/10

B. M. over penultimate supports is equal to - (wl2)/10

C. Max. sagging B.M. for the interior spans = + (wl2)/12

D. All option are correct

Ans. D

Sol. All option are correct.

27. Two beam of equal cross sectional area are subject to equal bending moment. If one beam has square cross section and the other has circular section, then _____.

A. both beams will be equally strong

B. circular section beam will be stronger

C. square section beam will be stronger

D. the strength of the beam will depend on the nature of aiding

Ans. C

Sol. From the bending equation,

$M/I = \sigma/y$

$M = \sigma \times Z$

So, σ is inversely proportional to I.

If I or Z will be more then beam will be stronger.

& here I will be more for the square cross-section.

Explanation:

The area (AA) of a square section with side h&h is $A=h^2$ and its $I=h^4/12$,

The area (AA) of a circular section with radius r is $A=\pi r^2$ and its $I=\pi r^4/4$

Given that the two areas are equal: $h^2=\pi r^2$ or, $r=h/\sqrt{\pi}$

Plugging this value of r into the circular $I=\pi r^4/4$

will give: $I=h^4/4\pi=h^4/12.57$

which is smaller than the I for square section: $I=h^4/12$

Therefore, the **higher value of I for the square section** means the bending stress will be lower at any point on the square cross-section compared to the circular section and the square section will be more efficient.

so finally square beam will be stronger.

28. Clark's method aims at which one of the following?

A. Developing an IUH due to an instantaneous rainfall excess over catchment

B. Developing stage discharge relationship

C. Measurement of infiltration

D. Flood routing through channels

Ans. A

Sol. In IUH the effective precipitation is applied to the drainage basin in zero time. Clark's method requires estimation of three basin parameters for the derivation of IUH, time of concentration (Tc), storage attenuation coefficient (K) and time-area histogram of the basin.

29. Which of the following is a part of speed and delay studies?

1) Floating car method

2) Interview technique

3) License plate method

A. 1, 2 and 3

B. 2 and 3 only

C. 1 and 3 only

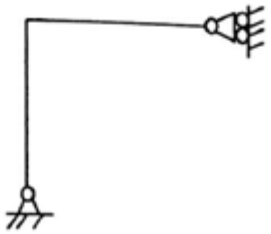
D. 1 and 2 only

Ans. A

Sol. Various methods of speed and delay studies are:

1. Floating car method
2. License plate method or vehicle number method
3. Interview technique
4. Elevated observation
5. Photographic technique

30. The rigid frame shown in figure is:



A. Stable and determinate

B. Unstable

C. Stable and indeterminate

D. Stable and indeterminate to 2d degree

Ans. A

Sol. $Ds = 3m + re - 3J = 3X2 + 3 - 3X3 = 0$

for stability as we know there are three support reaction and they don't pass through a single point,

Hence it is determinate and stable

31. In the process of the hydration of OPC, what is the water requirement (expressed as the percentage by weight of cement) to complete the chemical reactions?

A. 15 to 25% B. 20 to 25%

C. 25 to 35% D. 35 to 45%

Ans. B

Sol. To hydrate any cement completely, the amount of water you require is 20-25% the weight of the cement, but to account for workability and the loss of water you can probably take the weight of water to be around 40-45% to the weight of the cement.

32. The effective width of a column strip of a flat slab that is taken into consideration?

A. one-fourth the width of the panel B. half the width of the panel

C. radius of the column D. diameter of the column'

Ans. B

Sol. Column strip means a design strip having a width of 0.25I, but not greater than 0.25I, on each side of the column center-line, where I is the span in the direction moments are being determined, measured center to center of supports.

The effective width of a column strip of a flat slab is taken half the width of the panel.

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

Sol. A body is said to be in equilibrium if it remain its position toward the original position.

34. What are the dimensions of a 35-liter forma for measuring aggregates by volume?

A. length 30 cm, breadth 25 cm, height 30 cm

B. length 39 cm, breadth 25 cm, height 32 cm

C. length 27 cm, breadth 27 cm, height 48 cm

D. length 220 cm, breadth 25 cm, height 40 cm

Ans. C

Sol. The dimensions of a 35-liter forma for measuring aggregates are 270×270×480 mm

35. The ratio of the difference between the void ratio of the soil in its loosest state and its natural void ratio (e) to the difference the void ratios in the loosest and fully dense state, is generally termed as _____.

A. Degree of density

B. Relative Density

C. Density Index

D. both b and c

Ans. D

Sol. Relative density or density index is the ratio of the difference between the void ratios of a cohesionless soil in its loosest state and existing natural state to the difference between its void ratio in the loosest and densest states.

$$Relative\ density = \frac{e_{max} - e}{e_{max} - e_{min}}$$

Where,

$e_{max}$ = void ratio of coarse grained soil in its loosest state.

$e_{min}$ = void ratio of coarse grained soil in its densest state.

$e$ = *void ratio of coarse grained soil in its natural existing state in the field*

36. Porosity is :

A. Volume of water/volume of voids

B. Volume of voids/volume of soil solids

C. Volume of voids/total volume of soil

D. Volume of voids/volume of water

Ans. C

Sol. Porosity is Volume of voids/total volume of soil where as void ratio is Volume of voids/volume of soil solids.

37. Bulk modulus of a fluid is the ratio of

A. shear stress to shear strain

B. increase in volume to the viscosity of fluid

C. increase in volumetric stress to the volumetric strain

D. critical velocity to the velocity of fluid

Ans. C

Sol. The **bulk modulus** of a substance is a measure of how incompressible/resistant to compressibility that substance is. It is defined as the ratio of the infinitesimal pressure increase to the resulting *relative* decrease of the volume.

Bulk modulus, B = Volumetric Stress/ Volumetric Strain

38. Anti-siphonage pipe is connected to _____.

A. Main soil pipe
B. Bottom of P trap W.C
C. Top of P trap W.C
D. Side of water closet

Ans. B

Sol. The pipe installed for the purpose of ventilation is known as a vent pipe while a pipe which is installed in a house drainage to preserve the water seal of trap is an anti-siphonage pipe. The main anti-siphonage pipe is generally connected to the upper continuation of the waste-pipe above the highest fitting; this economises piping, and is quite as effective as carrying it up independently to the same height as the waste-pipe vent.

39. In preparation of Marshall Mix design, the mass specific gravity of Marshall Specimen is 2.1 and the theoretical specific gravity of Marshall specific gravity is 2.4, then calculate the percentage air voids?

A. 16.4%
B. 12.5 %
C. 10.6 %
D. 9.4 %

Ans. B

Sol.

Percentage air voids = $V_v = \frac{G_t - G_m}{G_t} \times 100$

$G_t$ = Theoretical specific gravity

$G_m$ = Mass specific gravity

$V_v = \frac{2.4-2.1}{2.4} \times 100 = 12.5\ \%$

40. Kinematic Viscosity of water in comparison to mercury is _____.

A. higher
B. lower
C. same
D. higher/lower depending on temperature

Ans. A

Sol. It also apparently explains the high **viscosity of water**, since its molecules are so highly interconnected. **The viscosity** of **mercury** is higher than **water**. Yes its **kinematic viscosity** is lower just because of it higher **density**. And shear stress developed in **mercury** is also higher as **compared** to **water**.

The dynamic viscosity of mercury is 1.52 and water is 0.894 but the kinematic viscosity is smaller for mercury because it has large density than water.

41. The governing criteria in design of two way slab is:

A. Flexural moments
B. Shear forces
C. Cracking
D. Deflection

Ans. D

Sol. Two-way slabs are slabs that are supported on four sides. In two-way slabs, the load will be carried in both directions, thus main reinforcement is provided in both directions for two-

way slabs. The slabs are considered as spanning two-way when the longer to shorter span length is less than a ratio of two. The bending of these slabs takes the shape of a dish-like form when loaded uniformly. Thus deflection of the slab in both direction should not increase the permissible deflection.

42. Outer projection of a "Tread' is called

A. nosing
B. treader
C. step
D. going

Ans. A

Sol. The outer projection of a tread is known as nosing. An edge part of the tread that protrudes over the riser beneath.

43. If W is the weight of a retaining wall and P is the horizontal earth pressure, the factor of safety against sliding is

A. 1
B. 1.25
C. 1.5
D. 2

Ans. C

Sol. The factor of safety against sliding is defined as forces preventing sliding along the bottom divided by the forces that will cause sliding along the bottom surface. Factor of safety should not be less than 1.5 for sliding condition.

44. In case of two way slab, the limiting deflection of the slab is _____.

A. primarily a function of the long span
B. primarily a function of the short span
C. independent of long or short span
D. dependent of both long and short spans

Ans. B

Sol. The strip of a two way slab may be checked against shorter span to effective depth ratio.

| Type of slab | Mild steel | Fe -415 |
|---|---|---|
| Simply supported | 35 | 28 |
| Continous | 40 | 32 |

45. In the concrete mix with proportions of its ingredient 1:3:6, the actual quantity of sand per unit volume of cement, if bulking of the sand is 15% is_____. Mix proportion is took by volume.

A. 3
B. 3.45
C. 6
D. 4.5

Ans. B

Sol. Mix proportion = 1 : 3 : 6

Let the volume of cement = 1 $m^3$ (unit volume of cement)

Volume of sand = 3 $m^3$

15% bulking means we require 15% more sand so,

Actual volume of sand $=3x(1+\frac{15}{100})= 3.45\ m^3$

46. Calculate the capacity (vehicle per hour) of the road when reaction time of the driver is 2 seconds. The design speed is 80 kmph and average length of the vehicle is 6m. Take coefficient of friction as 0.35.

A. 600 B. 653

C. 687 D. 724

Ans. C

Sol. Given

Speed of vehicle, v = 80 km/ph = 80 × (5/18) = 22.22 m/sec

Reaction time, t = 2 sec, coefficient of friction, f = 0.35

So stopping sight distance, $S = v.t + v^2 / 2gf$

$= 22.22 \times 2 + (22.22)^2 / 2 \times 9.81 \times 0.35$

= 116.33 m

So capacity of vehicle = 1000 V / S = 1000×80 / 116.33 = 687.69 (vehicle per hour)

47. The RL of a floor level is 45 m and staff reading on the floor is 1.025 m. The staff reading when held vertical touching the roof slab comes out to be 2.025 m. What is the floor height?

A. 2.75 m B. 3.05 m

C. 3.75 m D. 3.95 m

Ans. B

Sol. Floor height (as per the diagram) = Staff reading when staff is touching floor + staff reading when staff touching roof slab

Floor height = 1.025 +2.025 = 3.05 m

48. Which one of the following cement is best for the marine works?

A. Blast furnace slag cement B. High alumina cement

C. Low heat Portland cement D. Rapid hardening cement

Ans. A

Sol. Blast furnace slag cement is best for the marine work.

49. A canal irrigates a portion of a culturable command area to grow sugarcane and wheat. The average discharge required to grow sugarcane and wheat are 1 cumec and 0.6 cumec respectively. The time factor is 0.8. The required design capacity of the canal is

A. 0.5 cumec B. 1 cumec

C. 1.5 cumec D. 2 cumec

Ans. D

Sol. Sugarcane is perennial crop and Wheat is a Rabi crop.

Time factor = 0.8

Average discharge required for sugarcane, $Q_S$ = 1 cumec

Average discharge required for wheat, $Q_W$ = 0.6 cumec

Total average discharge required during Rabi season, $Q = Q_S + Q_S = 1 + 0.6 = 1.6$ cumec

Required design capacity of the canal, $Q_0 = \frac{\text{Total average discharge}}{\text{Time factor}}$

$$Q_0 = \frac{1.6}{0.8} = 2 \text{ cumec}$$

50. A catchment has an area of 150 ha and a runoff/rainfall ratio of 0.40. If 10cm is the rainfall over the catchment, then runoff volume will be

A. 600 $m^3$ B. 1200 $m^3$

C. 120000 $m^3$ D. 60000 $m^3$

Ans. D

Sol. Catchment area, A = 150 ha = 150 × $10^4$ $m^2$

Rainfall = 10 cm

$$\frac{\text{Runoff}}{\text{Rainfall}} = 0.4$$

Runoff = 0.4x10 = 4 cm = 0.04 m

Runoff volume, $V = A \text{ x Runoff} = 150x10^4x0.04 = 60000 \text{ m}^3$

51. The cross-sections for a highway is taken at _____.

A. right angle to the triangle

B. 30 meters apart

C. intermediate points having abrupt change is gradient

D. All options are correct

Ans. D

Sol. The cross sections are taken at right angles to some convenient line which runs longitudinally through the earthworks and although it is capable of general application, it is probably most used on long narrow works such as roads, railways, canals, embankments, pipe excavations, etc.

The volume of earthwork between successive cross sections are calculated from a consideration of the cross-sectional areas, which in turn are measured or calculated by the general methods such as, by planimeter, division into triangles, coordinates, etc. A cross section is a section taken normal to the direction of the proposed centre line of an engineering project, such as a highways, railroad, trench, earth dam or canal. The cross section for these would have similar characteristics. It is bounded by a base (formation), side slopes and the natural terrain. The inclination of a side slope is defined by the horizontal distance m on the slope corresponding to a unit vertical distance. The slope may be a rise (in excavation) or a fall (in emabankment). A slide slope of 3 to 1, e.g., means that for each 3 ft of horizontal distance, the rise or fall of slide slope is 1 ft.

52. I.S. Sieve Nos. 10 mm and 4.75 mm are generally used for grading of

A. coarse aggregates

B. fine aggregates

C. Both coarse aggregates and fine aggregates

D. None of these

Ans. A

Sol. Course soil ranges from 0.075 mm to 80 mm.
it has two type course aggregate and fine aggregate
particle size of course aggregate ranges from 4.75 mm to 80 mm and fine aggregate from 0.075 mm to 4.75 mm.

53. A two way continuous slab of short span 3.0 m and subjected to a live load of 1.5 KN/$m^2$ is reinforced with Fe 250 steel. The minimum depth of slab as per deflection control criteria is:

A. 100 mm
B. 150 mm
C. 125 mm
D. 75 mm

Ans. D

Sol. For continuous slab reinforced with Fe 250 steel and span up to 3.5 m along with live load up to 3 KN/$m^2$, depth of slab d =

$$d = \frac{short\ span}{40} = \frac{3000}{40} = 75\ mm$$

54. The values of whole circle bearing vary from _____.

A. 0° to 90°
B. 0° to 180°
C. 0° to 270°
D. 0° to 360°

Ans. D

Sol. The value of whole circle bearing lies 0° to 360°.

55. Which one is the smallest scale?

A. 1:100
B. 1:1,000
C. 1:2,500
D. 1:50000

Ans. D

Sol. Since $\frac{1}{50000}$ has largest denominator, therefore it is smallest among all.

56. In a truss girder of a bridge, a diagonal consists of mild steel flat 400 I.S.F. and carries a pull of 80 tonnes. If the gross diameter of the rivet is 26 mm, the number of rivets required in the splice is

A. 6
B. 7
C. 8
D. 9

Ans. C

Sol. As per IS 800:1984, the shear strength of rivet = 100 MPa (assuming power-driven rivet)
Shear capacity of rivet = Number of shear planes × Area × Shear Strength = 2 × (π/4 ×$26^2$ )×100 = 106.22 kN
Double shear is assumed as solving with single shear doesn't match any options.
No. of rivets required = 800 / 106.22 = 7.53 (taken as 8)
80 tonne = 800kN

57. Pick up the correct statement from the following

A. Lime in excess, causes the cement to expand and disintegrate
B. Silica in excess, causes the cement to set slowly

C. Alumina in excess, reduces the strength of the cement

D. all options are correct

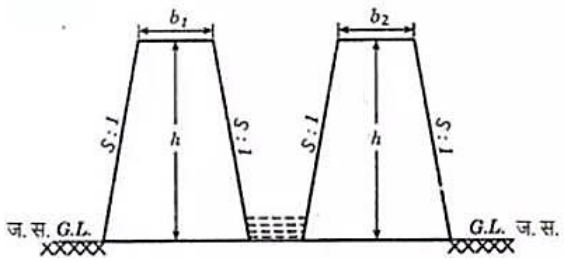
Ans. D

Sol. **Lime (CaO):**This is the important ingredient of cement and I s proportion is to be carefully maintained. The lime in excess makes the cement unsound and causes the cement to expand and disintegrate. On the other hand, if lime is in deficiency, the strength of cement decreases and it causes cement to set quickly.

**Silica (Si02):**This is also an important ingredient' of cement and it gives or imparts strength to the cement due to the formation of dicalcium and tricalcium silicates. If silica is present in excess quantity, the strength of cement increases but at the same time, its setting time is p. longed.

**Alumina (AI203):**This ingredient imparts quick setting property to the cement. It acts as a flux and it lowers the clinkering temperature. However the high temperature is essential for the formation of a suitable type of cement and hence the alumina should not be present in excess amount as it weakens the cement.

58. The cross-sectional area of the embankment of a canal fully in embankment, (refer the figure given below) is:-




A. $1/2(b_1+b_2)h$

B. $(b_1+b_2)h+Sb^2$

C. $(b_1+b_2)h+2sh^2$

D. $2[(b_1+b_2)(b+Sh)]$

Ans. C

Sol. $A1 = (2b_1+2sh)\times h/2 = (b_1+sh)h.$

Similarly, $A2 = (b_2+sh)h$

$A = A1+A2 = (b_1+b_2)h+2sh^2$

59. A wall of width 300 mm contains two T junctions. The height of the wall is 3 m and total length of the central line is 150m. Calculate the quantity of the brick work (in cubic meter) using central line method.

A. 134.46 B. 134.73

C. 134.86 D. 135

Ans. B

Sol. Width of wall = 300 mm = 0.3 m

Total length of centre line = 150 m

And height of the wall = 3 m

So quantity of brickwork using centre line method = (150 – 0.3) × 0.3 × 3

= 134.73 $m^3$

60. A light house to be constructed so that it is visible from a distance of 66 kms from the port. Find the height of the light house required?

A. 300 m B. 260 m

C. 225 m D. 360 m

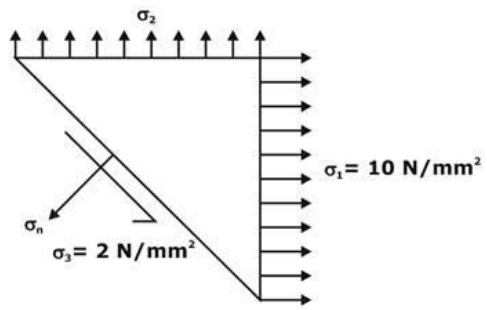
Ans. A

Sol. d(km) = 3.8553√c(m)

$$\frac{66}{3.8553} = \sqrt{c\ (m)}$$

$$c = 293.07\ m$$

61. For the two dimensional stresses shown in the figure below, what is the normal stress on the 45° plane?




A. 14 $N/mm^2$ B. 12 $N/mm^2$

C. 16 $N/mm^2$ D. 20 $N/mm^2$

Ans. A

Sol.

Tangential stress, $\sigma_3$= 2N/$mm^2$

And, $\sigma_3 = \frac{-(\sigma_1 - \sigma_2)Sin2\theta}{2}$

$\sigma_1$= 10N/$mm^2$

$\sigma_2 = \sigma_2$

$$2 = \frac{-(10 - \sigma_2)Sin90}{2}$$

$\sigma_2$ = 14 N/$mm^2$

$$\sigma n = \frac{(\sigma_1 + \sigma_2)}{2} + \frac{(\sigma_1 - \sigma_2)\cos 2\theta}{2}$$

$$\sigma n = 12N/mm^2$$

62. A pressure increase of 200 N/cm$^2$ increases the density of water by 0.1%. What is the bulk modulus of elasticity of water?

A. 200 GN/m$^2$ B. 20 GN/m$^2$

C. 2 GN/m$^2$ D. 0.2 GN/m$^2$

Ans. C

Sol.

$$K = \frac{dP}{\left(\frac{d\rho}{\rho}\right)} = \frac{200\times10^4}{\left(\frac{0.1}{100}\right)} N/m^2 = 2\times10^9\ N/m^2 = 2GN/m^2$$

63. The ratio of runoff to rainfall is called:

A. Rainfall coefficient B. Runoff coefficient

C. Infiltration coefficient D. Distribution coefficient

Ans. B

Sol. The runoff coefficient (C) is a dimensionless coefficient relating the amount of runoff to the amount of precipitation received. It is a larger value for areas with low infiltration and high runoff (pavement, steep gradient), and lower for permeable, well vegetated areas (forest, flat land)

64. Which of the following is the unit of measurement for the sills of windows?

A. Cubic meter B. meter

C. Number D. Square meter

Ans. D

Sol. A window sill is the surface at the bottom of a window. It is measured in sqm.

65. 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. C

Sol. **Perpendicular Axis Theorem**. For a planar object, the moment of inertia about an axis perpendicular to the plane is the sum of the moments of inertia of two perpendicular axes through the same point in the plane of the object.

**Hence $I_z = I_x + I_Y$**

66. The weight of coarse aggregate having specific gravity 2.65, which is completely filled into a cylinder of volume 0.003 m$^3$ is 5247 gm. What is angularity number?

A. 1% B. 3 %

C. 7% D. 11%

Ans. A

Sol. $W_a$ = 5247 gm or 5.247%

$W_w = \rho_w V_w$ = 1000 x 0.003 = 3 kg

$G_a$ = 2.65

Angularity number = 67% - $\frac{W_a}{W_w G_a}$ = 67% - $\frac{5.247 \times 100}{3 \times 2.65}$ = 67 % - 66 %

Angularity Number = 1%

67. An isochrones is a line on the basin map

A. Joining raingauge stations with equal rainfall duration

B. Joining points having equal standard time

C. Connecting points having equal time of travel of the surface runoff to the catchment outlet

D. That connectrs points of equal rainfall depth in a given time interval

Ans. C

Sol. An isochrone is defined as a line drawn on a map connecting points at which something occurs or arrives at the same time. Such a map is sometimes termed simply an isochrone (iso = equal, chrone = time).

In hydrology and transportation planning isochrone maps are commonly used to depict areas of equal travel time.

68. Calculate the cost of the plastering required for a wall of 4 m long, 3.5 m high and 300 mm thick, if the rate of plastering is Rs. 12 per square meter. (Assume both side plastering is done)

A. 101 B. 168

C. 336 D. 423

Ans. C

Sol. Cost of plastering (both sides of wall)

= 2 × (Surface area × rate of plastering)

= 2 × (3.5 × 4 × 12)

= Rs. 336

69. Which of the following proportion of cement and standard sand is used in cement mortar while testing the compressive and tensile strength of cement?

A. 1:2 B. 1:3

C. 1:4 D. 1:6

Ans. B

Sol. The Proportion of cement and standard sand is used in cement mortar while testing the compressive and tensile strength of cement is 1: 3

70. Cut- Back bitumen

A. is prepared by adding volatile diluents

B. has viscosity lower than ordinary bitumen

C. is classified in three classes

D. All of the above

Ans. D

Sol. Cut back bitumen is prepared by adding volatile diluents such as kerosene to decrease the viscosity of bitumen. It is classified in 3 classes: Rapid curing, Medium curing and slow curing.

71. For a $120^0$ fillet weld, the ratio of throat thickness to the size of the weld is-

A. 1:√2 B. √3:2

C. 1:2 D. 2:1

Ans. C

Sol. For $120^0$ fillet weld, Constant K (= t/S) is given as 0.5.

72. Which of the following is an example of Rheopetic Fluid?

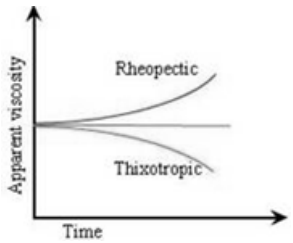
A. Gypsum solution in water B. Toothpaste

C. Rubber solution D. Sewage sludge

Ans. A

Sol. Rheopecty or rheopexy is the rare property of some non-Newtonian **fluids** to show a time-dependent increase in viscosity (time-dependent viscosity); the longer the **fluid** undergoes shearing force, the higher its viscosity. **Rheopectic fluids**, such as some lubricants, thicken or solidify when shaken.

Ex- **Gypsum solution in water & Bentonite Solution**




73. A circular column of length 2m has crushing load of 1.5kN and buckling load of 1.6kN. Find the Rankine failure load in kN

A. 2.2 B. o.774

C. 3.1 D. 1.6

Ans. B

Sol. Rankine failure load = P

Crushing load =$P_c$ = 1.5kN

Buckling load = $P_b$ =1.6Kn

$$\frac{1}{P} = \frac{1}{Pb} + \frac{1}{Pc}$$

P = 0.774 kN

74. In a pile foundation, 400 mm diameter and 10 m long piles are used as foundation for a column in clayey soil. The unconfined compressive strength of clay is 80 kN/$m^2$ and cohesion factor 0.8. Bearing capacity of pile is? Take $N_c$ = 30

A. 527.6 kN B. 375.4 kN

C. 405.4 kN D. 475.4 kN

Ans. A

Sol. Length of pile, L = 10 m

Diameter of pile, d= 400 mm or 0.4 m

Mobilisation around each pile (m) = 0.8

Unconfined compressive strength of clay, $q_u = 80\ kN/m^2$

Cohesion in soil, $c = \frac{q_u}{2} = \frac{80}{2} = 40\ kN/m^2$

Bearing capacity of pile

Where $A_s = \text{surface area of pile} = \pi dL$

$A_S$ = (22/7)X0.4X10 = 12.566 $m_2$

$Q_{un} = C\,N_c A_b + mCA_s$

$$Q_{un} = 40 \times 30 \times \pi \times \frac{(0.4)^2}{4} + 0.8 \times 40 \times 12.566$$

$Q_{un}$ = 527.6 kN

75. If the strain energy stored per unit volume in a hollow shaft subjected to a pure torque when t attains maximum shear stress is $(17f^2_s)/(64G)$ ,the ratio of the inner diameter to outer diameter is

A. ½ B. 1/3

C. 1/4 D. 1/5

Ans. C

Sol.

$$\frac{1}{4}\left(\frac{D_o^2 + D_i^2}{D_o^2}\right) = \frac{17}{64}$$

$$16\left(D_o^2 + D_i^2\right) = 17D_o^2$$

$$D_o^2 = 4D_i^2$$

$$\frac{D_o}{D_i^o} = 4$$

$$\boxed{\frac{D_i}{D_o} = \frac{1}{4}}$$

76. Central line method for estimation is suitable for_____.

A. building having large numbers of cross wall

B. building having large numbers of junctions

C. walls having different widths

D. walls having same widths

Ans. D

Sol. The centre line method, for different sections of walls centre line is found out and this length is multiplied by breadth and depth to get total quantity. Estimates are produced more quickly.

77. Calculate the curvature correction (in m) if distance between the instrument and staff is 500 m.

A. 0.0196 B. – 0.019 6

C. 0.0028 D. – 0.002 8

Ans. B

Sol. The correction of curvature is given as

$C_C = -0.0785\ D^2$, where D is in 'km'

$C_C = -0.0785 \times 0.5^2 = -0.01962$

78. If the pressure carried by a CBR specimen at 2.5 mm penetration is 3.5 N/mm$^2$, the CBR of the soil is:

A. 10 % B. 35 %

C. 50 % D. 70 %

Ans. C

Sol. The pressure carried by the standard specimen in CBR test for 2.5 mm penetration = 70 kg/cm$^2$ = 1370 kg

The pressure carried by a CBR specimen at 2.5 mm penetration = 3.5 N/mm$^2$ = 35 kg/cm$^2$

CBR = $\frac{35}{70} \text{ x } 100 = 50\ \%$

79. The captain of a ship standing on the deck, just sees a lighthouse of height 64 m above MSL. If height of captain's eye above MSL is 9 m then what is the difference of light house from the captain?

A. 42.35 km B. 40.55 km

C. 37.45 km D. 35 km

Ans. A

Sol.

Distance of the captain from the light house = D (in km) = $3.85\ (\sqrt{h_1} + \sqrt{h_2})$

Where $h_1$ = 64 m and $h_2$ = 9 m are the corresponding heights

D (in km) = $3.85\ (\sqrt{64} + \sqrt{9})$

D = 3.85 x 11

D = 42.35 km

80. The diameter of a domestic sewer pipe laid at gradient 1 in 150 is recommended _____.

A. 100 mm B. 150 mm

C. 200 mm D. 175 mm

Ans. B

Sol.

| Peak flow (liters/sec) | Pipe size (mm) | Minimum gradient |
|---|---|---|
| less than 1 | 75<br>100 | 1:40<br>1:40 |
| greater than 1 | 75<br>100<br>150 | 1:60<br>1:80<br>1:150 |

81. The volume of the cement required for 10 $m^3$ of brickwork in 1: 6 cement mortar is approximately equal to _____.

A. 3/7 $m^3$ B. 3/6 $m^3$

C. 3/4 $m^3$ D. 3/5 $m^3$

Ans. A

Sol. By thumb rule, in 1 m3 brick masonry approximately 0.3 m3 dry mortar is required. So for 10 m3 brick masonry dry mortar required is = 3 m3

Hence volume of cement (1/7)*3= 3/7 m3

82. For building project estimate which method is generally used in PWD?

A. Crossing method B. Centre line method

C. Short wall method D. Long wall and short wall method

Ans. D

Sol.

- By Centre line method estimate of a building can be prepared quickly eliminating lengthy mathematical calculations. But the centre line of a building cannot be physically measured at site, where as the long and short walls i.e. out-to-out and in-to-in measurements of rooms of a building can be physically measured.
- So, Centre line method is preferred to prepare estimates and long and short wall method is preferred for entring measurements in the Measurement Book (M.B).
- **Long wall and short wall method estimation is most commonly used in PWD(Public Work Department) because it is practically most easy and accurate method in any circumstances.**

83. The covered area of a proposed building is 150$m^2$ and it includes a rear courtyard of 5m × 4m. If the prevailing plinth area rate for similar buildings is Rs.1,250/$m^2$, what is its cost (in Rs)?

A. 1,87,500 B. 2,12,500

C. 1,62,500 D. 3,75,000

Ans. C

Sol. Covered area = 150$m^2$

Rear courtyard area = 20$m^2$

Total plinth area = 150-20= 130$m^2$

Cost of plinth area = 130 * 1250 = Rs.162500

84. The field capacity and permanent wilting point for a given 0.8 m root zone soil are 35% and 10% respectively. At a given time, the soil moisture in the soil is 20% when a farmer irrigates the soil with 250 mm depth of water. Assuming bulk specific gravity of the soil is

1.6, determine amount of water wasted from consideration of irrigation?( take the plan area of the soil in root zone to be 1 $m^2$)

A. 21% B. 23.5%

C. 27.5% D. 34%

Ans. B

Sol.

Depth of extra soil moisture = $\frac{1.6 \times 1 \times 0.8 \times (0.35-0.20)}{1}$ = 0.192 m

Amount of water wasted = 0.250-0.192

= 0.058 m

Amount of water wasted = 58 mm

Percentage of water wasted = $\frac{58}{250}$ x 100 = 23.5 % approximately

85. Compute the theoretical oxygen demand of the water that contains 25 mg/l of benzene?

A. 64 mg/l B. 70 mg/l

C. 72 mg/l D. 77 mg/l

Ans. D

Sol. The equation for the total oxidation of benzene is given as:

$C_6H_6 + 7.5\ O_2 = 6CO_2 + 3\ H_20$

78 gm of benzene reacts with 240 gm of oxygen to give 264 gm of carbon dioxide and 54 gm of water

Total theoretical oxygen demand = $\frac{240}{78}\ x\ 25$ = 77 mg/l

86. Calculate the critical velocity of a channel using Kennedy's theory, if the depth of flow is 4.5 m. (take m = 1)

A. 0.84 m /sec B. 1.44 m /sec

C. 2.7 m /sec D. 7.2 m /sec

Ans. B

Sol. According to kennedy's theory,

$V_0 = 0.55\ m\ D^{0.64}$

$= 0.55\ (4.5)^{0.64} = 1.44$

87. Which one is the upper limit of survey area (square kilometer) for use of plane survey?

A. 250 B. 300

C. 350 D. 450

Ans. A

Sol. For using the survey area for use of plane survey, upper limit is 250 $km^2$.

88. A closed coil helical spring is subjected to a torque about its axis. The spring wire would experience a _____.

A. Bending stress

B. Direct tensile stress of uniform intensity at its cross section

C. Direct shear stress

D. Torsional shearing stress

Ans. D

Sol.

- When an axial load is applied to the spring, stresses are developed due to Torsion, Direct Shear due to axial load and bending stresses.
- The stresses due to the direct shear and bending are very small and may be neglected in comparison to the torsion.
- And for light springs direct shear also can be neglected.

Hence, finally shear stress due to torsion dominates which is given by

$16T/\prod d^3$

89. An industrial waste water enters a stream having a BOD concentration of 10 mg/l and a flow of 20 $m^3/s$. If the flow of waste water is 1.5 $m^3/s$ and its BOD concentration is 250 mg/l, then the BOD concentration in the stream at a point downstream of the point of confluence of waste water with the stream will be:

A. 2.67 mg/l

B. 12.1 mg/l

C. 13 mg/l

D. 26.75 mg/l

Ans. D

Sol.

$$BOD_{stream} = \frac{Q_1 y_1 + Q_2 y_2}{Q_1 + Q_2}$$

Where $Q_1$ and $y_1$ are the discharge and concentration of stream

And $Q_2$ and $y_2$ are the discharge and concentration of waste water

$$BOD_{stream} = \frac{20 \text{ x } 10 + 1.5 \text{ x } 250}{20 + 1.5}$$

$BOD_{stream}$ = 26.75 mg/l

90. As soon as the external forces causing deformation in a perfectly elastic body are withdrawn, the elastic deformation disappears:

A. Only partially

B. Completely over a prolonged period of time

C. Completely and instantaneously

D. Completely after an initial period of rest

Ans. C

Sol. For perfectly elastic body, ideal transformation takes place. Ideal deformation means that the deformation take place instantaneously upon application of force and disappears completely and instantaneously on the removal of force.

91. Steam curing is not used with _____.

A. Ordinary Portland cement

B. Rapid hardening cement

C. High alumina cement

D. All the options are correct

Ans. C

Sol. Steam curing is applied where early gain in strength is required, so high amount of alumina where heat of hydration is very high steam curing is not required.

92. Which of the following statements is true?

A. To ensure uniform pressure distribution, the thickness of the foundation is kept uniform throughout

B. To ensure uniform pressure distribution, the thickness of the foundation is increased gradually towards the edge

C. To ensure uniform pressure distribution, the thickness of the foundation is decreased gradually towards the edge and kept minimum.

D. To ensure uniform pressure distribution, the thickness of the foundation is kept zero at the edge

Ans. C

Sol. The maximum load acts at center line of footing or center of foundation. Intensity of load is reduced towards the outer edge of footing.

Footing is designed according to load distribution, thickness of footing is maximum at center and Reduced towards edge of footing.

Pressure=Load/cross sectional Area.

Greater the load greater is the thickness.

Smaller the load smaller is the thickness.

So pressure will be the same throughout width of footing.

93. The thermal coefficient of concrete:

(i) Depends on nature of concrete

(ii) Depends on the cement content

(iii )Depends on relative humidity

(iv)Depends on the size of section

A. (i) and (ii) only

B. (ii) and (iii) only

C. (iii) only

D. All of the above

Ans. D

Sol. The thermal coefficient of concrete depends on nature of concrete, the cement content, relative humidity and the size of section.

94. If the efficiencies of BOD removal of first stage and second stage trickling filters are each 65% then what is the overall BOD removal efficiency of these filters?

A. 65%

B. 77.25%

C. 87.75%

D. 92%

Ans. C

Sol. Efficiency of first stage trickling filter = $\eta_i$ = 65%

Efficiency of second stage trickling filter = $\eta_{ii}$ = 65%

Overall Efficiency of trickling filter = $\eta_{final} = \eta_i + (100-\eta_i\%) \times \eta_{ii}\%$

$\eta_{final}$ = 65% + (100-65) x 65%

$\eta_{final}$ = 87.5%

95. Acceptable lower limit of bacteria removal through activated sludge process is:

A. 60% B. 70%

C. 80% D. 90%

Ans. D

Sol. Bacteria and organisms are removed by mechanical means during waste water treatment

| Process | % removal |
|---|---|
| Coarse screens | 0-5 |
| Fine screens | 10-20 |
| Grit chambers | 10-25 |
| Plain sedimentation | 25-75 |
| Chemical precipitation | 40-80 |
| Trickling filters | 90-95 |
| Activated sludge | 90-98 |
| Chlorination | 98-99.999 |

96. Wheat is to be grown in field having field capacity 29% and the permanent wilting point is 15%. Find the depth of water stored in 80 cm depth of soil, if the dry unit weight of the soil is 1.5 g/cc:

A. 16.8 B. 15

C. 18.6 D. 20.5

Ans. A

Sol. Storage capacity = Depth of water stored at a moisture content ($d_w$)

$$d_w = \frac{\gamma_d}{\gamma_w} \text{ x d x } x$$

d = depth of soil, $\gamma_d$ = dry unit weight of soil, $\gamma_w$ = unit weight of water

*x* can be (Field capacity – permanent wilting point) in case of available water.

x can be ( Field capacity – optimum moisture content) in case of readily available water .

$$d_w = \frac{1.5}{1} \text{ x } 80 \text{ x } (0.29 - 0.15)$$

$$d_w = 16.8 \text{ cm}$$

97. When both ends of a column are fixed, the crippling load is F. If one end of the column is made free, the value of crippling load will be changed to _____.

A. F/4 B. F/2

C. F/16 D. 4F

Ans. C

Sol. When both end fixed then effective length = L/2

And when made one end free then effective length = 2L

Crippling load=$\pi 2\ EI/L2$

As effective length is increasing four times so the critical load will decrease by $4^2$ =16 times.

98. Water conveyance efficiency is given as:

A. $\frac{\text{Quantity of water delivered to the field}}{\text{Quantity of water diverted into the canal system fro the irrigation}}$

B. $\frac{\text{Quantity of water stored in the root zone of the plants}}{\text{Quantity of water diverted to the field}}$

C. $\frac{\text{Quantity of water used beneficially}}{\text{Quantity of water delivered to the fields}}$

D. None of the above

Ans. A

Sol.

Water conveyance efficiency

$\eta_c = \frac{\text{Quantity of water delivered to the field}}{\text{Quantity of water diverted into the canal system fro the irrigation}}$

It includes losses which occurs in conveyance from point of diversion into canal system to the fields.

99. According to Indian standards, the number of raingauge stations for an area of 10400 $km^2$ in plains should be

A. 10 B. 20

C. 25 D. 40

Ans. B

Sol. In plains, 1 station per 520 $km^2$ is recommended. So, 10400 / 520 = 20.

100. A stream of 150 liters per second was delivered from a canal and 120 per second were delivered to field. The depth of water penetration varied linearly from 2 m at the head end of the field to 1.2 m at the tail end. Available moisture holding capacity of the soil is 200 mm per metre depth of soil. What will be the water distribution efficiency?

A. 50% B. 65%

C. 75% D. 90%

Ans. C

Sol. Depth of water penetration at the head end of the field = 2 m

Depth of water penetration at the tail end of the field = 1.2 m

Average depth of water stored in the root zone, $d = \frac{2+1.2}{2} = 1.6\ m$

Numerical deviation from depth of penetration at the head end of the field = 2 – 1.6 = 0.4 m

Numerical deviation from depth of penetration at the tail end of the field = 1.6 – 1.2 = 0.4 m

Average numerical deviation from depth of water stored, $y = \frac{0.4+0.4}{2} = 0.4$

Water distribution efficiency, $\eta_d = \left(1 - \frac{y}{d}\right) x\ 100$

$$\eta_d = \left(1 - \frac{0.4}{1.6}\right) x\ 100$$

$$\eta_d = 75\%$$

****