



**WBPSC, WBPSC SAE/AE, KMDA, Nirman  
Sahayak, SSC JE and State JE/AE**



**NIRMAN SAHAYAK SPECIAL**



**GAUARENTEED  
SCORE BOOSTER BATCH**

**SET-1 LECTURE-1**

**CHINMOY GHOSH**

**DAILY MCQs SERIES!**

**Q.1 For crossing and points, the maximum size of ballast is**

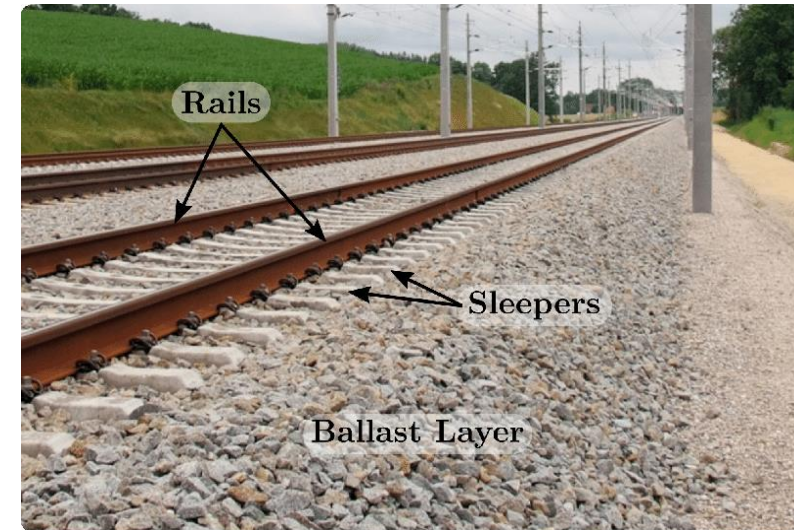
- A. 50 mm**
- B. 20 mm**
- C. 25 mm**
- D. 35 mm**



**Answer: C**

**Solution:**

- ☐ Max. size of Ballast: 19-51 mm or 20-50 mm
- ☐ For metal sleepers with rounded edges: 40 mm
- ☐ For point & crossing: 25 mm
- ☐ For flat bottom sleepers: 50 mm
- ☐ For wooden sleepers: 50 mm



**Q.2 The test most suitable for concrete of very low workability is**

- A. Slump test**
- B. Kelly ball test**
- C. Compaction factor test**
- D. Vee-Bee test**



**Answer: D**

**Solution:**

Workability test methods applicability in order of very low to high workability:

- Vee-Bee consistometer method ( $\geq 50\text{mm slump}$ ) < Compacting Factor Test < Slump test < Flow Test
- Measure workability of concrete in terms of **vee-bee seconds**.
- This test can measure the workability of concrete with a low slump value up to the 50 mm.



**Q.3 An accurate estimate is prepared in detail item wise by**

- A. Detailed Estimate**
- B. Cube Rate Estimate**
- C. Plinth Area Estimate**
- D. Preliminary Estimate**



**Answer: A**

**Solution:**

**Detailed Estimate or Item Rate Estimate:**

- ☐ Detailed estimate is prepared for **technical sanction**.
- ☐ It is the accurate estimate prepared by working out quantities of each items of work.
- ☐ **Most Accurate or Reliable method**.
- ☐ **Detailed specification & Drawing** is used for estimate.
- ☐ Prepared in 2 stages:

1. Details of measurement & calculation of quantity- **'M Book or Bible of JE'**

Measurement Book (M Book): **Length- Breadth –Height**

2. Abstract of estimated cost- **'Abstract Sheet'**

| SL. No | Item Description | Number | L | B | H | Quantity | Remarks |
|--------|------------------|--------|---|---|---|----------|---------|
|--------|------------------|--------|---|---|---|----------|---------|

| SL. No | Item Description | Quantity | Unit | Rate | Amount |
|--------|------------------|----------|------|------|--------|
|--------|------------------|----------|------|------|--------|



**Q.4 Which value is obtained by dismantling the building?**

- A. Distress Value**
- B. Book Value**
- C. Scrap Value**
- D. Salvage Value**



**Answer: C**

## Scrap value:

- ☐ The value of dismantled material of property at the end of its utility.
- ☐ Normally 10% of estimated cost or present value is considered as scrap value.
- ☐ The cost of dismantling & removal of rubbish material is deducted from total receipt obtain from sale of useable materials.
- ☐ Scrap value may be positive, negative or zero.



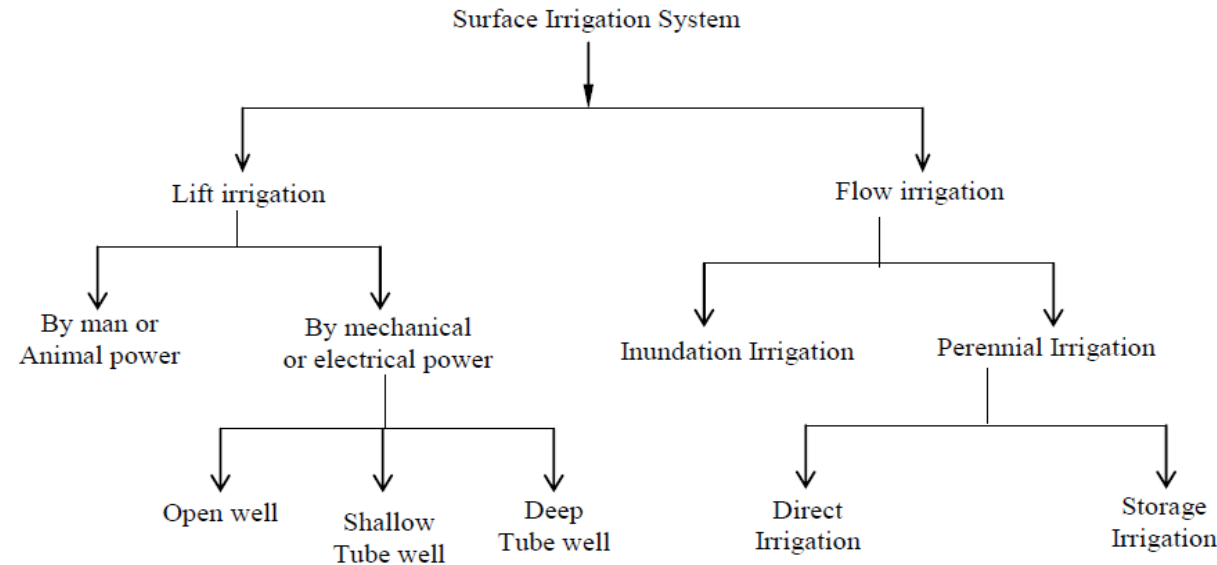
**Q.5 Irrigation water conveyed to the land by means of gravity flow indicates which of the following type of irrigation?**

- A. Drip Irrigation**
- B. Flow irrigation**
- C. Lift Irrigation**
- D. Sprinkler Irrigation**



**Answer: B**

**Solution:**



**Flow irrigation:**

- ❑ These are also called gravity irrigation. It is the type of irrigation in which water is available at a higher level to enable supply to the land by gravity flow.



**Q.7 According to Indian Standard, the number of rain gauge stations for an area of 5200 km<sup>2</sup> in plains should be**

- A. 10**
- B. 20**
- C. 25**
- D. 15**



**Answer: A**

**Solution:**

Rain gauge density (IS 4987-1968):

1. Plain area: **1 station per 520 Sq.km**
2. Region of Avg. elevation 1000 m: **1 station per 260-390 Sq.km**
3. Predominantly hilly areas with heavy rainfall: **1 station per 130 Sq.km.**



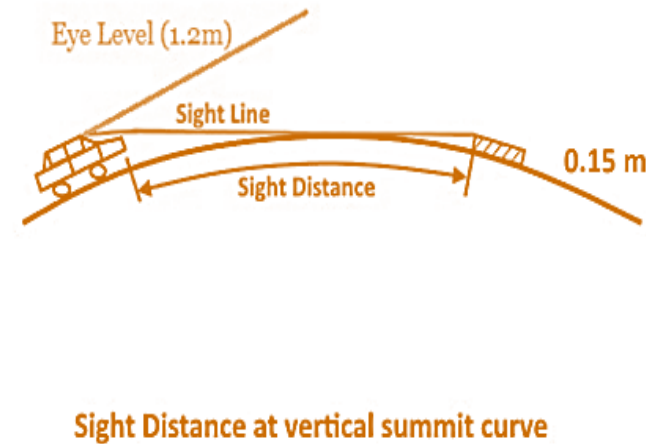
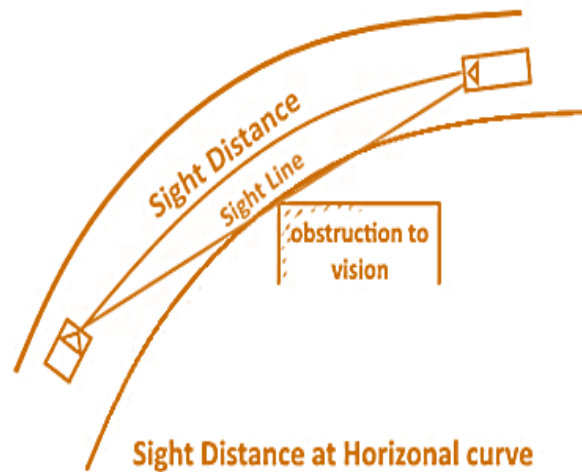
**Q.7 For non-passing sight distance, the height of stationary object considered is**

- A. 10 cm**
- B. 50 cm**
- C. 15 cm**
- D. 75 cm**



**Answer: C**

**Solution:**



- ❑ IRC has suggested that the height of the eye level of the driver is **1.2 m** and the height of the object as **0.15 m** above the road surface.



**Q.8 As per IS:10500-2012, the maximum desirable limits of iron and fluorides for drinking water are**

- A. 0.3 and 0.3 mg/l**
- B. 0.5 and 1.5 mg/l**
- C. 0.3 and 1.0 mg/l**
- D. 0.3 and 1.5 mg/l**



**Answer: C**

**Table 2 General Parameters Concerning Substances Undesirable in Excessive Amounts**  
(Foreword and Clause 4)

| Sl No. | Characteristic                                      | Requirement<br>(Acceptable<br>Limit) | Permissible<br>Limit in the<br>Absence of<br>Alternate<br>Source | Method of Test,<br>Ref to               | Remarks                                                                                                                                                                        |
|--------|-----------------------------------------------------|--------------------------------------|------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)    | (2)                                                 | (3)                                  | (4)                                                              | (5)                                     | (6)                                                                                                                                                                            |
| i)     | Aluminium (as Al), mg/l, <i>Max</i>                 | 0.03                                 | 0.2                                                              | IS 3025 (Part 55)                       | —                                                                                                                                                                              |
| ii)    | Ammonia (as total ammonia-N),<br>mg/l, <i>Max</i>   | 0.5                                  | No relaxation                                                    | IS 3025 (Part 34)                       | —                                                                                                                                                                              |
| iii)   | Anionic detergents (as MBAS)<br>mg/l, <i>Max</i>    | 0.2                                  | 1.0                                                              | Annex K of IS 13428                     | —                                                                                                                                                                              |
| iv)    | Barium (as Ba), mg/l, <i>Max</i>                    | 0.7                                  | No relaxation                                                    | Annex F of IS 13428*<br>or IS 15302     | —                                                                                                                                                                              |
| v)     | Boron (as B), mg/l, <i>Max</i>                      | 0.5                                  | 1.0                                                              | IS 3025 (Part 57)                       | —                                                                                                                                                                              |
| vi)    | Calcium (as Ca), mg/l, <i>Max</i>                   | 75                                   | 200                                                              | IS 3025 (Part 40)                       | —                                                                                                                                                                              |
| vii)   | Chloramines (as Cl <sub>2</sub> ), mg/l, <i>Max</i> | 4.0                                  | No relaxation                                                    | IS 3025 (Part 26)*<br>or APHA 4500-Cl G | —                                                                                                                                                                              |
| viii)  | Chloride (as Cl), mg/l, <i>Max</i>                  | 250                                  | 1 000                                                            | IS 3025 (Part 32)                       | —                                                                                                                                                                              |
| ix)    | Copper (as Cu), mg/l, <i>Max</i>                    | 0.05                                 | 1.5                                                              | IS 3025 (Part 42)                       | —                                                                                                                                                                              |
| x)     | Fluoride (as F) mg/l, <i>Max</i>                    | 1.0                                  | 1.5                                                              | IS 3025 (Part 60)                       | —                                                                                                                                                                              |
| xi)    | Free residual chlorine, mg/l, <i>Min</i>            | 0.2                                  | 1                                                                | IS 3025 (Part 26)                       | To be applicable only when<br>water is chlorinated. Tested<br>at consumer end. When pro-<br>tection against viral infec-<br>tion is required, it should be<br>minimum 0.5 mg/l |
| xii)   | Iron (as Fe), mg/l, <i>Max</i>                      | 0.3                                  | No relaxation                                                    | IS 3025 (Part 53)                       | Total concentration of man-<br>ganese (as Mn) and iron (as<br>Fe) shall not exceed 0.3 mg/l                                                                                    |
| xiii)  | Magnesium (as Mg), mg/l, <i>Max</i>                 | 30                                   | 100                                                              | IS 3025 (Part 46)                       | —                                                                                                                                                                              |



**Q.9 The alum added as a coagulant in water treatment functions when the raw water is**

- A. Acidic with high turbidity**
- B. Neutral with low turbidity**
- C. Acidic with low turbidity**
- D. Alkaline with high turbidity**



**Answer: D**

- ☐ Alum works best in **alkaline conditions**, with a pH range of **6.5 to 8.5**. At this pH range, aluminum hydroxide precipitates form quickly, which helps to trap and remove impurities such as suspended solids and microorganisms.
- ☐ Alum is more effective in water with **high turbidity** levels because the particles are more likely to collide and form larger flocs that can be easily removed by sedimentation or filtration.



**Q.10 If the intensity of rainfall is more than the infiltration capacity of soil, then the infiltration rate will be**

- A. Equal to rate of rainfall**
- B. Equal to infiltration capacity**
- C. More than rate of rainfall**
- D. More than infiltration capacity**



**Answer: B**

**Solution:**

**Infiltration Capacity:**

- ☐ It is the maximum rate at which a given soil at a given time can absorb water and is denoted by  $f$ .
- ☐ If  $i \geq f$  then  $f_a = f$  (depend upon soil capacity)
- ☐ If  $i < f$  then  $f_a = i$  (depend upon rainfall intensity), where  $f_a$  = actual infiltration capacity,  $i$  = rate of rainfall,  $f$  = infiltration capacity.



**Q.11 Which of the following would represent the surface of the water level of a still lake?**

- A. Level surface**
- B. Contour surface**
- C. Horizontal surface**
- D. None of these**



**Answer: A**

**Solution:**

**Level surface:**

- ☐ The level surface is the surface that is parallel to the earth's curvature at all points.
- ☐ It is always perpendicular to the plumb line.

**Notes:**

- For boundary of water of a still lake: **Contour line**
- Surface of water level of a still lake: **Level surface**



**Q.12 A well-graded sand should have**

- A.  $C_u \geq 4$**
- B.  $C_u > 6$**
- C.  $C_u \geq 1$**
- D.  $C_u > 3$**

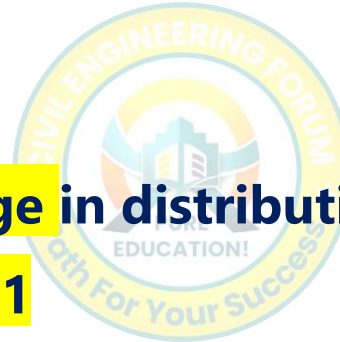


**Answer: B**

**Solution:**

**Uniformity Coefficient:**

- $C_u = \frac{D_{60}}{D_{10}}$
- Represents the **particle size range** in distribution curve.
- For uniformly graded soil,  **$C_u = 1$**
- For well graded sand,  **$C_u > 6$**
- For well graded gravel,  **$C_u > 4$**



**Q.13 For dense sand, the relative density is**

- A. Between 35 and 65**
- B. Between 65 and 85**
- C. Between 85 and 100**
- D.  $> 100$**



**Answer: B**

**Solution:**

- Relative density is the measure of **compactness of cohesionless soil**.
- 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.
- $R_D = \frac{(e_{max} - e_n)}{(e_{max} - e_{min})} \times 100\%$

| Relative Density (%) | Classification |
|----------------------|----------------|
| < 15                 | Very loose     |
| 15-35                | Loose          |
| 35-65                | Medium dense   |
| 65-85                | Dense          |
| > 85                 | Very dense     |



**Q.14 The particle size distribution curve with a hump is obtained for a**

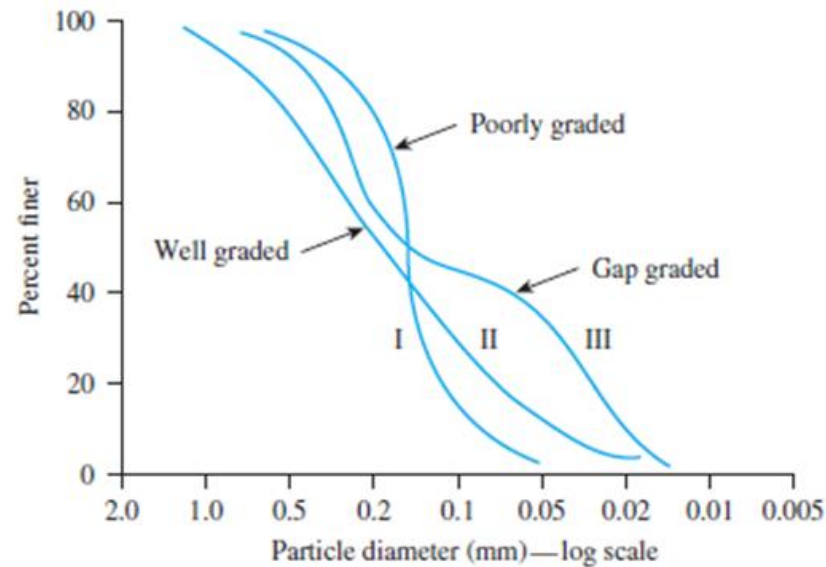
- A. Uniform soil**
- B. Well-graded soil**
- C. Gap-graded soil**
- D. Poorly-graded soil**



**Answer: C**

**Solution:**

- ❑ The particle size distribution curve with a hump is obtained for a **Gap graded soil**.



**Q.15 The collapsible soil is associated with**

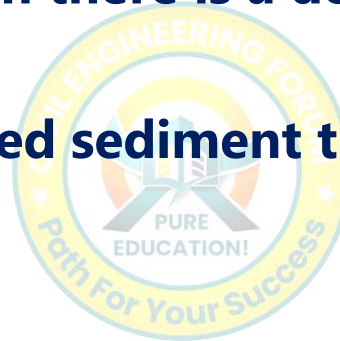
- A. Dune sand**
- B. Laterite sand**
- C. Loess**
- D. Black cotton soil**



**Answer: C**

**Solution:**

- ☐ Collapsible soil is those for which there is a decrease in volume on the addition of water. Example: **Loess**
- ☐ **Loess** is predominantly a silt-sized sediment that is formed by the accumulation of **wind-blown** dust.



**Q.16 For a soil deposit having  $n = 33\%$  and  $G = 2.60$ , the critical gradient is**

- A. 1.0**
- B. 1.05**
- C. 1.07**
- D. 1.10**



**Answer: C**

**Solution:**

$$G = 2.6, n = 0.33$$

A.  $e = \frac{n}{1-n} = 0.492$

B. Critical hydraulic gradient,  $i_c = \frac{G-1}{1+e}$  or,  $(G-1)(1-n) = 1.07$

☐ At the critical conditions, the effective stress is equal to zero.



**Q.17 Quick sand is**

- A. A type of sand**
- B. A condition in which a cohesionless soil loses its strength because of upward flow of water.**
- C. A condition in which a cohesive soil loses its strength**
- D. None of the above**



**Answer: B**

**Solution:**



## Quick Sand Condition/Boiling Condition:

- ☐ Quicksand condition is not a type of soil but a flow condition that occurs in cohesionless soils.
- ☐ This process in which soil particles are lifted over the soil mass is called quicksand condition.
- ☐ It occurs when the upward seepage pressure in soil becomes equal to submerged unit weight of the soil. This results into effective stress equal to zero.



**Q.18 The hypotenuse allowance (in m) for 30 m long chain, if the slope is 1:10 is**

- A. 0.1**
- B. 0.12**
- C. 0.15**
- D. 0.22**



**Answer: C**

**Solution:**

$$\text{Slope} = \frac{1}{10} = \frac{h}{L}$$

$$\text{So, } h = \frac{30}{10} = 3 \text{ m}$$

$$\text{Hypotenuse allowance} = \frac{h^2}{2L} = \frac{3^2}{2 \times 30} = 0.15$$



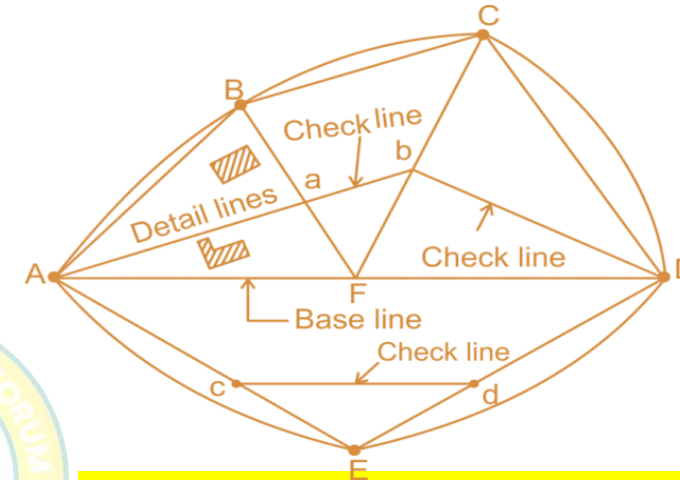
**Q.19 The line which is used to collect the details of the object in an area is called**

- A. Base Line**
- B. Check Line**
- C. Main Line**
- D. Tie Line**



**Answer: D**

**Solution:**



**Check line:** The lines which are run in the field to **check the accuracy of the work** are known as Check line. They are also known as Proof lines.

**Base line:** The **biggest line that will divide the total area into two parts** is known as Base line. It is the biggest line among all the lines in a traverse.

**Tie line:** The lines which are used to **collect the details of the nearby objects** are known as Tie line.



**Q.20 The type of surveying in which the curvature of the earth is taken into account is called**

- A. Geodetic survey**
- B. Plane survey**
- C. Preliminary survey**
- D. Topographical survey**



**Answer: A**

**Solution:**

| Property                       | Plane Survey                                                                        | Geodetic Survey                                                                                  |
|--------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Curvature of earth             | Not taken into account (considered as plane)                                        | Taken into account                                                                               |
| Area of survey                 | Smaller ( $< 195.5 \text{ km}^2$ or $< 250 \text{ m}^2$ )                           | Larger ( $> 195.5 \text{ km}^2$ or $> 250 \text{ m}^2$ )                                         |
| Degree of Precision (Accuracy) | Less                                                                                | More                                                                                             |
| Plumb line                     | Parallel to each other (direction of gravity)                                       | Meet at centre of the earth                                                                      |
| Angular measurement            | Plane triangle (Sum of angle = $180^\circ$ )                                        | Spherical triangle (Sum of angle = $180^\circ + 1 \text{ second for area } 195.5 \text{ km}^2$ ) |
| Linear measurement             | Curvature of the earth not considered (No difference between straight & curve line) | Difference between straight & curve line: 1 cm for 12 km & 1.5 cm for 18 km.                     |
| Used by                        | Irrigation & railway                                                                | Survey department of India                                                                       |



**Q.21 Which of the following Indian Standard is referred to determine zone of fine aggregate:**

- A. IS 456**
- B. IS 1893**
- C. IS 800**
- D. IS 383**



**Answer: D**

**Solution:**

| IS Codes       | Details                                                |
|----------------|--------------------------------------------------------|
| IS: 269-2015   | OPC cement (33/43/53 grade)                            |
| IS: 383-2016   | Coarse and Fine Aggregate for Concrete - Specification |
| IS: 456-2000   | RCC design                                             |
| IS: 800-2007   | Steel design                                           |
| IS: 1893-2016  | Earthquake design                                      |
| IS: 10262-2019 | Mix design of concrete                                 |
| IS: 2386       | Aggregate test                                         |
| IS: 4031       | Cement test                                            |



**Q.22 To prevent segregation, the maximum height of placing of concrete is**

- A. 100 cm**
- B. 150 cm**
- C. 125 cm**
- D. 200 cm**



**Answer: B**

**Solution:**

- ❑ As per clause 13.2 of IS 456: 2000, the maximum permissible free fall of concrete to avoid segregation may be taken as **1.5 m or 150 cm**.



**Q.23 Approximate value of shrinkage strain in concrete is**

- A. 0.03**
- B. 0.003**
- C. 0.0003**
- D. 0.00003**



**Answer: C**

**Solution:**

- ☐ As per Clause 6.2. 4.1 of IS 456:2000, The approximate value of the total shrinkage strain for design may be taken as **0.0003**.



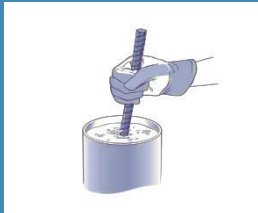
**Q.24 \_\_\_\_ are used to finish concrete surfaces such as bridge floors, road slabs**

- A. Immersion vibrators**
- B. Surface vibrators**
- C. Form vibrators**
- D. Internal vibrators**



**Answer: B**

**Solution:**

| Methods                                                                                              | Suitability                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hand compaction<br> | <ul style="list-style-type: none"><li>➤ Hand compaction is obtained for small quantities of concrete.</li><li>➤ We use hand compaction when Vibrators are not available on site.</li><li>➤ It results in inefficient compaction.</li><li>➤ Hand compaction requires high water content.</li><li>➤ It can be done by Tamping, Ramming and Rodding.</li><li>➤ Useful for layer thickness &lt; 20 cm.</li></ul> |
| Surface or screed vibrator                                                                           | <ul style="list-style-type: none"><li>➤ For thin <b>slabs, pavement and floors</b>.</li><li>➤ Used in rigid pavement.</li><li>➤ Compacted up to 150-250 mm layer thickness (200 mm in general).</li></ul>                                                                                                                                                                                                    |
| External or form vibrator                                                                            | <ul style="list-style-type: none"><li>➤ Used in thin &amp; heavily reinforced section (tunnel lining work)</li></ul>                                                                                                                                                                                                                                                                                         |
| Internal/Needle/Pin vibrator                                                                         | <ul style="list-style-type: none"><li>➤ Mass concreting work (bridge pier construction)</li></ul>                                                                                                                                                                                                                                                                                                            |
| Mechanical vibrator                                                                                  | <ul style="list-style-type: none"><li>➤ Closely spaced reinforced section (slump-50 mm)</li></ul>                                                                                                                                                                                                                                                                                                            |
| Table vibrator                                                                                       | <ul style="list-style-type: none"><li>➤ Cube casting in laboratory</li><li>➤ For precast concrete member</li></ul>                                                                                                                                                                                                                                                                                           |



**Q.25 Grouting of the Cracks is measured in \_\_\_\_.**

- A. M3**
- B. M2**
- C. M**
- D. Number**



**Answer: C**

**Solution:**

- ☐ Grouting method used in concrete repair to restore structural integrity, stop water leaks, or merely to seal the crack.
- ☐ Measured in running meter.



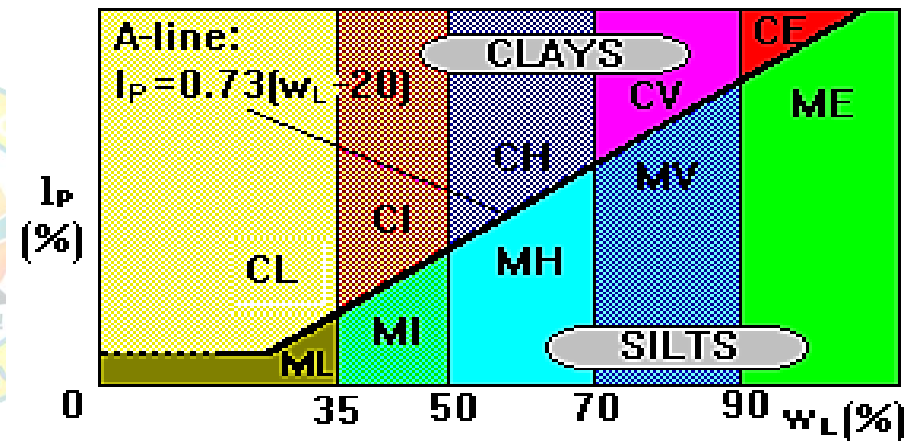
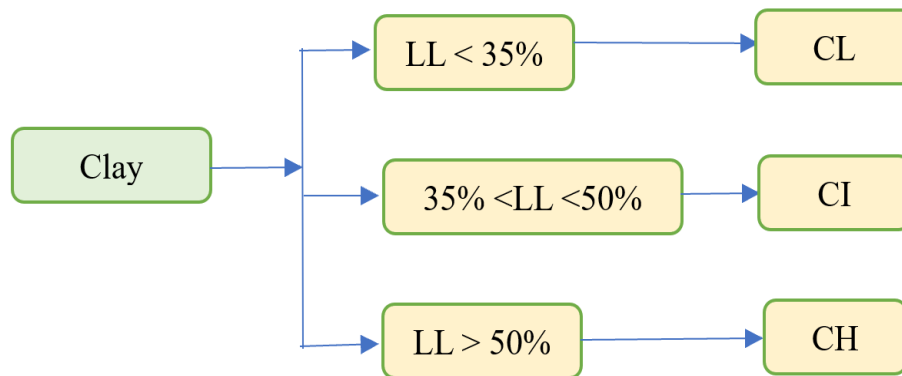
**Q.26 For a fine-grained soil, WL = 48% and WP = 27%, then the soil is classified as**

- A. CL
- B. ML
- C. CH
- D. CI



**Answer: D**

**Solution:**



**Q.27 Plasticity index of a clayey soil is 20%. If plastic limit is 30%, then the compression index is**

- A. 0.45**
- B. 0.27**
- C. 0.36**
- D. 0.18**



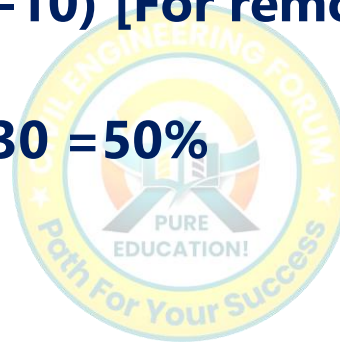
**Answer: C**

**Solution:**

Compression Index,  $C_c = 0.009 (LL - 10)$  [For undisturbed clays]  
 $= 0.007 (LL - 10)$  [For remoulded clays]

$$I_p = LL - PL \text{ or, } LL = I_p + PL = 20 + 30 = 50\%$$

$$C_c = 0.009 (50 - 10) = 0.36$$



**Q.28 Minimum nominal cover for designing RCC water tank is**

- A. 55 mm**
- B. 50 mm**
- C. 45 mm**
- D. 40 mm**



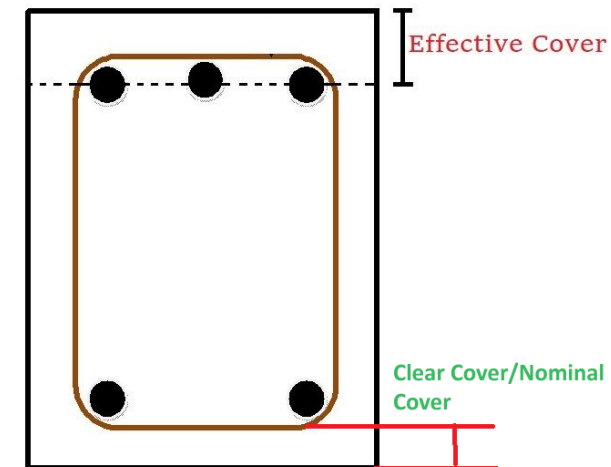
**Answer: C**

**Solution:**

**Nominal cover (min):**

**Effective cover = Nominal cover (Clear cover) + Diameter of ring +  $\frac{1}{2}$  Diameter of Main bar**

- ☐ Slab: 15/20 mm
- ☐ Beam: 25 mm
- ☐ Column: 40/25 mm
- ☐ Footing: 50 mm
- ☐ Pile cap: 60 mm
- ☐ Pile: 75 mm
- ☐ Water tank: 45 mm



**Q.29 The shape of the particle size curve is represented by**

- A. Coefficient of curvature**
- B. Effective diameter**
- C. Effective size**
- D. Uniformity coefficient**



**Answer: A**

**Solution:**

- ☐ Co-efficient of curvature ( $C_c$ ) represents the **shape of the particle size distribution curve.**
- ☐ Uniformity co-efficient ( $C_u$ ) signifies the **range of particle size distribution curve.**



**Q.30 The initial setting time of hydraulic lime is**

- A. 30 minutes**
- B. 60 minutes**
- C. 120 minutes**
- D. 90 minutes**



**Answer: C**

**Solution:**

**Hydraulic lime/water lime:**

- Purity: 70 to 95%, Clay: 5 to 30%.
- Obtained from calcination of kankar.
- Off white colour less vigorous in nature than fat lime.
- Used where strength is required.
- Capable of setting in water and in damp locations.
- Initial setting time of hydraulic lime is 120 min (2 hours).
- Used in: Brick Masonry, Stone Masonry, under water construction etc.



**Q.31 According to IS:303-1989, the thickness of plywood boards (in mm unit) in a 3-ply board is**

- A. 3, 5, 7, 9**
- B. 3, 4, 5, 6**
- C. 4, 5, 6, 7**
- D. 2, 3, 4, 6**



**Answer: D**

**Solution:**

**Thickness of Plywood Boards: (As per IS: 303-1989)**

| Board        | Thickness (mm) |
|--------------|----------------|
| 3 ply        | 3, 4, 5, 6     |
| 5 ply        | 5, 6, 8, 9     |
| 7 ply        | 9, 12, 15, 16  |
| 9 ply        | 12, 15, 16, 19 |
| 11 ply       | 19, 22, 25     |
| Above 11 ply | As ordered     |



**Q.32 As per IS:269-2015, ratio of percentage of alumina to that of iron oxide is**

- A. 0.2**
- B. 0.33**
- C. 0.5**
- D. 0.66**



**Answer: D**

**Solution:**

**As per IS: 269-2015**

| Chemical requirements           | 33/43 Grade                                            | 53 Grade                                               |
|---------------------------------|--------------------------------------------------------|--------------------------------------------------------|
| Lime Saturation Factor (LSF)    | 0.66-1.02                                              | 0.80-1.02                                              |
| Alumina Modulus (AM)            | 0.66 (min)                                             | 0.66 (min)                                             |
| Insoluble residue (% by mass)   | 5% (max)                                               | 5% (max)                                               |
| Magnesia (% by mass)            | 6% (max)                                               | 6% (max)                                               |
| Sulphuric anhydride (% by mass) | 3.5% (max)                                             | 3.5% (max)                                             |
| Total loss of ignition (%)      | 5% (max)                                               | 4% (max)                                               |
| Chloride (%)                    | 0.10% (max) and 0.05% (max)<br>for prestress structure | 0.10% (max) and 0.05% (max)<br>for prestress structure |



**Q.33 If the soundness test of coarse aggregate soaked with magnesium sulphate, then loss in % should not be more than**

- A. 12%**
- B. 18%**
- C. 30%**
- D. 45%**



**Answer: B**

**Solution:**

| Property            | Test                      | Limits                                                                            |
|---------------------|---------------------------|-----------------------------------------------------------------------------------|
| Cleanliness         | Sieve Analysis            | Max. 5 % passing on 75 $\mu$ sieve                                                |
| Shape & size        | FI & EI (combine)         | 40 % (max)                                                                        |
| Strength            | Los Angles Abrasion Value | 30 % (max) for wearing course<br>50 % (max) for other than wearing course         |
|                     | Aggregate Impact Value    | 30 % (max) for wearing course<br>45 % (max) for other than wearing course         |
|                     | Crushing Value            | Max. 30%                                                                          |
| Durability          | Soundness                 | 12 % max. on Sodium Sulphate solution<br>18 % max. on Magnesium Sulphate solution |
| Water absorption    | Water absorption          | In general, 2 % max but for road aggregate max. 0.6 %                             |
| Adhesion to Bitumen | Coating & Stripping value | Max.5 % [IRC]                                                                     |
| Water Sensitivity   | Retained tensile strength | Min. 80%                                                                          |



**Q.34 Maximum permissible color for domestic water supply based on cobalt scale**

- A. 5 ppm**
- B. 15 ppm**
- C. 10 ppm**
- D. 20 ppm**



**Answer: D**

**Solution:**

**Measurement:**

- ☐ Measurement of color is done by color matching techniques using Nessler's Tubes ( Instrument used - Tintometer).
- ☐ The color of water is measured on Platinum cobalt scale.

| Scale            | AL | CFR |
|------------------|----|-----|
| Hazen scale/ TCU | 5  | 15  |
| Cobalt scale     | 10 | 20  |



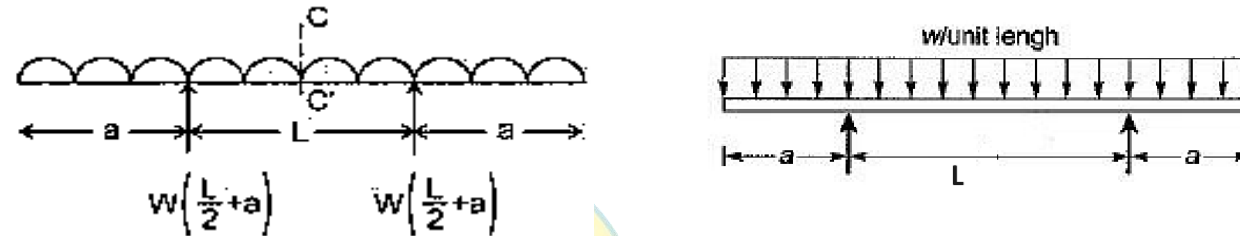
**Q.35 A simply supported beam ( $l + 2a$ ) with equal overhangs ( $a$ ) carries a udl over the whole length, the BM changes sign if**

- A.  $l > 2a$**
- B.  $l = 2a$**
- C.  $l = 4a$**
- D.  $l < 2a$**



**Answer: A**

**Solution:**



$$\text{BM at centre} = W \left( \frac{L}{2} + a \right)^2 \times \frac{1}{2} - W \left( \frac{L}{2} + a \right) \times \frac{L}{2} = W \left( a + \frac{L}{2} \right) \left( \frac{a}{2} - \frac{L}{4} \right)$$

BM will change sign if  $\frac{a}{2} - \frac{L}{4} < 0$

Or,  $L > 2a$



**Q.36 The minimum cement content (in kg/m<sup>3</sup>) for PCC required for severe exposure condition as per IS:456-2000**

- A. 400**
- B. 300**
- C. 340**
- D. 250**



**Answer: D**

**Solution:**

| Type of Concrete    | PCC                    |                                          |                | RCC                    |                                          |                |
|---------------------|------------------------|------------------------------------------|----------------|------------------------|------------------------------------------|----------------|
| Exposure Conditions | Min. grade of Concrete | Min. Cement Content (kg/m <sup>3</sup> ) | Max. W/C ratio | Min. grade of Concrete | Min. Cement Content (kg/m <sup>3</sup> ) | Max. W/C ratio |
| Mild                | -                      | 220                                      | 0.60           | M20                    | 300                                      | 0.55           |
| Moderate            | M15                    | 240                                      | 0.60           | M25                    | 300                                      | 0.50           |
| Severe              | M20                    | 250                                      | 0.50           | M30                    | 320                                      | 0.45           |
| Very Sever          | M20                    | 260                                      | 0.45           | M35                    | 340                                      | 0.45           |
| Extreme             | M25                    | 280                                      | 0.40           | M40                    | 360                                      | 0.40           |



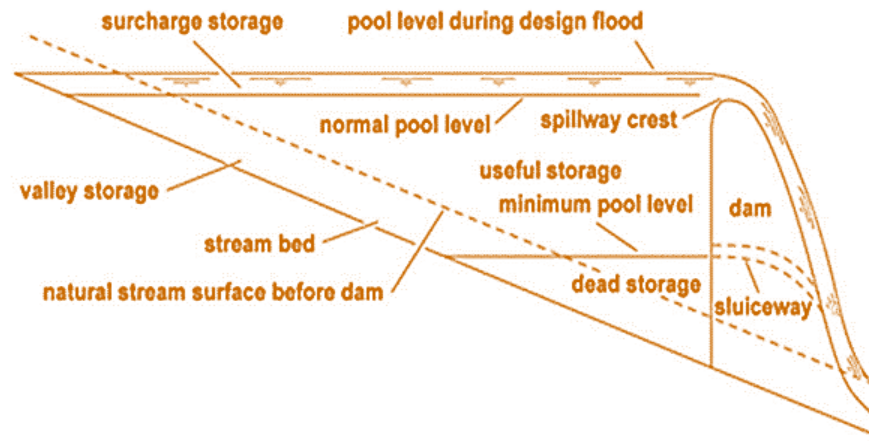
**Q.37 Water stored in a reservoir below the minimum pool level is called**

- A. Valley storage**
- B. Bank storage**
- C. Surcharge storage**
- D. Dead storage**



**Answer: D**

**Solution:**



- ❑ **Dead Storage:** The volume of water held below the minimum pool level is called the dead storage.
- ❑ **Useful storage** is the water stored in a reservoir above the minimum pool level and is available for use.
- ❑ **Valley storage:** Some amount of water stored by the stream channel even before a dam is constructed.
- ❑ **Surcharge storage** is the water stored in a reservoir above the maximum pool level. It is not available for use and is used to protect the dam from overtopping.



**Q.38 Obstacle to ranging but not chaining is**

- A. River**
- B. Hill**
- C. Building**
- D. Pond**



**Answer: B**

**Solution:**

- ☐ **Chaining** is the process of measuring the length of series of a straight lines with tape or chain and then locating the details on the ground relative to these lines.
- ☐ **Ranging** is the process of locating a number of points on the long survey line.
- ☐ A river is an obstacle to chaining but not ranging.
- ☐ A hill is an obstacle to ranging but not chaining.
- ☐ A Building is obstacle of chaining as well as ranging.



**Q.39 The process of turning the telescope about the vertical axis in horizontal plane is called a**

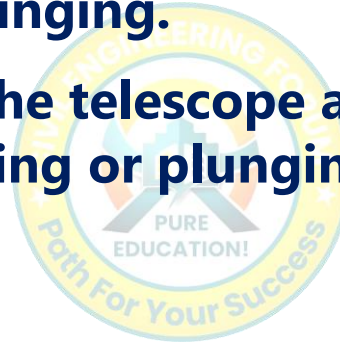
- A. Reversing**
- B. Transiting**
- C. Plunging**
- D. Swinging**



**Answer: D**

**Solution:**

- ❑ **Swinging:** The process of turning the telescope about the vertical axis in a horizontal plane is known as swinging.
- ❑ **Transiting:** It is the rotation of the telescope about its horizontal axis in a vertical plane. It is also known as reversing or plunging.



**Q.40 If the fore bearings of lines AB and BC are  $190^{\circ}$  and  $39^{\circ}$  respectively, the included angle ABC is**

- A.  $29^{\circ}$**
- B.  $151^{\circ}$**
- C.  $49^{\circ}$**
- D.  $229^{\circ}$**



**Answer: D**

**Solution:**

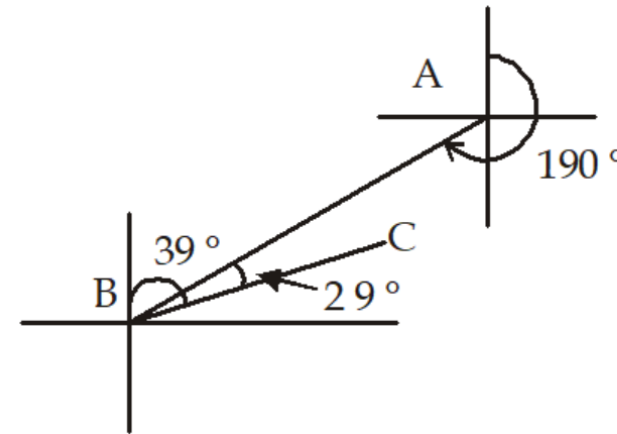
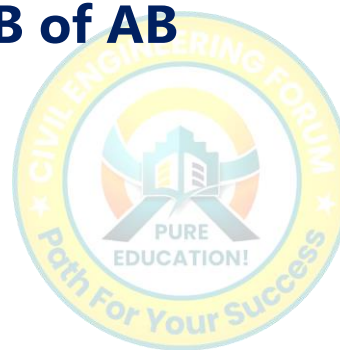
**Included angle  $ABC = \text{FB of } BC - \text{BB of } AB$**

**FB of  $BC = 39^\circ$**

**FB of  $AB = 190^\circ$**

**BB of  $AB = 10^\circ$**

**$\angle ABC = 39^\circ - 10^\circ = 29^\circ$**



**Q.41 A 1st class brick immersed in water for 24 hours, should not absorb water (by weight) more than**

- A. 10 %**
- B. 15 %**
- C. 20 %**
- D. 25 %**



**Answer: C**

**Solution:**

**Good Bricks Recognition:**

- ☐ Uniform, rectangular shape/surface and sharp edges.
- ☐ Uniform deep red or cherry color.
- ☐ Free from stones, grits, organic matters etc.
- ☐ No impression is made when stretched by finger nail.
- ☐ When two bricks are stuck together a metallic sound should be produced.
- ☐ Water absorption **should not be more than 20%** and crushing strength **> 10 N/mm<sup>2</sup>.**



**Q.42 The moment of inertia of a triangular section (base  $b$ , height  $h$ ) about centroidal axis parallel to the base, is**

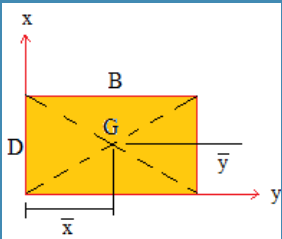
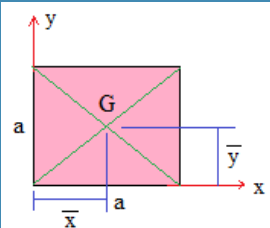
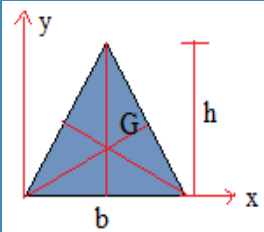
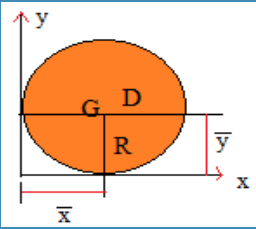
- A.  $bh^3/3$
- B.  $bh^3/36$
- C.  $b^3h/12$
- D.  $bh^3/2$



**Answer: B**

**Solution:**

**Moment of Inertia:**

|                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |
| $\frac{BD^3}{12}, \frac{DB^3}{12}$                                                | $\frac{a^4}{12}$                                                                   | $\frac{bh^3}{36}, \frac{hb^3}{48}$                                                  | $\frac{\pi D^4}{64}$                                                                |



**Q.43 The minimum diameter of longitudinal bars in a column is**

- A. 12 mm**
- B. 6 mm**
- C. 8 mm**
- D. 16 mm**



**Answer: A**

**Solution:**

**As per IS 456: 2000, clause 26.5.3.1,**

- (i) The main longitudinal reinforcement bars used in column shall not be less than 12 mm in diameter.
- (ii) The minimum number of the longitudinal bar provided in column shall be four in rectangular columns and six in circular columns.
- (iii) The cross-sectional area of longitudinal reinforcement shall be not less than 0.8 per cent nor more than 6 per cent of the gross cross-sectional area of the column.
- (iv) A reinforced concrete column having helical reinforcement shall have at least six bar of longitudinal reinforcement within the helical reinforcement.



**Q.44 The effective length of a weld, is taken as the actual length**

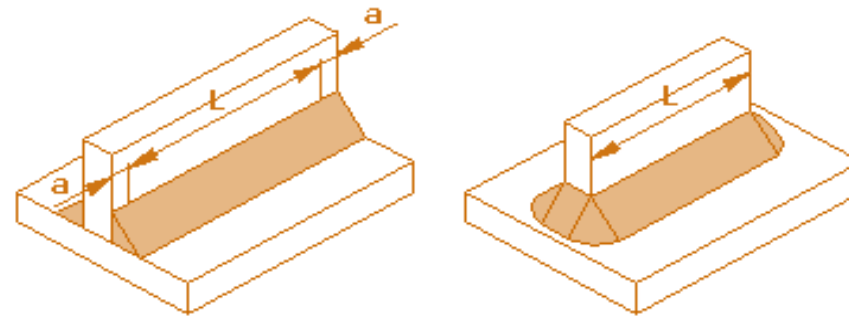
- A. Minus twice the size of weld**
- B. Plus the size of weld**
- C. Minus the size of weld**
- D. Plus twice the size of weld**



**Answer: A**

**Solution:**

- ❑ The effective length of a weld refers to the portion of the weld that contributes to the strength and stability of the joint.
- ❑ **Effective length of weld = Actual length of weld – 2 x size of weld** > 4 S



**Q.45 The shape factor of an isosceles triangle for bending about the axis parallel to the base is:**

- A. 1.7**
- B. 2.0**
- C. 1.5**
- D. 2.34**



**Answer: D**

**Solution:**

**Shape factor** =  $\frac{\text{Plastic moment}}{\text{Yield moment}}$

| Section                 | Shape factor             |
|-------------------------|--------------------------|
| Triangular              | 2.34                     |
| Diamond                 | 2                        |
| Circle                  | 1.7                      |
| Rectangle/Square        | 1.5                      |
| I-section               | 1.12-1.14                |
| H-section               | 1.5                      |
| Circular hollow section | 1.27                     |
| Solid circular section  | $\frac{16}{3\pi} = 1.67$ |



**Q.46 The number of independent equations to be satisfied for static equilibrium of a plane structure is**

- A. 3**
- B. 5**
- C. 4**
- D. 6**



**Answer: A**

**Solution:**

**Equation of Static Equilibrium:**

❑ For a plane frame structure, **number of static equilibrium equation is 3.**

1. Algebraic sum of horizontal external forces,  $\sum F_x = 0$
2. Algebraic sum of vertical external forces,  $\sum F_y = 0$  and
3. Algebraic sum of all moments at any point,  $\sum M_z = 0$

❑ For a space frame structure, **number of static equilibrium equation is 6.**

$$\sum F_x = 0, \sum F_y = 0, \sum F_z = 0, \sum M_x = 0, \sum M_y = 0 \text{ and } \sum M_z = 0$$



**Q.47 If there are  $m$  unknown member forces,  $r$  unknown reaction components and  $j$  number of joints, then the degree of static indeterminacy of a pin-jointed plane frame is given by**

- A.  $m - r + 2j$
- B.  $m + r - 2j$
- C.  $m - r + 2j$
- D.  $m + r + 2j$



**Answer: B**

**Solution:**

**Static Indeterminacy ( $D_s$ ):**

- ✓ For beam,  $D_s = D_{se} + D_{si} = D_{se} = r - 3$
- ✓ For truss,  $D_s = D_{se} + D_{si} = (r - 3) + (m - 2j + 3) = m + r - 2j$
- ✓ For frame,  $D_s = D_{se} + D_{si} = (r - 3) + (3C - R_r)$

Where,  $m$  = No of available members

$J$  = No of joints

$C$  = No of close loop

$R_r$  = No of force release (For hybrid joint) = (No of connected members - 1)



**Q.48 Degree of kinematic indeterminacy of a pin-jointed plane frame is given by**

- A.  $2j - r$
- B.  $j - 2r$
- C.  $3j - r$
- D.  $2j + r$



**Answer: A**

**Solution:**

| Type of Joints | Type of plane | Structure | Degree of Kinematic Indeterminacy ( $D_k$ ) |
|----------------|---------------|-----------|---------------------------------------------|
| Pin Joint      | 2D (Plane)    | Truss     | $2j - r$                                    |
|                | 3D (Space)    | Truss     | $3j - r$                                    |
| Rigid Joint    | 2D (Plane)    | Beam      | $3j - r$                                    |
|                |               | Frame     |                                             |
|                | 3D (Space)    | Frame     | $6j - r$                                    |



**Q.49 An aggrading river is a**

- A. Scouring River**
- B. Silting River**
- C. Neither silting nor scouring river**
- D. Both silting and scouring river**



**Answer: B**

**Solution:**

- ❑ **Aggrading Rivers:** These rivers collect sediments and build up their bed by silting.
- ❑ **Degrading Rivers:** The rivers which displace sediment and carry on scouring are known as degrading rivers.



**Q.50 When the reservoir is full, the maximum compressive force in a gravity dam is produced**

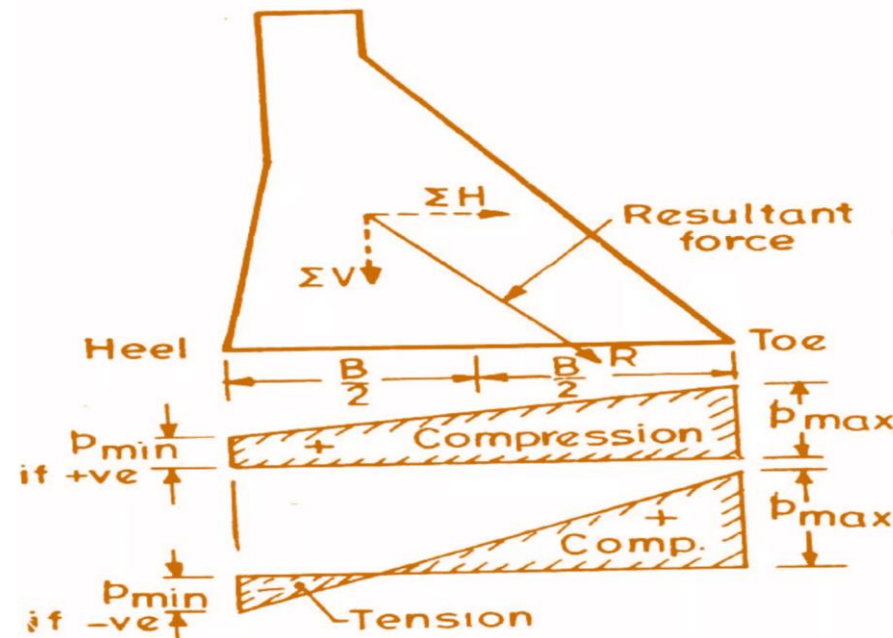
- A. At the heel**
- B. At the toe**
- C. Within the middle third of base**
- D. At centre of base**



**Answer: B**

**Solution:**

- ❑ For reservoir empty condition maximum compressive force will be **at the heel**.
- ❑ For reservoir full condition maximum compressive force will be **at the toe of the dam**.



**Q.51 Surveys which are carried out to depict mountains, rivers, water bodies, wooded areas and other cultural details, are known as**

- A. Cadastral surveys**
- B. City surveys**
- C. Topographical surveys**
- D. Guide map surveys**



**Answer: C**

**Solution:**

On the basis of purpose:

- ☐ Topographical Survey: Natural + Man made features (scale- 1:50000 toposheet).
- ☐ Engineering Survey: To prepare detailed drawing of projects involving roadways & railways.
- ☐ Cadastral Survey: To fix the boundary/Property line, calculate land area.
- ☐ Geological Survey: Mineral, fault, fold.
- ☐ Archaeological Survey: Ancient feature.
- ☐ Geographical Survey: Different strata of earth crust.
- ☐ Military Survey: Communication between road, railway, airport within the different part of country.



**Q.52 For the design of a simply supported T-beam the ratio of the effective span to the overall depth of the beam is limited to**

- A. 25**
- B. 20**
- C. 10**
- D. 15**



**Answer: B**

**Solution:**

**Deflection Control:**

❑ Deflection is controlled by Span/Depth ratio.

| Type of beam     | Span/Depth ratio |                             |                                             |                                                   |
|------------------|------------------|-----------------------------|---------------------------------------------|---------------------------------------------------|
|                  | Span up to 10 m  | Span > 10 m                 | Applied modification factor up to 10 m span | Applied modification factor > 10 m span           |
| Cantilever       | 7                | 7                           | $7 \times K_c \times K_t$                   | $7 \times K_c \times K_t$                         |
| Simply supported | 20               | $20 \times \frac{10}{Span}$ | $20 \times K_c \times K_t$                  | $20 \times K_c \times K_t \times \frac{10}{Span}$ |
| Continuous       | 26               | $26 \times \frac{10}{Span}$ | $26 \times K_c \times K_t$                  | $26 \times K_c \times K_t \times \frac{10}{Span}$ |



**Q.53 The maximum diameter of a bar used in a ribbed slab, is**

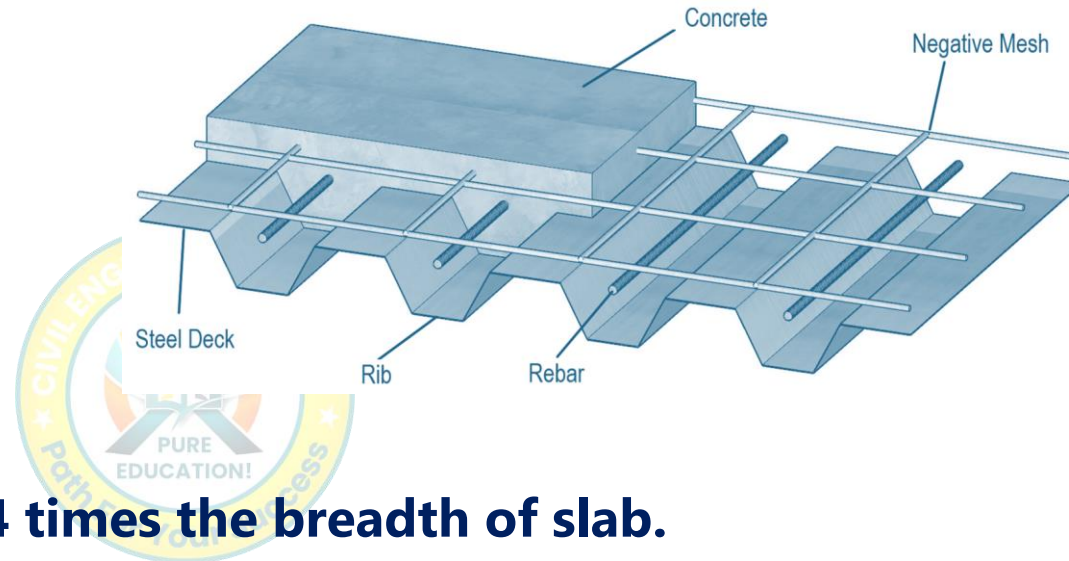
- A. 20 mm**
- B. 22 mm**
- C. 12 mm**
- D. 6 mm**



**Answer: B**

**Solution:**

- ☐ Max. Diameter of bar: **22 mm**
- ☐ Topping thickness: 5 to 8 cm
- ☐ Nominal cover (Min): 20 mm
- ☐ Thickness of rib (Min): 65 mm
- ☐ Overall depth shall not exceed 4 times the breadth of slab.



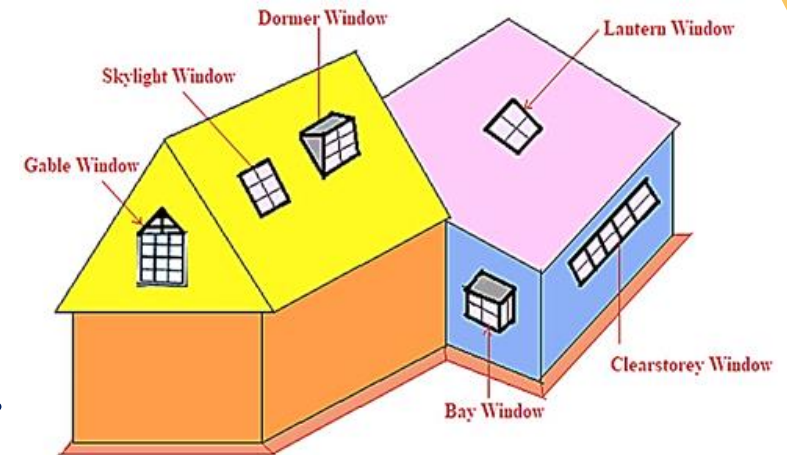
**Q.54 The opening provided in sloping roof with its top parallel to the roof surface, is called**

- A. Skylight window**
- B. Lantern window**
- C. Dormer window**
- D. Louvered window**



**Answer: A**

**Solution:**



- ☐ Casement windows: Shutters of which open like doors.
- ☐ Gable windows: Windows which are provided in the gable ends of a roof.
- ☐ Bay windows: Windows project outside the external wall of a room.
- ☐ Lantern window: Fixed on flat roofs to provide light to the inner portion of the building.
- ☐ Skylights window: **Provided on the sloping surface of a pitched roof.**
- ☐ Dormer windows: Vertical window built into the sloping side of a pitched roof.
- ☐ Clerestorey window: Window usually provided near the main roof of a room and opens above the adjoining veranda.



**Q.55 The stepped structure provided for lateral support of a structure, is**

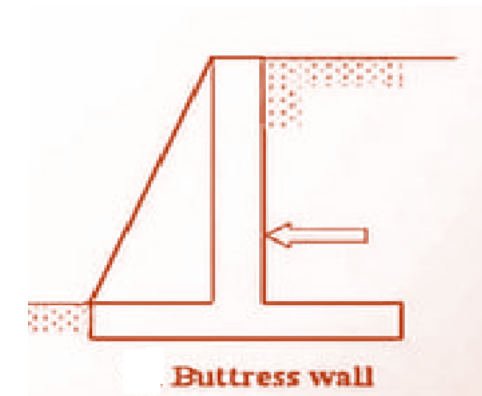
- A. Breast wall**
- B. Buttress**
- C. Retaining wall**
- D. Parapet wall**



**Answer: B**

**Solution:**

- ☐ The stepped structure provided for lateral support of a structure, is called **Buttress**.



**Q.56 The process of making the back ground rough, before plastering, is**

- A. Peeling**
- B. Blistering**
- C. Dubbing**
- D. Hacking**



**Answer: D**

**Solution:**

**Plastering Work:**

- ☐ IS Code: 1661
- ☐ Measured in m<sup>2</sup>.
- ☐ Generally, thickness of plaster is 12 mm.
- ☐ First coat/Rendering/Under coat: For straightening or leveling an uneven surface. Thickness- 10-15 mm
- ☐ Second coat/Floating coat: Thickness- 3-8 mm
- ☐ 3rd coat/Final coat/Finishing coat/setting coat: Provide smooth surface. Thickness-2-3 mm.
- ☐ If plastering is done in single coat, its thickness range is 6-12 mm.
- ☐ **Bull mark** is used to ensure that thickness of plastering is uniform.
- ☐ **Pargetting** is a decorative or water proof plastering applied on the walls.
- ☐ The process of making the back ground rough before plastering is called **hacking**.



**Q.57 While designing a stair, the product of rise and going is approximately kept equal to**

- A. 450**
- B. 500**
- C. 350**
- D. 420**

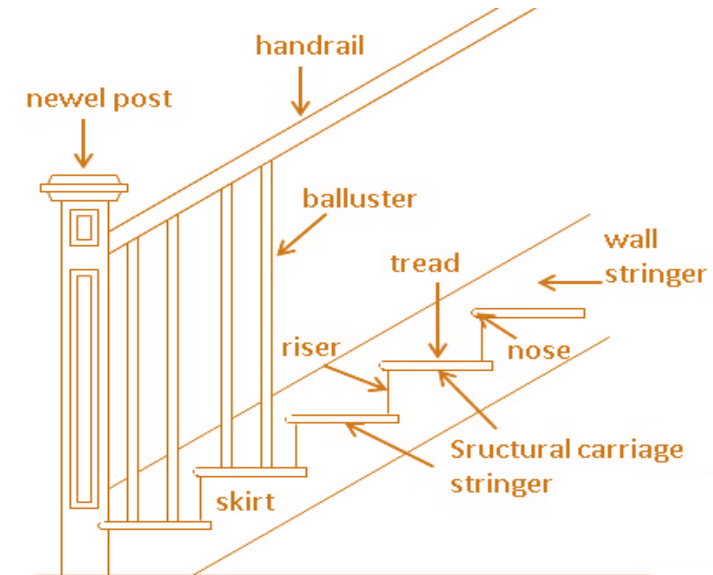


**Answer: D**

**Solution:**

**Thumb Rule for dimension of steps:**

- **$T + 2R = 550 \text{ to } 600 \text{ mm}$**
- **$R + T = 400 \text{ to } 450 \text{ mm}$**
- **$R \times T = 40000 \text{ to } 41000 \text{ mm}^2$**



**Q.58 While compacting the concrete by a mechanical vibrator, the slump should not exceed**

- A. 5.0 cm**
- B. 7.5 cm**
- C. 2.5 cm**
- D. 10 cm**



**Answer: A**

**Solution:**

| Type of vibrator    | Slump Value (mm) |
|---------------------|------------------|
| Power driven        | < 25 mm          |
| Hand driven         | 25-50 mm         |
| Mechanical vibrator | 50 mm            |
| Normal vibrator     | 100 mm           |



**Q.59 For a cantilever of effective depth of 0.5 m, the maximum span to satisfy vertical deflection limit is**

- A. 4 m**
- B. 4.5 m**
- C. 3.5 m**
- D. 5 m**



**Answer: C**

**Solution:**

For cantilever,  $\frac{\text{Span}}{\text{Depth}} = 7$

or, Span = 7 x 0.5 = 3.5 m.



**Q.60 For the construction of cement concrete floor, the maximum permissible size of aggregate, is**

- A. 8 mm**
- B. 10 mm**
- C. 4 mm**
- D. 6 mm**



**Answer: B**

**Solution:**

**Maximum permissible size of aggregate:**

- ☐ DPC: 10 mm
- ☐ Floor: 10 mm
- ☐ Mass concrete: 40 mm
- ☐ Most of RCC work: 20 mm
- ☐ Congested r/f area: 10 mm



**Q.61 Separation of coarse aggregates from mortar during transportation, is known**

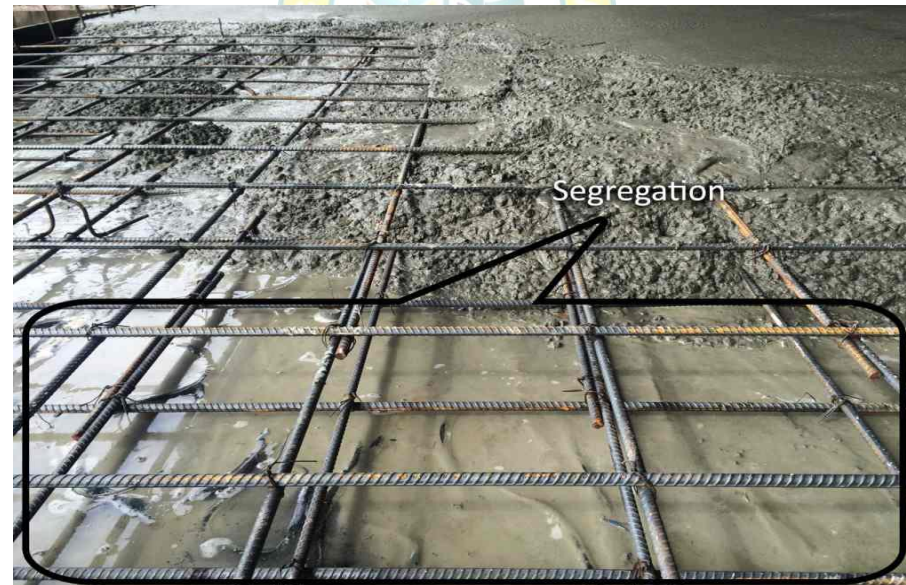
- A. Segregation**
- B. Shrinkage**
- C. Bleeding**
- D. Creeping**



**Answer: A**

**Solution:**

- ☐ Separation of coarse aggregate from mortar during transportation, is known as segregation.
- ☐ Bleeding is the tendency of the water to rise to the surface of the freshly laid concrete.



**Q.62 The shuttering of a hall measuring 4 m × 5 m, can be removed after**

- A. 14 days**
- B. 5 days**
- C. 7 days**
- D. 10 days**



**Answer: C**

**Solution:**

| Type of formwork                          | Minimum Period<br>for OPC | Minimum Period for<br>OPC + mineral<br>admixture |
|-------------------------------------------|---------------------------|--------------------------------------------------|
| Vertical member, Side of beam             | 16 – 24 hr                | 16 – 24 hr                                       |
| Soffit formwork to Slab (refix props)     | 3 days                    | 7 days                                           |
| Soffit formwork to Beam (refix props)     | 7 days                    | 10 days                                          |
| Prop to Slab<br>Span up to 4.5 m          | 7 days                    | 10 days                                          |
| Span over 4.5 m                           | 14 days                   | 14 days                                          |
| Prop to beams to arches<br>Span up to 6 m | 14 days                   | 14 days                                          |
| Span over 6 m                             | 21 days                   | 21 days                                          |



**Q.63 The approximate value of the ratio between direct tensile strength and flexural strength is**

- A. 0.33**
- B. 0.5**
- C. 0.75**
- D. 1.0**



**Answer: B**

**Solution:**

- **Compressive Strength ( $f_{ck}$ ) > Cylinder strength > Flexural strength ( $f_{cr}$ ) > Split tensile strength ( $f_{cs}$ ) > Direct tensile strength ( $f_{ct}$ )**
- **Direct tensile strength =  $\frac{1}{2}$  Flexural strength of concrete.**

| Parameters | Compressive Strength ( $f_{ck}$ ) | Flexural strength ( $f_{cr}$ ) | Split tensile strength ( $f_{cs}$ )      | Direct tensile strength ( $f_{ct}$ ) |
|------------|-----------------------------------|--------------------------------|------------------------------------------|--------------------------------------|
| Test       | Compression test                  | 2 point & 3 point test         | Split tensile test                       | Direct tension test                  |
| Specimen   | 150 mm cube                       | 150 mm X 150 mm X 700 mm beam  | 150 mm diameter & 300 mm height cylinder | 150 mm X 150 mm X 700 mm beam        |
| Machine    | CTM, UTM                          | CTM, UTM                       | UTM                                      | UTM                                  |
| Result     | $f_{ck}$                          | $0.7 \sqrt{f_{ck}}$            | $0.67 \times 0.7 \sqrt{f_{ck}}$          | $0.5 \times 0.7 \sqrt{f_{ck}}$       |



**Q.64 An aggregate is said to be flaky if its least dimension is less than**

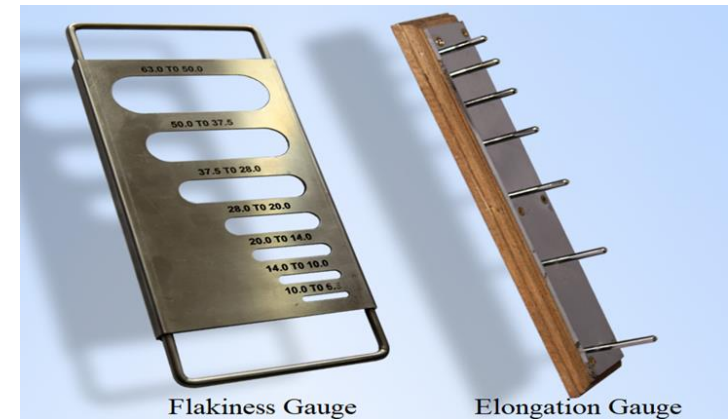
- A.  $\frac{4}{5}$ th of mean dimension**
- B.  $\frac{1}{5}$ th of mean dimension**
- C.  $\frac{2}{5}$ th of mean dimension**
- D.  $\frac{3}{5}$ th of mean dimension**



**Answer: D**

**Solution:**

- ☐ Flakiness Index of aggregate is the percentage by weight of aggregate particles whose least lateral dimension (thickness) is less than  $\frac{3}{5}$ th or 0.6 of their mean dimensions.
- ☐ Elongation index test of an aggregate is the percentage by weight of particles whose greatest dimension (length) is greater than  $\frac{9}{5}$ th or 1.8 times their mean dimensions.
- ☐ Not applicable for less than 6.3 mm size of aggregate.



**Q.65 Air valves are generally provided in pressure pipes of water supply**

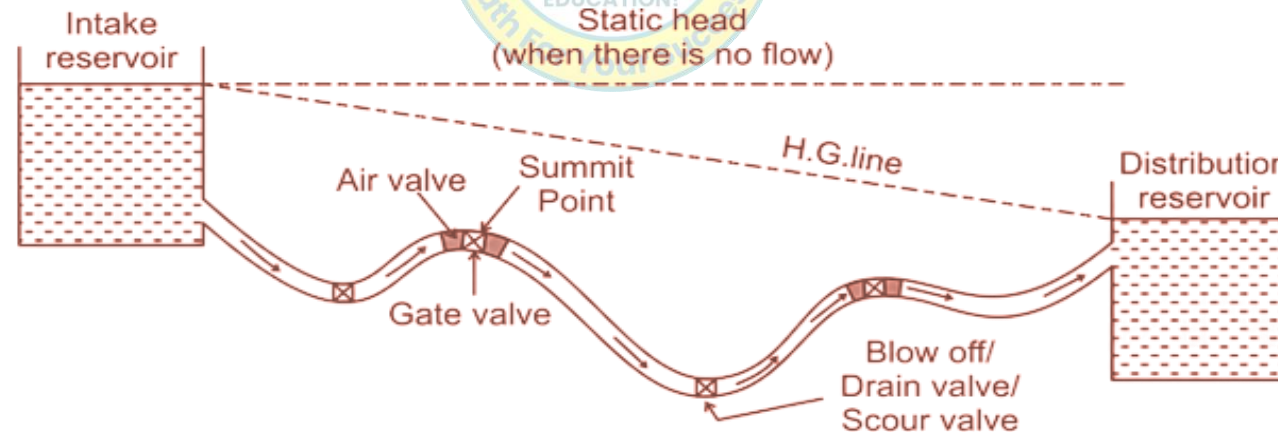
- A. Near service pipes**
- B. At pipe junctions**
- C. At summits**
- D. At low points**



**Answer: C**

**Solution:**

- ❑ Sluice/ Gate/ Shut off valves: **Regulate flow of water** in pipes, Divide main line summits of the pressures. (Summit points). Provide on street corners & pipe junction.
- ❑ Air valve: Used every **summit point** (air release value)
- ❑ Check value or reflux value or non- returning value: Water flows in **one direction only, backward flow not possible.**
- ❑ Scour or blow off value or drain value: Used in dead end of the pipe line to **remove sand, silt etc.** Drain valves are provided **at lower point or every depression & dead end** to drain out the waste water.
- ❑ Pressure Relief value or cutoff value or safety valve: **Helps in regulating the water hammer pressure.**



Profile of the pressure pipe showing the locations of gates and valves

