

Subject Code: AAH807

Subject Name: ESTIMATION AND COSTING

UNIT – I: INTRODUCTION

PART - A (Multiple Choice Questions)

1. What is the primary purpose of preparing an estimate?

- A) To finalize architectural drawings
- B) To find the probable cost of construction before it starts
- C) To apply for land registration
- D) To evaluate the market value of a completed property

Answer: B

2. Which estimate is prepared when a sanctioned estimate is exceeded by more than 5% due to price escalations?

- A) Supplementary Estimate
- B) Revised Estimate
- C) Annual Maintenance Estimate
- D) Sub Estimate

Answer: B

3. The standard unit of measurement for earthwork in excavation is:

- A) Square meter (sq.m)
- B) Cubic meter (cu.m)
- C) Running meter (rm)
- D) Kilogram (kg)

Answer: B

4. What is the degree of accuracy generally observed in measuring lengths for estimation purposes?

- A) 0.001 m
- B) 0.01 m
- C) 0.10 m
- D) 1.00 m

Answer: B

5. According to standard rules, a deduction for an opening in masonry is NOT made if the area of the opening is less than:

- A) 0.1 sq.m
- B) 0.5 sq.m
- C) 1.0 sq.m
- D) 2.0 sq.m

Answer: A

6. Which estimate is required when further additional works are introduced during the execution of a project?

- A) Revised estimate
- B) Supplementary estimate
- C) Repair estimate
- D) Complete estimate

Answer: B

7. The term 'Out turn of works' refers to:

- A) Total cost of the project
- B) The amount of work done by a skilled laborer per day
- C) The waste materials produced
- D) The final finishing of the building

Answer: B

8. What is the standard unit of measurement for plastering?

- A) Cubic meter
- B) Square meter
- C) Running meter
- D) Kilogram

Answer: B

9. The center line method is specially adopted for estimating the quantities of:

- A) Circular buildings
- B) Hexagonal buildings
- C) Octagonal buildings
- D) All of the above

Answer: D

10. In the long and short wall method of estimation, the length of the long wall is the center-to-center distance between walls plus:

- A) Half breadth of wall on each side
- B) One breadth of wall on each side
- C) One and a half breadth of wall
- D) None of the above

Answer: A

11. What does the 'Trade System' of taking out quantities mean?

- A) Grouping items by floor level
- B) Item-wise calculation for specific trades (e.g., masonry)
- C) Exchanging materials at the site
- D) Purchasing materials from wholesalers

Answer: B

12. The percentage usually allowed for 'Contingencies' in a detailed estimate is:

- A) 1% to 2%
- B) 3% to 5%
- C) 7% to 9%
- D) 10% to 15%

Answer: B

13. The number of standard modular bricks required for 1 cubic meter of brick masonry is:

- A) 400
- B) 450
- C) 500
- D) 550

Answer: C

14. What is the unit of measurement for brickwork in a foundation?

- A) Square meter
- B) Running meter
- C) Cubic meter
- D) Number

Answer: C

15. In estimation, a 'Sub Estimate' is typically prepared for:

- A) The entire project
- B) A distinct, minor part of the main work
- C) Only the painting works
- D) Annual maintenance works

Answer: B

16. Why is a 'painting coefficient' used in estimation?

- A) To determine paint color
- B) To account for paneled or corrugated surface areas
- C) To calculate drying time
- D) To determine brush costs

Answer: B

17. The unit of measurement for skirting and cornice is:

- A) Square meter
- B) Cubic meter
- C) Running meter
- D) Liters

Answer: C

18. The estimate prepared for the purpose of maintaining a structure in proper order and safe condition is called:

- A) Annual maintenance estimate
- B) Repair estimate

- C) Revised estimate
- D) Complete estimate

Answer: A

19. What is the first stage in the preparation of a detailed estimate?

- A) Abstracting
- B) Taking off quantities
- C) Preparation of Data
- D) Fixing the building layout

Answer: B

20. What is the standard out-turn of brickwork in cement mortar in foundation and plinth per mason per day?

- A) 1.25 cu.m
- B) 2.00 cu.m
- C) 3.50 cu.m
- D) 5.00 cu.m

Answer: A

21. The items of steel work such as collapsible gates and rolling shutters are measured in:

- A) Kilograms
- B) Square meters
- C) Cubic meters
- D) Running meters

Answer: B

22. A heavy storm damages the roof of a polytechnic college building. Which specific type of estimate must the engineer prepare to secure immediate funds for restoring the roof?

- A) Annual maintenance estimate
- B) Repair estimate
- C) Revised estimate
- D) Supplementary estimate

Answer: B

23. A quantity surveyor calculates the plastering area for a wall with a window. They forget to apply the standard 'deduction for opening' rule. How will this affect the estimate?

- A) The material and labor cost will be under-estimated.
- B) The estimate will remain perfectly accurate.
- C) The plastering quantity and cost will be over-estimated.
- D) Plastering does not require deductions.

Answer: C

24. If the sanctioned budget for a project is Rs. 10 Lakhs, and due to sudden material price increases, the detailed estimate recalculates to Rs. 10.7 Lakhs, what official action is required?

- A) Proceed without changes.
- B) Prepare a Supplementary Estimate.
- C) Prepare a Revised Estimate since the cost exceeded by more than 5%.
- D) Prepare an Annual Maintenance Estimate.

Answer: C

25. Arrange the following stages of detailed estimation in the correct chronological sequence: 1. Preparation of Abstract Estimate, 2. Taking off quantities, 3. Preparation of Data (Rates).

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

Answer: B

26. A single rectangular room has inner dimensions of 4m × 3m. The wall thickness is 0.3m on all sides. Calculate the total center line length of the room walls.

- A) 14.0 m
- B) 14.6 m
- C) 15.2 m

D) 16.4 m

Answer: C

27. Consider two statements regarding estimation methods.

Statement 1: The Group System of taking off quantities saves time by avoiding repetition of descriptions.

Statement 2: The Trade System groups quantities strictly by the type of trade (masonry, carpentry). Which is correct?

A) Both statements are true.

B) Both statements are false.

C) Statement 1 is true, Statement 2 is false.

D) Statement 1 is false, Statement 2 is true.

Answer: A

28. An engineer applies a painting coefficient of 1.14 for a fully paneled door on both sides. Why is this coefficient applied instead of simply using the Length × Width measurement?

A) To deduct the area of the hinges.

B) To account for the extra surface area created by the panels and frames.

C) Because the paint used is highly expensive.

D) To calculate the volume of the door.

Answer: B

29. To calculate the amount of cement required for 10 cubic meters of wet cement concrete, the surveyor must convert wet volume to dry volume. The dry volume is typically assumed to be what percentage of the wet volume?

A) 100%

B) 110%

C) 130%

D) 152% to 154%

Answer: D

30. In a detailed estimate, the provision for work charge establishment is generally taken as 1.5% to 2%. If the total estimated cost of works is Rs.

5,000,000, what is the maximum amount allocated for work charge establishment?

- A) Rs. 50,000
- B) Rs. 75,000
- C) Rs. 100,000
- D) Rs. 150,000

Answer: C

PART - B (Descriptive Questions)

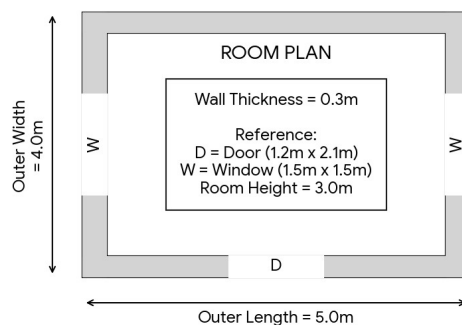
1. Define 'Estimate'. Briefly explain the different types of estimates (Revised, Supplementary, and Repair) and their importance in civil engineering projects.

2. Differentiate between the Centre Line method and the Long Wall and Short Wall method of estimation. Discuss the specific advantages of each method.

3. Explain the stages of a detailed estimate. List out the essential duties and qualities required of a professional Quantity Surveyor.

4. State the general rules and standard practices for making "deductions for openings" while calculating the quantities of masonry and plastering works.

5. Based on the architectural room plan provided in the figure below, a contractor is assigned to build a small room. The drawing shows 1 entrance door and 2 large windows on the walls.



Explain step-by-step how the contractor should calculate the exact volume of brickwork required for the superstructure. In your explanation:

- State the units of measurement involved for the brickwork.
- Detail the calculation of the gross wall volume using either the Center Line or Long Wall / Short Wall method.
- Explicitly highlight how the deductions for the door and window openings should be handled mathematically.
- Provide the final Net Volume of Brickwork required.

(Assume the room height from the floor level to the roof is 3.0m, and the wall thickness is uniform at 0.3m).

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UNIT – II: DETAILED ESTIMATE

PART - A (Multiple Choice Questions)

1. The system of estimating in which quantities are calculated item-wise for various trades (like masonry, carpentry, etc.) across the entire building is known as:

- A) Group system
- B) Trade system
- C) Center line system
- D) Plinth area system

Answer: B

2. In a detailed estimate of a single-room building, the volume of earthwork in excavation is calculated by multiplying length, breadth, and:

- A) Depth of foundation
- B) Height of plinth
- C) Height of room
- D) Thickness of DPC

Answer: A

3. Which of the following items is measured in square meters (sq.m) in the detailed estimate of a residential building?

- A) R.C.C. roof slab
- B) Brickwork in superstructure
- C) Damp Proof Course (DPC)
- D) Earthwork excavation

Answer: C

4. For a flat roof, the bearing of the R.C.C. slab on a brick wall is usually taken as equal to:

- A) Half the thickness of the wall
- B) The thickness of the slab or the thickness of the wall, whichever is minimum
- C) The thickness of the slab, subject to a minimum of 10 cm
- D) 5 cm, regardless of slab thickness

Answer: C

5. When estimating the interior space of a shop, the measurement of rolling shutters is done in:

- A) Running meter
- B) Square meter
- C) Cubic meter
- D) Kilogram

Answer: B

6. The unit of measurement for R.C.C. work in beams and slabs is:

- A) Square meter (sq.m)
- B) Cubic meter (cu.m)
- C) Running meter (rm)
- D) Quintal

Answer: B

7. In detailed estimation, the area of formwork (centering and shuttering) for an R.C.C. roof slab is calculated by taking the:

- A) Clear floor area
- B) Area of slab excluding bearings
- C) Total bottom surface area plus side edges
- D) Volume of the slab

Answer: C

8. While preparing a detailed estimate, the length of the lintel is calculated as the clear span of the opening plus:

- A) One bearing
- B) Two bearings
- C) Thickness of lintel
- D) Height of lintel

Answer: B

9. What is the standard deduction made for the ends of beams while calculating internal plastering on walls?

- A) 0.5 sq.m
- B) 1.0 sq.m
- C) No deduction is made
- D) Full deduction is made

Answer: C

10. In the detailed estimate of a residential building, the item 'sand filling in basement/plinth' is measured in:

- A) Sq.m
- B) Cu.m
- C) Running meter
- D) Number

Answer: B

11. In a 2-room building, the central partition wall is considered a cross wall. Its length in earthwork excavation is calculated by taking the center-to-center distance and:

- A) Subtracting one breadth of the foundation
- B) Adding one breadth of the foundation
- C) Subtracting the wall thickness
- D) Keeping it equal to the center line dimension

Answer: A

12. For calculating internal plastering in a room, the height of plastering is taken from the floor level to the:

- A) Bottom of the roof slab
- B) Top of the roof slab
- C) Top of the parapet wall
- D) Mid-height of the lintel

Answer: A

13. While calculating quantities for a shop's interior, flooring is measured in sq.m. The area to be deducted for a small pillar of 0.2 sq.m is:

- A) 0.2 sq.m
- B) 0.1 sq.m
- C) 0.5 sq.m
- D) No deduction is made if area is less than 0.5 sq.m

Answer: D

14. The measurement for pointing on the outer side of a brick wall is done in:

- A) Running meter
- B) Square meter
- C) Cubic meter
- D) Lumpsum

Answer: B

15. When estimating the interior space of a shop, skirting is measured in:

- A) Square meter
- B) Cubic meter
- C) Running meter
- D) Number

Answer: C

16. The standard width of bearing for a lintel over a door opening is generally taken as:

- A) 5 cm to 10 cm
- B) 10 cm to 15 cm
- C) 20 cm to 30 cm
- D) Equal to the door width

Answer: B

17. According to IS 1200, the weight of binding wire used for tying reinforcement is:

- A) Calculated separately in sq.m
- B) Included in the rate of reinforcement steel (not measured separately)
- C) Calculated in running meters

D) Deducted from the steel weight

Answer: B

18. In taking off quantities for a flat roof, the volume of the brick parapet wall is calculated in:

A) Running meter

B) Square meter

C) Cubic meter

D) Liters

Answer: C

19. Which of the following is calculated first when taking off quantities for a new single-room building?

A) Brickwork in superstructure

B) Plain Cement Concrete in foundation

C) Earthwork in excavation

D) Damp Proof Course

Answer: C

20. The weathering course on an R.C.C. flat roof is usually measured in:

A) Square meters

B) Cubic meters

C) Running meters

D) Liters

Answer: B

21. For estimating the reinforcement steel in an R.C.C. roof slab, the density of steel is taken as:

A) 7850 kg/cu.m

B) 2500 kg/cu.m

C) 1440 kg/cu.m

D) 1000 kg/cu.m

Answer: A

22. A single room building has inner dimensions of 5m × 4m. The wall thickness is 0.3m. What is the total center-line length of the walls?

- A) 18.0 m
- B) 19.2 m
- C) 20.4 m
- D) 21.6 m

Answer: B

23. The interior flooring of a shop measures 8m × 5m. Vitrified tiles cost Rs. 800 per sq.m. If 5% extra is added for wastage, what is the total estimated material cost for the tiles?

- A) Rs. 32,000
- B) Rs. 33,600
- C) Rs. 40,000
- D) Rs. 42,000

Answer: B

24. You are estimating a residential building with 2 rooms. One wall acts as a common partition between the two rooms. To avoid over-estimation of the earthwork at the T-junction, how should this common wall be treated using the long-wall short-wall method?

- A) Measured twice for safety.
- B) Treated as a long wall.
- C) Treated as a short wall and its length calculated by subtracting one foundation breadth from the center-to-center distance.
- D) Completely ignored as it is internal.

Answer: C

25. Arrange the correct sequence for taking off quantities for a single-room building's substructure: 1) Brickwork in foundation, 2) Earthwork in excavation, 3) Damp Proof Course (DPC), 4) Plain Cement Concrete (PCC) in foundation.

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

Answer: A

26. A surveyor is calculating the R.C.C. roof slab volume for a 4m x 4m clear room. He knows the slab thickness is 0.15m. What critical piece of dimensional data is missing to accurately complete the volume calculation?

- A) Grade of concrete
- B) Width of the bearing on the walls
- C) Amount of reinforcement steel
- D) Height of the parapet wall

Answer: B

27. Consider two statements regarding the trade system.

Statement 1: Centering and shuttering for an RCC roof is measured in cubic meters.

Statement 2: The RCC slab itself is measured in cubic meters. Which is correct?

- A) Both statements are true.
- B) Statement 1 is false, Statement 2 is true.
- C) Statement 1 is true, Statement 2 is false.
- D) Both statements are false.

Answer: B

28. The cross-section of a foundation trench is 1.0m wide and 1.2m deep. The total center line length is 20m. What is the total quantity of earthwork in excavation?

- A) 20 cu.m
- B) 24 cu.m
- C) 30 cu.m
- D) 40 cu.m

Answer: B

29. In a shop's interior space, the skirting is to be provided along the walls of a 6m x 4m room. There is one door of 1.5m width and one rolling shutter of 3.0m width. What is the net running length of skirting required?

- A) 20.0 m
- B) 18.5 m
- C) 15.5 m
- D) 12.0 m

Answer: C

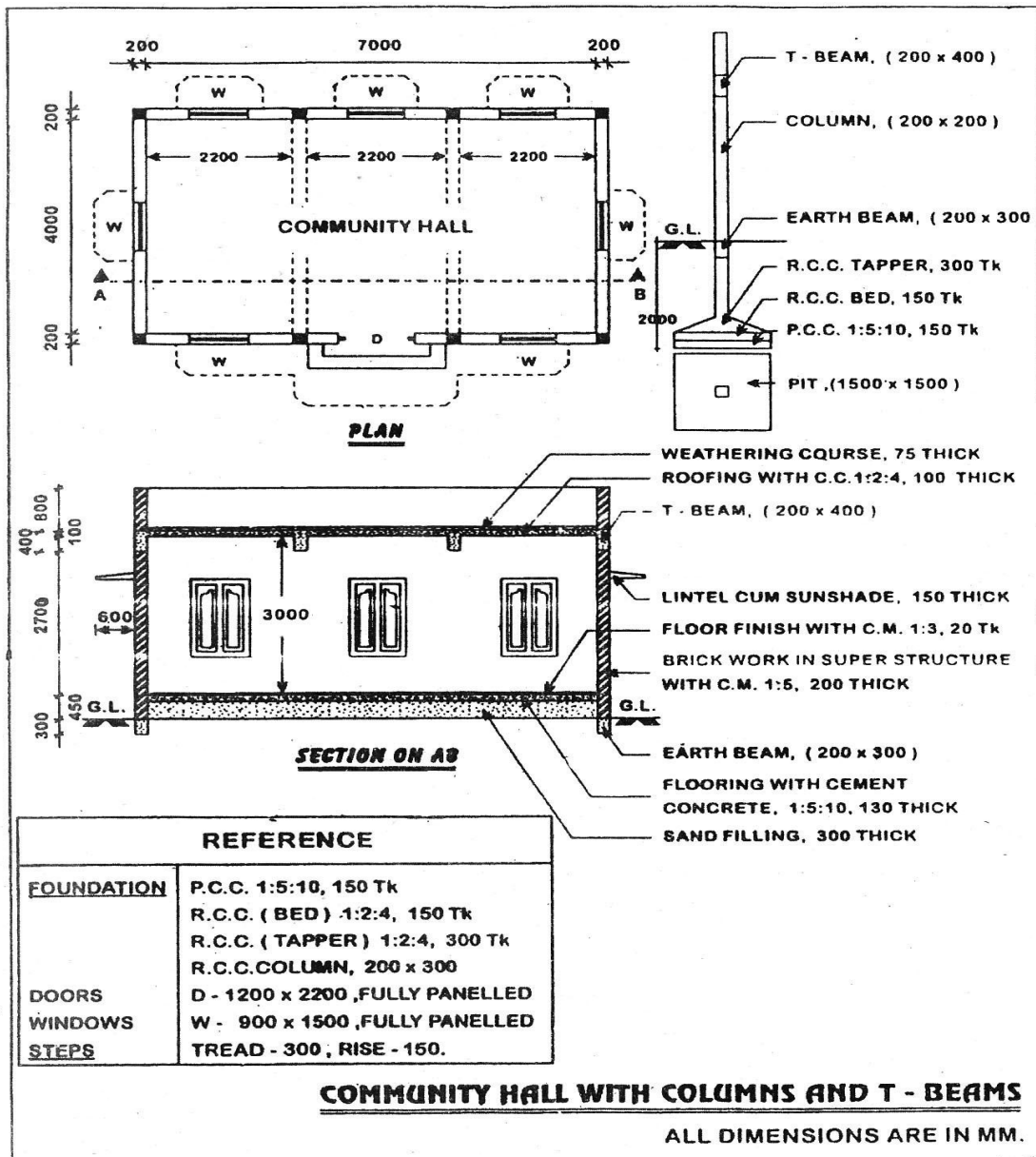
30. While preparing a detailed estimate for a 3-room building, an engineer decides to extract all 'woodwork' (doors, windows, ventilators) from all rooms and group them into a single section of the estimate document. Which specific estimation system is the engineer applying?

- A) Center line system
- B) Area method
- C) Trade system
- D) Crossing method

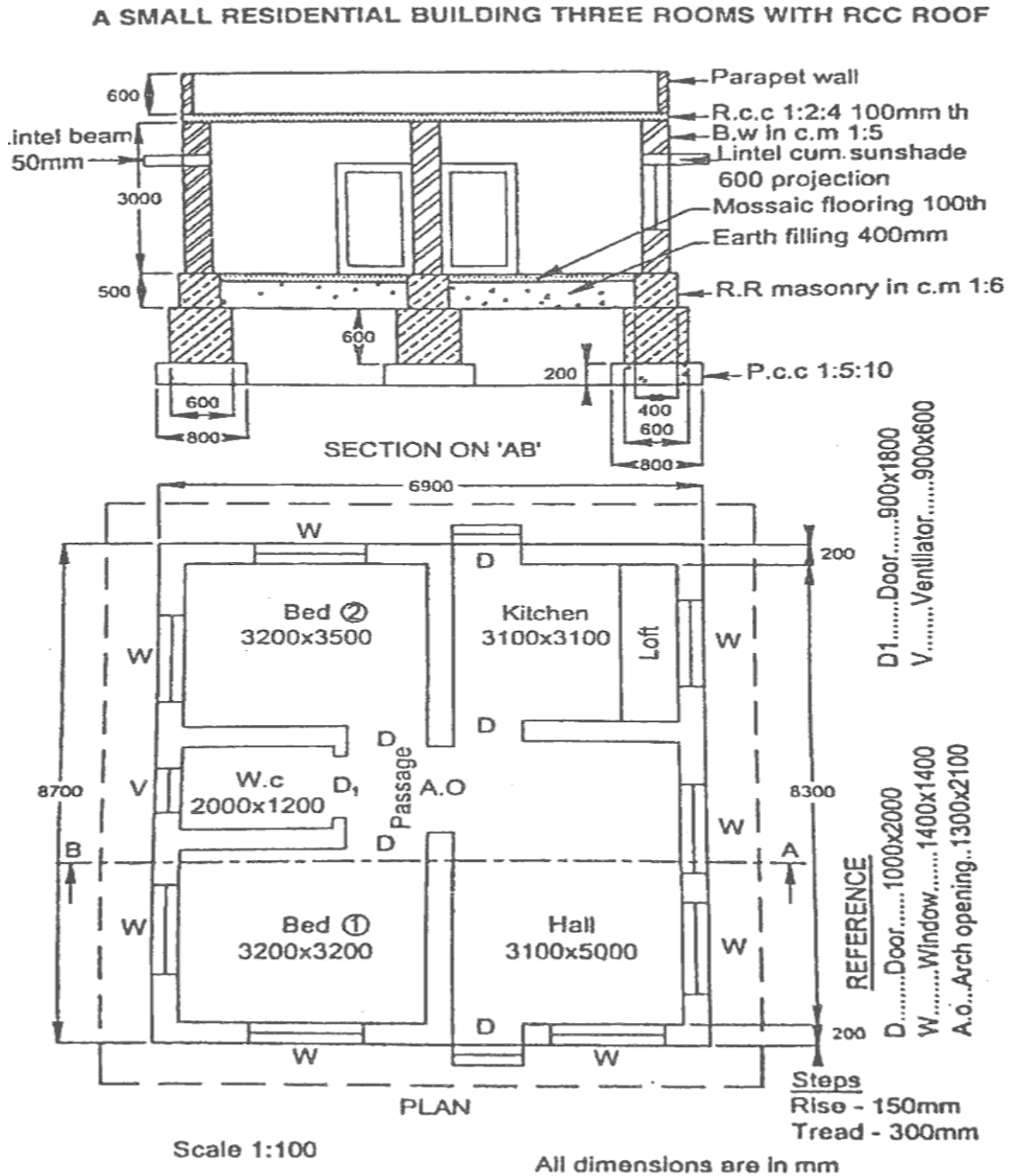
Answer: C

PART - B (Descriptive Questions)

1. Take the following quantities for the "COMMUNITY HALL" as shown in figure using Trade System (i) Earthwork in excavation, and (ii) PCC in foundation

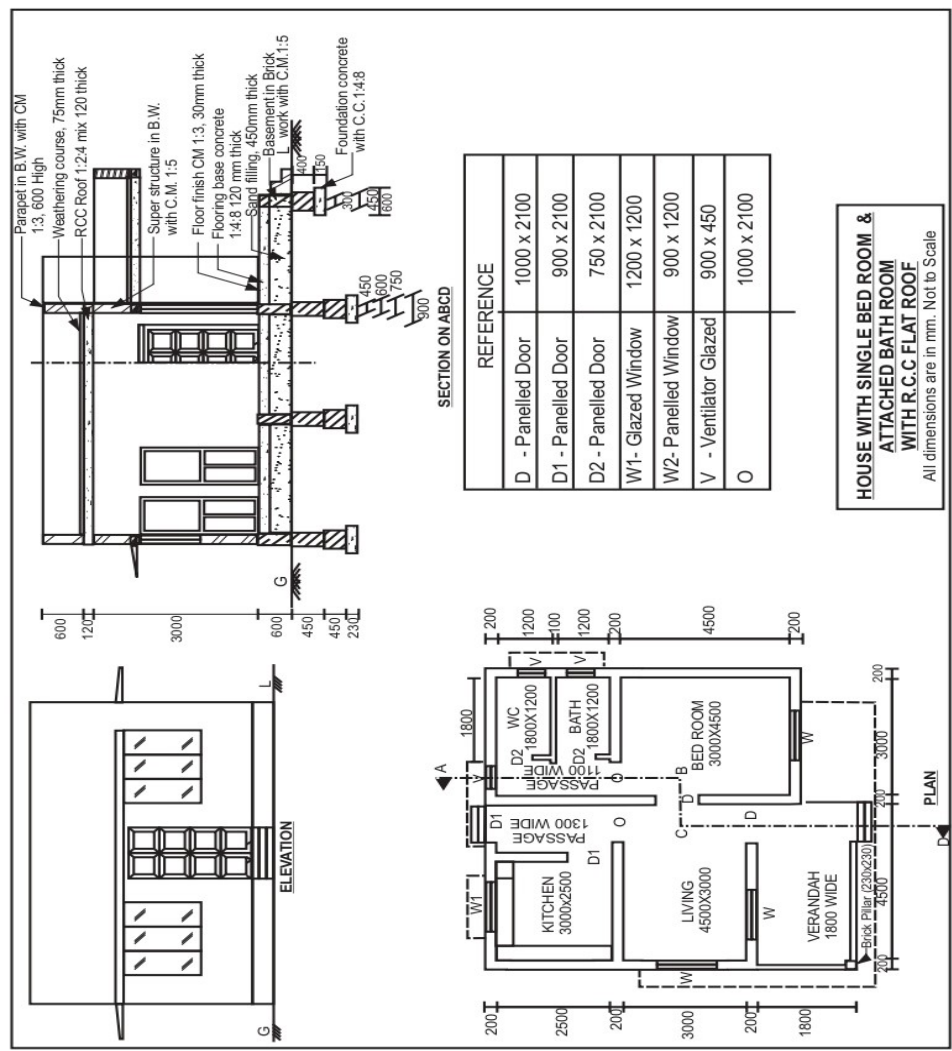


2. Take the following quantities for the “Residential building” as shown in figure.
 (i) Earthwork excavation in hard soil for foundation (ii) Plain cement concrete for base concrete

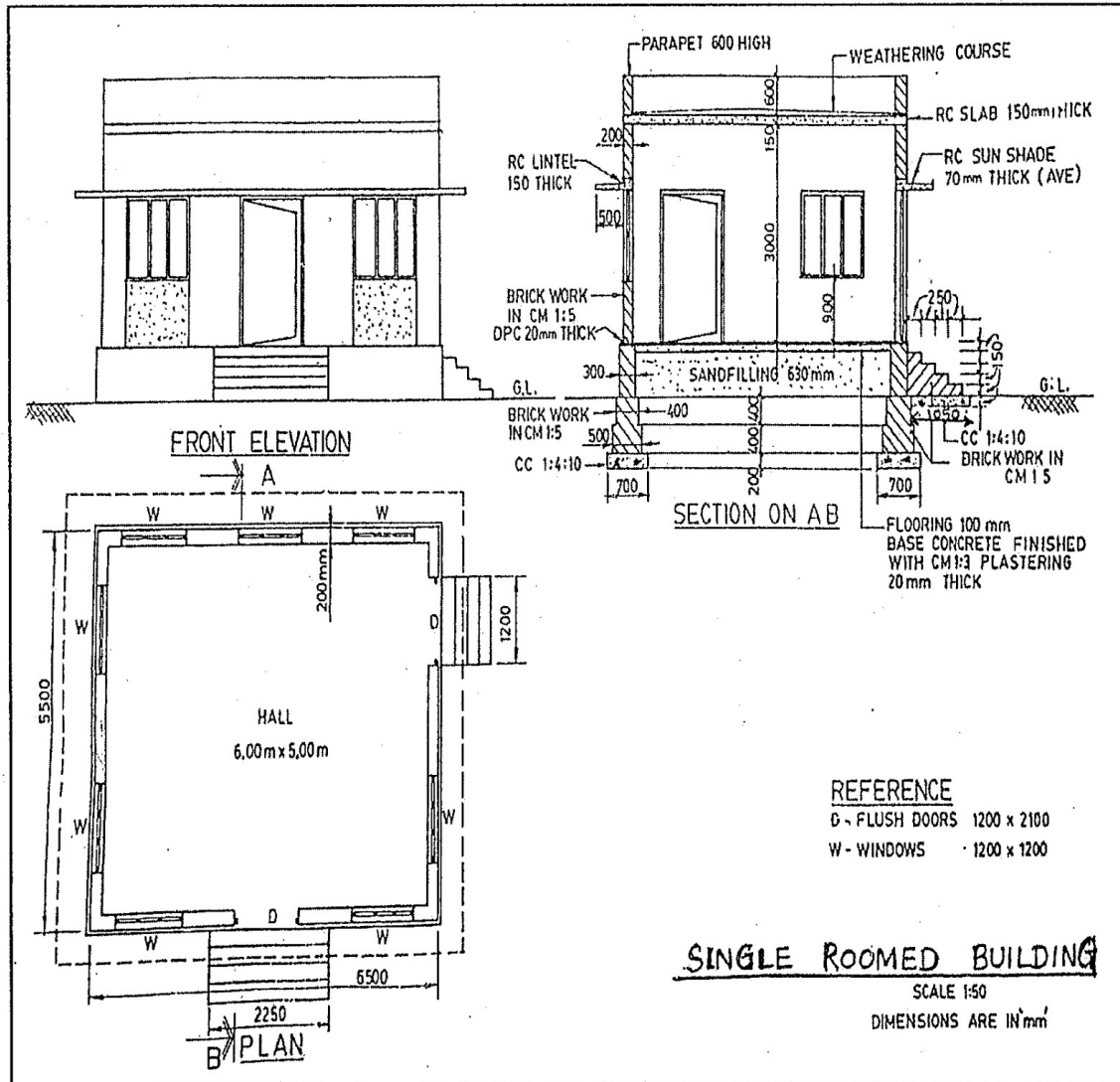


3. Take the following quantities for the “Residential building” as shown in figure.
(i) Earthwork excavation in hard soil for foundation (ii) Plain cement concrete for base concrete

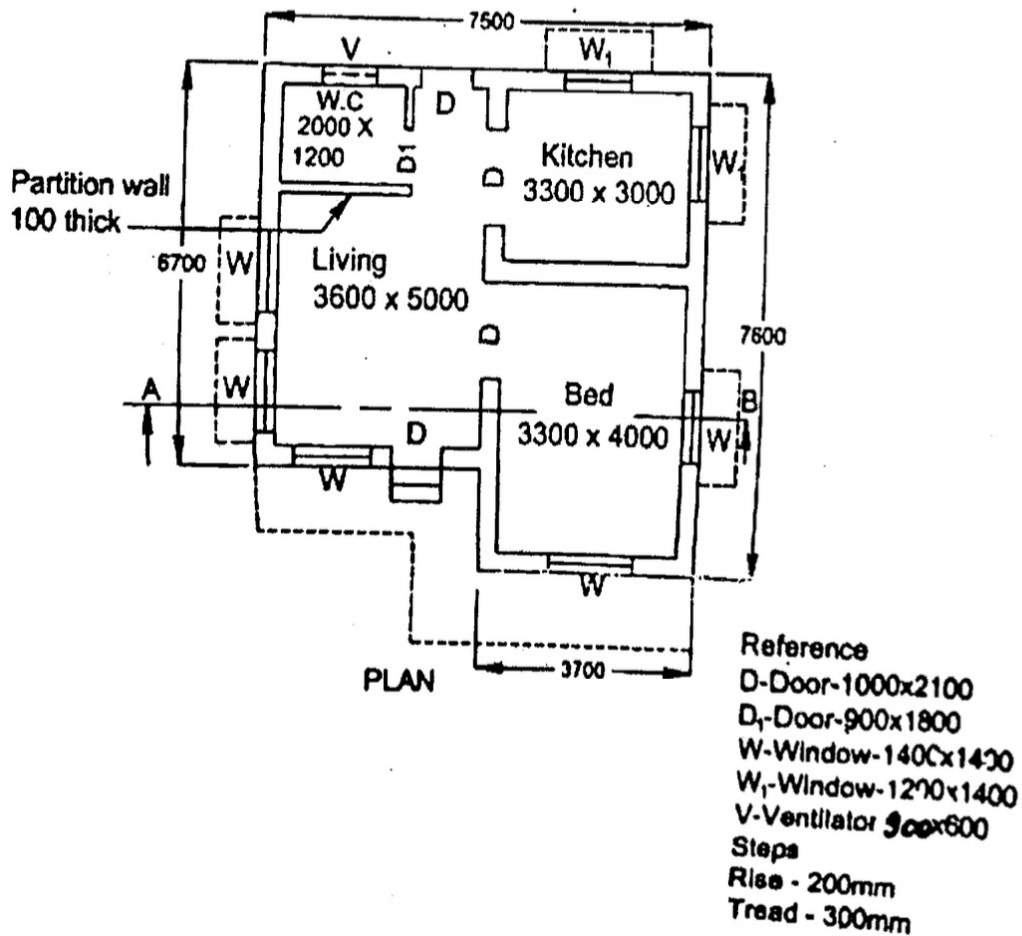
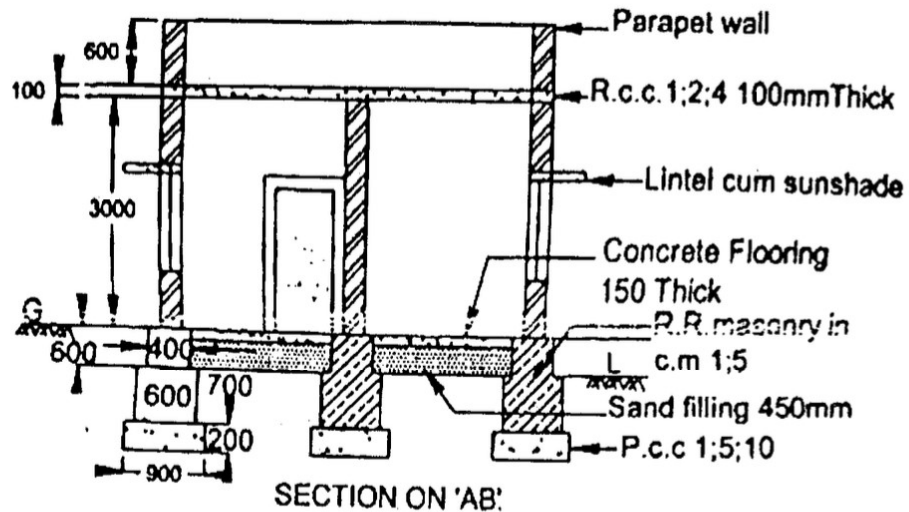
Small residential building with two rooms with RCC roof.



4. Prepare the detailed estimate of quantities for the following items for a single roomed building shown in figure. (i) Damp proof course (ii) RCC roof slab.



5. Prepare the detailed estimate of quantities for the following items for a building with single bed room as shown in figure. (i) Brickwork for walls (ii) Earth filling in basement



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UNIT – III: APPROXIMATE ESTIMATES

PART - A (Multiple Choice Questions)

1. The approximate estimate is also commonly known as:

- A) Detailed estimate
- B) Preliminary estimate
- C) Revised estimate
- D) Supplementary estimate

Answer: B

2. Which of the following approximate methods is considered the most accurate for building valuation?

- A) Plinth area method
- B) Cubical content method
- C) Typical bay method
- D) Service unit method

Answer: B

3. The area of an irregular figure calculated by Simpson's rule assumes that the boundaries between the extremities of ordinates consist of:

- A) Straight lines
- B) Parabolic arcs
- C) Circular arcs
- D) Elliptical arcs

Answer: B

4. Plinth area of a building does NOT include the area of:

- A) Walls at floor level
- B) Internal shafts for sanitary installations
- C) Open unroofed courtyards
- D) Verandahs with roofs

Answer: C

5. For applying Simpson's rule to calculate an area, the total number of ordinates must always be:

- A) Even
- B) Odd
- C) Prime
- D) Any number

Answer: B

6. The standard service unit for preparing an approximate estimate for a hospital is:

- A) Per room
- B) Per bed
- C) Per doctor
- D) Per square meter

Answer: B

7. According to the Trapezoidal rule for calculating the area of irregular shapes, the boundaries between ordinates are assumed to be:

- A) Parabolic
- B) Straight lines
- C) Curved
- D) Circular

Answer: B

8. The volume of earthwork in an embankment is calculated using the prismoidal formula. This formula is also mathematically equivalent to:

- A) Simpson's rule for volumes
- B) Trapezoidal rule
- C) Mid-ordinate rule
- D) Mean area rule

Answer: A

9. The typical bay method of approximate estimation is generally adopted for:

- A) Residential buildings
- B) Hospitals
- C) Factory sheds and railway platforms
- D) Water tanks

Answer: C

10. Which rule generally yields a smaller (and theoretically more exact) volume compared to the trapezoidal rule when calculating earthwork?

- A) Mid-ordinate rule
- B) Prismoidal rule
- C) Average ordinate rule
- D) Mean sectional area rule

Answer: B

11. For a building project, if the plinth area is 150 sq.m and the plinth area rate is Rs. 2000 per sq.m, the approximate estimate is:

- A) Rs. 30,000
- B) Rs. 3,00,000
- C) Rs. 3,50,000
- D) Rs. 1,50,000

Answer: B

12. The cubical content of a building is determined by multiplying the plinth area by the:

- A) Height from foundation top to roof
- B) Height from floor level to top of roof
- C) Height from floor level to sill level
- D) Depth of foundation

Answer: B

13. While calculating the volume of earthwork using the mean sectional area method, the volume between two sections A1 and A2 separated by length L is:

- A) $(A1 + A2) \times L / 2$
- B) $(A1 - A2) \times L / 2$
- C) $(A1 \times A2) \times L$

D) $A1 + (A2 \times L)$

Answer: A

14. What is the standard service unit used for the approximate estimate of a water supply scheme?

A) Per kilometer

B) Per household

C) Per capita (per person)

D) Per pipe

Answer: C

15. In the prismoidal formula for volume: $V = d/3 [(A1+A_n) + 4(\text{Even Areas}) + X(\text{Odd Areas})]$, the multiplier X is:

A) 1

B) 2

C) 3

D) 4

Answer: B

16. Which of the following formulas represents the mid-ordinate rule for calculating the area of an irregular figure?

A) Area = Average ordinate $\times$ length of base

B) Area = Sum of mid-ordinates $\times$ common distance

C) Area = (First + Last ordinate) / 2 $\times$ common distance

D) Area = Sum of all ordinates $\times$ common distance

Answer: B

17. The plinth area rate is generally derived from:

A) Cost of similar buildings in the same locality

B) Cost of materials globally

C) The detailed estimate of the current building

D) Land value

Answer: A

18. A cross-section of a canal in cutting is entirely below the ground level. It is called a:

- A) Fully banked section
- B) Fully in cutting (level section)
- C) Partially in cutting and filling
- D) None of the above

Answer: B

19. Which formula is used to calculate the cross-sectional area of an embankment on level ground with formation width 'B', depth 'd', and side slope 's:1'?

- A) $Bd + s.d$
- B) $Bd + s.d^2$
- C) $Bd^2 + s.d$
- D) $B^2d + s.d^2$

Answer: B

20. In the average ordinate rule, the area is calculated by multiplying the average of all ordinates by:

- A) The common distance between ordinates
- B) The total length of the base line
- C) Half the base line length
- D) The number of ordinates

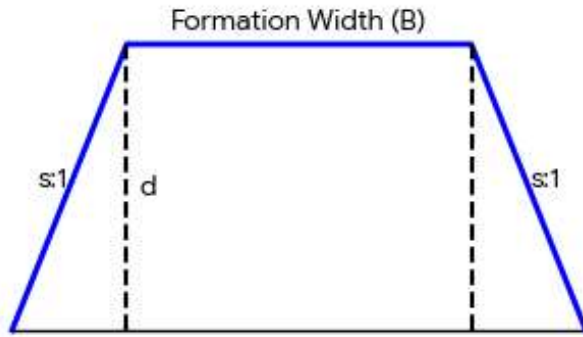
Answer: B

21. The approximate cost of electrification (electrical installations) in a building is usually taken as what percentage of the estimated cost of building works?

- A) 1% to 2%
- B) 3% to 5%
- C) 8% to 10%
- D) 20% to 25%

Answer: C

22. Refer to Figure showing the cross-section of an embankment.

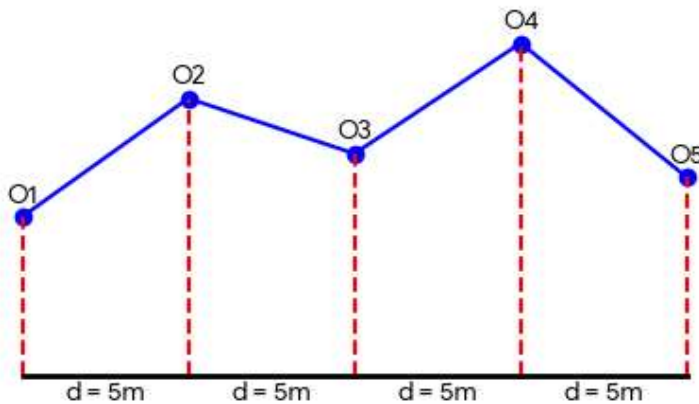


If the formation width (B) is 10m, depth (d) is 2m, and side slopes (s:1) are 2:1, what is the cross-sectional area?

- A) 20 sq.m
- B) 24 sq.m
- C) 28 sq.m
- D) 36 sq.m

Answer: C

23. Refer to Figure showing ordinates taken along a boundary.

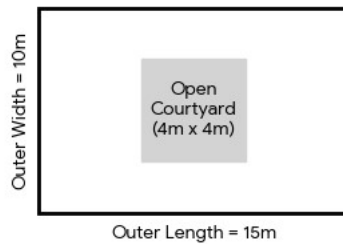


Using the Trapezoidal rule, calculate the approximate area. The common distance 'd' is 5m.

- A) 55.0 sq.m
- B) 63.75 sq.m
- C) 75.0 sq.m
- D) 127.5 sq.m

Answer: B

24. Refer to Figure showing the plan of a proposed building.



Calculate the total Plinth Area of the building according to standard estimation rules.

- A) 150 sq.m
- B) 134 sq.m
- C) 166 sq.m
- D) 120 sq.m

Answer: B

25. An engineer must choose a method to calculate the earthwork volume for a curved 500m road section. Which method will yield the most theoretically exact volume to prevent contractor overpayment?

- A) Trapezoidal rule
- B) Mean Sectional Area rule
- C) Prismoidal rule
- D) Average ordinate rule

Answer: C

26. A government hospital requires an approximate estimate. The proposed capacity is 500 beds. Based on a recently completed hospital in the same district, the service unit rate is Rs. 1.5 Lakhs per bed. What is the total approximate budget required?

- A) Rs. 15 Lakhs
- B) Rs. 50 Lakhs
- C) Rs. 75 Lakhs
- D) Rs. 7.5 Crores

Answer: D

27. You are asked to use Simpson's rule to find an area. You are given the common interval ($d = 10\text{m}$) and the ordinate values. You notice there are exactly 6 ordinates. What must you do?

- A) Apply Simpson's rule normally; the number of ordinates doesn't matter.
- B) Apply Simpson's rule to the first 5 ordinates, and calculate the area of the last segment using the trapezoidal rule.
- C) Divide the total area by 2.
- D) Multiply the final answer by $6/5$.

Answer: B

28. Consider two statements regarding approximate estimation.

Statement 1: The Cubical content method gives a more accurate cost estimate than the Plinth area method.

Statement 2: Cubical content considers the height of the building, whereas the plinth area method does not. Which is true?

- A) Both statements are true and Statement 2 is the correct reason for Statement 1.
- B) Both statements are false.
- C) Statement 1 is true but Statement 2 is false.
- D) Statement 1 is false but Statement 2 is true.

Answer: A

29. Arrange the logical sequence of steps to estimate a highway's earthwork volume using the trapezoidal rule: 1) Measure the chainage lengths, 2) Calculate cross-sectional areas at intervals, 3) Apply the volume formula, 4) Take depth/level readings at intervals.

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

Answer: A

30. A table shows cross-sectional areas of an earthwork cutting at 30m intervals: $A_1=20\text{ sq.m}$, $A_2=40\text{ sq.m}$, $A_3=60\text{ sq.m}$. Using the Prismoidal formula, what is the total volume of earthwork?

- A) 1200 cu.m
- B) 2400 cu.m
- C) 3600 cu.m
- D) 4000 cu.m

Answer: B

PART - B (Descriptive Questions)

1. The actual expenditure incurred in the construction of a flat-roofed residential building having a plinth area of 75 m^2 and height 4 m is Rs. 5.40 lakhs. It is proposed to construct another similar building in the same locality with a plinth area of 90 m^2 and height 3.45 m. Estimate the approximate amount required for the proposed building, assuming an increase in the cost of materials and labour of 20%.
2. A warehouse 3 m wide and 12 m long has GI sheet roofing supported over roof trusses, with brick walls on all sides. The warehouse may be divided into 4 bays. The cost of the previous work per bay is Rs. 1,50,000. If there is a proposal for a future extension of 3 more bays, find the approximate cost, taking an increase in the cost of materials and labour of 22%.
3. A hospital building with 100 beds was constructed 5 years ago at a total cost of Rs. 90 lakhs, of which the cost of materials was Rs. 63 lakhs, the cost of labour was Rs. 22.5 lakhs, and the cost of services was Rs. 4.5 lakhs. There is now an escalation of 25% in the cost of materials, 40% in the wages of labour, and a decrease of 20% in the cost of services. It is now proposed to construct a similar hospital building in the same area with 140 beds. Find the approximate cost of the building.
4. State the mathematical formulas for the Trapezoidal Rule and Simpson's Rule for calculating areas of irregular figures. List the limitations or specific conditions required to use Simpson's Rule.

5. A railway embankment is to be constructed on level ground over a length of 120 meters. The formation width is 8m, and the side slopes are 2:1. The center heights (depths) of the embankment at 30m intervals are: 1.0m, 1.5m, 2.0m, 1.5m, and 1.2m. i) Calculate the cross-sectional area at each interval. ii) Calculate the total volume of earthwork required using the Trapezoidal Rule. iii) Calculate the total volume using the Prismoidal Rule and comment on why the answers might differ.

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UNIT – IV: DATA

PART - A (Multiple Choice Questions)

1. The document that contains the basic rates of materials, labour, and transport, published annually by the Public Works Department is called the:

- A) Lead statement
- B) Schedule of Rates (SoR)
- C) Data book
- D) Abstract estimate

Answer: B

2. A statement showing the distance of the source of materials from the work site and their conveyance costs is known as a:

- A) Schedule of Rates
- B) Lead Statement
- C) Standard Data
- D) Sub-data

Answer: B

3. While preparing data for cement concrete (1:2:4), the dry volume of materials required is taken as what percentage of the finished wet volume?

- A) 100%
- B) 110% to 120%
- C) 130% to 140%
- D) 152% to 154%

Answer: D

4. In the preparation of data for an item of work, 'Sundries' refers to:

- A) The profit margin of the contractor
- B) A lump sum amount provided for small tools, plants, and miscellaneous minor items
- C) The cost of water supply
- D) The cost of major machinery like road rollers

Answer: B

5. The analysis of rates for an item of work comprises the cost of materials, cost of labour, and:

- A) Only water charges
- B) Only contractor's profit
- C) Tools & plants, water charges, and contractor's profit
- D) Architectural fees

Answer: C

6. What is the standard percentage added for Contractor's Profit in rate analysis?

- A) 2%
- B) 5%
- C) 10%
- D) 20%

Answer: C

7. What is the standard percentage added for Water Charges in the preparation of data?

- A) 1% to 1.5%
- B) 5%
- C) 10%
- D) 15%

Answer: A

8. Data prepared for basic mortar mixes (e.g., Cement Mortar 1:4) which are subsequently used in calculating masonry or plastering rates is called:

- A) Main data
- B) Sub data
- C) Observed data

D) Standard data

Answer: B

9. The standard volume of one 50 kg bag of cement is approximately:

A) 0.0245 cu.m

B) 0.0347 cu.m

C) 0.0450 cu.m

D) 0.0500 cu.m

Answer: B

10. In rate analysis, what is the generally accepted volume of dry mortar required for 1 cubic meter of brick masonry?

A) 0.10 cu.m

B) 0.20 cu.m

C) 0.30 cu.m

D) 0.50 cu.m

Answer: C

11. 'Observed Data' in estimation refers to:

A) Data copied from old records

B) Data obtained by conducting time and motion studies on an actual ongoing work site for a new item

C) Theoretical data given in textbooks

D) Data representing purely material costs

Answer: B

12. What is the standard 'Lead' for earthwork calculation beyond which extra transport costs are added?

A) 10 m

B) 30 m

C) 50 m

D) 100 m

Answer: B

13. What is the standard 'Lift' considered in the basic rate of earthwork excavation?

- A) 1.0 m
- B) 1.5 m
- C) 2.0 m
- D) 3.0 m

Answer: B

14. In the rate analysis for 10 sq.m of 12mm thick plastering, the dry mortar volume is generally taken as:

- A) 0.12 cu.m
- B) 0.16 to 0.20 cu.m (including wastage and unevenness)
- C) 0.25 cu.m
- D) 0.30 cu.m

Answer: B

15. The 'Standard Data Book' published by the government provides:

- A) Only the market prices of materials
- B) The exact final cost of building items
- C) The standard requirement of materials and labour constants for a unit quantity of work
- D) The structural design of members

Answer: C

16. Which of the following is considered 'Main Data' rather than 'Sub Data'?

- A) Cement Mortar 1:5
- B) Lime Mortar
- C) First-class brickwork in CM 1:5
- D) Surkhi Mortar

Answer: C

17. The cost of materials at the site of work is calculated by adding the base cost of materials at the source to the:

- A) Water charges
- B) Contractor's profit

- C) Conveyance/Lead charges and loading/unloading charges
- D) Sundries

Answer: C

18. How many standard modular bricks are needed for 10 cu.m of brick masonry?

- A) 4000
- B) 4500
- C) 5000
- D) 5500

Answer: C

19. Which grade of bitumen or emulsion is typically analyzed in the data for surface dressing of a WBM road?

- A) 10/20 grade
- B) 30/40 grade
- C) 80/100 grade
- D) None of the above

Answer: C

20. For R.C.C. slab works, the cost of which of the following is usually calculated as a percentage (around 1%) of the reinforcement steel cost?

- A) Binding wire
- B) Centering oil
- C) Vibrator fuel
- D) Cover blocks

Answer: A

21. The capacity of a standard truck/lorry for transporting materials like sand or aggregates is generally taken around:

- A) 1 cu.m
- B) 2.83 to 5.66 cu.m (100 to 200 cu.ft)
- C) 10 cu.m
- D) 20 cu.m

Answer: B

22. You are preparing the data for 1 cu.m of Cement Concrete (1:2:4). The dry volume is 1.54 cu.m. What is the approximate volume of cement required?

- A) 0.10 cu.m
- B) 0.22 cu.m
- C) 0.44 cu.m
- D) 0.88 cu.m

Answer: B

23. In the analysis of rates for brickwork, if the basic cost of materials and labour for 10 cu.m is Rs. 40,000, and water charges are 1%, what is the value of the contractor's profit (at standard 10%) calculated on the subtotal?

- A) Rs. 4,000
- B) Rs. 4,040
- C) Rs. 4,440
- D) Rs. 5,000

Answer: B

24. Arrange the sequential steps for completing a Rate Analysis (Preparation of Data): 1) Add 10% Contractor Profit, 2) Calculate Material Cost including Lead, 3) Add 1% Water Charges, 4) Calculate Labour Cost.

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

Answer: A

25. An engineer is calculating the lead charges for sand. The quarry is 25 km away from the site. The SoR specifies Rs. 10/km for the first 5 km, and Rs. 8/km for subsequent distances. What is the total conveyance charge per cu.m?

- A) Rs. 250
- B) Rs. 210
- C) Rs. 200
- D) Rs. 150

Answer: B

26. Consider two statements regarding Data Preparation.

Statement 1: Sub-data must be prepared before Main data for composite items like Brickwork.

Statement 2: Mortar preparation is an example of Main data. Which is correct?

- A) Both statements are true.
- B) Both statements are false.
- C) Statement 1 is true, Statement 2 is false.
- D) Statement 1 is false, Statement 2 is true.

Answer: C

27. A surveyor needs to prepare data for a highly specialized acoustic ceiling installation not listed in the Standard Data Book. What is the technically appropriate method to establish the labour constants?

- A) Use the data for normal plastering.
- B) Ask the contractor for a random quote.
- C) Conduct a time and motion study at the site to prepare 'Observed Data'.
- D) Add a 50% lump sum provision to the overall estimate.

Answer: C

28. To calculate the material for 100 sq.m of 20mm thick cement plaster in 1:3 ratio, the surveyor assumes 30% extra for joint filling and wastage. What is the total dry volume of mortar required? (Assume dry volume = 1.25 times wet volume).

- A) 2.00 cu.m
- B) 2.60 cu.m
- C) 3.25 cu.m
- D) 4.00 cu.m

Answer: C

29. In a lead statement, the material 'Broken Stone' has a base cost of Rs. 500/cum and a handling charge of Rs. 40/cum. If the lead is 20 km at Rs. 10/km, what is the final rate of broken stone per cu.m at the site?

- A) Rs. 540
- B) Rs. 700
- C) Rs. 740
- D) Rs. 940

Answer: C

30. A Junior Engineer prepares data for RCC roof slab. They include the cost of concrete (1:1.5:3), steel reinforcement, and bending charges, but the final rate comes out 15% cheaper than the actual execution cost. Which critical item of work did they most likely forget to include in the rate analysis?

- A) Water charges
- B) Centering and shuttering (formwork)
- C) Binding wire
- D) Contractor's profit

Answer: B

PART - B (Descriptive Questions)

1. Define 'Lead Statement' and 'Schedule of Rates'. Explain how they are used together in the preparation of an estimate.

2. Differentiate between 'Main Data' and 'Sub Data' in rate analysis. Provide one concrete example of each to illustrate the difference.

3. Brick Work in CM 1:5 in Superstructure Using Second Class Brick - 10m³

Materials required for Cement Mortar 1:5 - 1 m³

Material	Quantity
Cement	288 kg
Sand	1 m ³
Mixing charges	1 m ³

Brickwork in Superstructure Using II Class Bricks in CM 1:5 - 10 m³

Material / Labour	Quantity
Brick, II class	5000 Nos
Cement mortar 1:5	2.2 m ³
Mason I class	3.5 Nos
Mason II class	10.6 Nos
Mazdoor I category	7.1 Nos
Mazdoor II category	21.2 Nos

Cost of Materials and Labour

S.No.	Material / Labour	Rate
1	Cement	Rs. 6000.00 / tonne
2	Sand	Rs. 800.00 / m ³
3	Brick, II class	Rs. 4000.00 / 1000 Nos
4	Mason I class	Rs. 600.00 each
5	Mason II class	Rs. 500.00 each
6	Mazdoor I class	Rs. 400.00 each
7	Mazdoor II class	Rs. 300.00 each
8	Mixing charges	Rs. 100.00 each

4. Flooring with Cement Concrete 1:5:10, 100 mm Thick, Plastered Over with CM 1:3, 20 mm Thick — Rate for 10 m²

(a) Cement Mortar 1:3 — 1 m³

Material	Quantity
Cement	480 kg
Sand	1 m ³

Mixing charges	1 m ³
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(b) Cement Mortar 1:5 — 1 m³

Material	Quantity
Cement	288 kg
Sand	1 m ³
Mixing charges	1 m ³

(c) Cement Concrete 1:5:10 — 10 m³

Material / Labour	Quantity
Broken stone, 40 mm size	9.5 m ³
Cement mortar 1:5	4.75 m ³
Mason II class	1.8 Nos
Mazdoor I class	17.7 Nos
Mazdoor II class	14.1 Nos

(d) Flooring with CC 1:5:10, 100 mm Thick, Plastered Over with CM 1:3, 20 mm Thick — 10 m²

Provide 5% extra cement concrete and 10% extra cement mortar over the theoretical quantities, to allow for unevenness of surface, wastage, etc. Add a lump sum of Rs. 200 for labour on plastering, curing, etc.

Cost of Materials and Labour

Material / Labour	Rate
Sand	Rs. 420 / m ³
Cement	Rs. 5200 / tonne
Broken stone, 40 mm size	Rs. 500 / m ³

Mason II class	Rs. 350 each / day
Mazdoor I class	Rs. 300 each / day
Mazdoor II class	Rs. 200 each / day
Mixing charges	Rs. 75 / m ³

5. RCC Sunshade, Roof Slab, Beam and Column

(i) RCC Sunshade, mix 1:2:4, 600 mm Projection, 80 mm Average Thickness — Rate for 10 m Run

(ii) Prepare the data for an RCC roof slab, 120 mm thick, mix 1:1½:3, using 20 mm broken jelly, with suitable reinforcement, including centering, curing, etc., complete — 1 m². (iii) Prepare the data for an RCC beam, mix 1:2:4, size 300 × 500 mm, using 20 mm broken stone jelly, with suitable reinforcement, including centering, shuttering, etc., complete — 1 m³. (iv) Prepare the data for an RCC column, mix 1:2:4, size 200 × 200 mm, with suitable reinforcement, including centering, curing, etc., complete — 1 m run.

Concrete Mix 1:2:4 — 10 m³ (for sunshade / column)

Material / Labour	Quantity
Broken stone, 20 mm size	9 m ³
Sand	4.5 m ³
Cement	3240 kg
Mason II class	3.5 Nos
Mazdoor I class	21.20 Nos
Mazdoor II class	35.3 Nos

RCC Sunshade, Mix 1:2:4, 600 mm Wide — 1 m Run

Item	Quantity
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Concrete 1:2:4	As required
Steel	70 kg / m ³
Binding wire	1% of reinforcement
Centering	As required, add 20% extra for sides
Bar bending	As required

Concrete Mix 1:1½:3 — 10 m³ (for roof slab)

Material / Labour	Quantity
Broken stone	9 m ³
Sand	4.5 m ³
Cement	4308 kg
Mason II class	3.50 Nos
Mazdoor I class	21.20 Nos
Mazdoor II class	35.30 Nos

RCC Roof Slab, Mix 1:1½:3, Using 20 mm Broken Jelly — 1 m³

Item	Quantity
Concrete 1:1½:3	As required
Steel	90 kg / m ³ of concrete
Binding wire	1% of reinforcement
Centering	As required, add 20% extra for sides
Bar bending	As required

RCC Beam, Mix 1:2:4 — 1 m³

Item	Quantity
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Concrete 1:2:4	1 m ³
Steel	150 kg / m ³ of concrete
Binding wire	1% of reinforcement
Centering	As required
Bar bending	As required

RCC Column, Mix 1:2:4 — 1 m Run

Item	Quantity
Concrete 1:2:4	1 m ³
Steel	90 kg / m ³ of concrete
Binding wire	1% of reinforcement
Centering	As required
Bar bending	As required

Concrete Mix 1:2:4 — 10 m³

Material / Labour	Quantity
Broken stone	9 m ³
Sand	4.5 m ³
Cement	3240 kg
Mason II class	3.50 Nos
Mazdoor I class	21.20 Nos
Mazdoor II class	35.30 Nos

Cost of Materials and Labour at Site

Material / Labour	Rate
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Cement	Rs. 5200 / tonne
Steel	Rs. 48,000 / tonne
Binding wire	Rs. 80 / kg
Sand	Rs. 420 / m ³
Broken stone, 20 mm	Rs. 500 / m ³
Centering charges	Rs. 150 / m ²
Bar bending	Rs. 250 / 100 kg
Mixing charges	Rs. 100 / m ³
Mason I class	Rs. 500 each / day
Mason II class	Rs. 450 each / day
Mazdoor I class	Rs. 400 each / day
Mazdoor II class	Rs. 300 each / day

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UNIT – V: SPECIFICATION AND REPORT WRITING

PART - A (Multiple Choice Questions)

1. The document that describes the nature, class, workmanship, and materials to be used for a project is called:

- A) Schedule of Rates
- B) Specification
- C) Abstract Estimate
- D) Report

Answer: B

2. Which of the following is NOT an essential requirement of a good specification?

- A) It should be clear and concise.
- B) It should use ambiguous legal terminology.
- C) It should specify the quality of materials.
- D) It should describe the workmanship expected.

Answer: B

3. In case of a discrepancy between the architectural drawings and the detailed specifications, which document holds legal priority?

- A) The drawings
- B) The detailed specifications
- C) The preliminary estimate
- D) Neither, the work stops permanently

Answer: B

4. A specification that describes the nature and class of the work in a short, generalized manner is called:

- A) Detailed specification
- B) General (or Brief) specification
- C) Standard specification
- D) Open specification

Answer: B

5. Which document acts as an essential guide for the contractor during execution and the engineer during supervision?

- A) Detailed Specification
- B) Lead Statement
- C) Dimension Paper
- D) Formwork drawing

Answer: A

6. Specifications standardized by major departments like the CPWD or State PWDs to maintain uniformity across all projects are known as:

- A) Open specifications
- B) Restricted specifications
- C) Standard specifications
- D) Manufacturer's specifications

Answer: C

7. A detailed specification for First Class Brickwork states that bricks must be thoroughly soaked in water for at least:

- A) 1 hour
- B) 2 hours
- C) 12 hours
- D) 24 hours

Answer: C

8. In the detailed specification for cement concrete (RCC), the standard curing period is usually specified as a minimum of:

- A) 3 days
- B) 7 days
- C) 14 to 21 days
- D) 28 days

Answer: C

9. For damp proof course (DPC), the specification usually requires the addition of:

- A) Retarders
- B) Water-proofing compound
- C) Accelerators
- D) Plasticizers

Answer: B

10. Which part of the project documents provides a narrative explaining the necessity, utility, and viability of the proposed project?

- A) Technical Report
- B) Schedule of Rates
- C) Bill of Quantities
- D) Detailed Specification

Answer: A

11. What is typically the first section of a comprehensive engineering project report?

- A) Cost Abstract
- B) Introduction and Background/History
- C) Appendices
- D) Specification clauses

Answer: B

12. A technical report for a new village road must heavily emphasize which of the following preliminary survey details?

- A) Population forecast
- B) Traffic survey and soil CBR values
- C) Number of doctors in the village

D) Roof types of adjacent houses

Answer: B

13. In a report for a water supply system, which parameter dictates the overall design capacity of the project?

A) Soil bearing capacity

B) Highest Flood Level (HFL)

C) Projected future population

D) Number of existing bridges

Answer: C

14. What accompanies a detailed technical report to give visual and structural context?

A) Site plans and design drawings

B) Only a list of labourers

C) The contractor's bank statements

D) Equipment manuals

Answer: A

15. A report for a hospital building must specifically detail arrangements for:

A) Traffic signals

B) Accommodation (wards/beds) and sanitary/medical waste disposal

C) Irrigation canals

D) Highway toll booths

Answer: B

16. Which of the following should be considered while writing an engineering report?

A) Subjective and emotional language should be used.

B) It should be written in a logical sequence with objective, formal language.

C) Only bullet points without explanations should be used.

D) Cost implications should be completely hidden.

Answer: B

17. The detailed specification for earthwork in foundation trenching states that the sides of the trench should be:

- A) Left to collapse naturally
- B) Kept strictly vertical or sloped depending on soil conditions, with shoring if necessary
- C) Filled with water
- D) Painted

Answer: B

18. For painting woodwork, the specification requires the application of a 'prime coat' primarily to:

- A) Make the wood completely fireproof
- B) Fill the pores of the wood and provide a base for subsequent coats
- C) Change the dimensions of the door
- D) Act as an adhesive for glass panes

Answer: B

19. Which document is primarily used by the arbitrator or court to settle disputes regarding the quality of executed work?

- A) The site diary
- B) The detailed specifications in the contract
- C) The abstract estimate
- D) The attendance register

Answer: B

20. In the specification for plastering, the thickness is strictly regulated. For internal walls, the standard thickness specified is usually:

- A) 6 mm
- B) 12 mm
- C) 20 mm
- D) 25 mm

Answer: B

21. The concluding section of an engineering report usually contains:

- A) An index of terms
- B) Conclusions, final recommendations, and financial justification
- C) The title of the project
- D) The history of the area

Answer: B

22. A dispute arises between the contractor and the client regarding the grade of cement to be used. The structural drawing indicates Grade 43, but the detailed specification contract explicitly mandates Grade 53. Which document legally prevails to resolve this dispute?

- A) The structural drawing
- B) The detailed specification
- C) The contractor's discretion
- D) Both must be ignored, and Grade 33 should be used

Answer: B

23. An engineer drafts a specification for concrete but completely forgets to specify the minimum curing period. How might this omission critically impact the project?

- A) The project will finish faster with no negative effects.
- B) The contractor may remove curing early to save costs, leading to weak concrete and potential structural failure.
- C) The cost of water supply will increase exponentially.
- D) It will improve the compressive strength of the concrete.

Answer: B

24. Arrange the logical sequence of formulating an engineering project report: 1) Preparation of detailed cost estimate, 2) Writing the Introduction and necessity of the project, 3) Detailing the proposed design and specifications, 4) Providing conclusions and recommendations.

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

Answer: B

25. Consider two statements regarding specifications.

Statement 1: General specifications form an integral part of the legal contract document.

Statement 2: General specifications provide the exact quantities of materials required for the project. Which is correct?

- A) Both statements are true.
- B) Both statements are false.
- C) Statement 1 is true, Statement 2 is false.
- D) Statement 1 is false, Statement 2 is true.

Answer: C

26. A technical report is being prepared for the construction of a new bridge over a river. Which of the following hydrological parameters must be fundamentally addressed in the report before structural costing can occur?

- A) The number of vehicles in the state
- B) The Highest Flood Level (HFL) and river discharge
- C) The number of streetlights on the approach road
- D) The population of the nearest city

Answer: B

27. An engineer is writing a detailed specification for 'Woodwork Painting'. Which of the following clauses is technically essential to ensure a smooth, high-quality finish?

- A) Paint must be applied on wet wood.
- B) Knots in the wood must be covered with knotting, and a prime coat applied before two finishing coats.
- C) Only one coat of direct paint is allowed without a primer.
- D) Wood should be soaked in water before painting.

Answer: B

28. A specification states: 'Bricks shall be immersed in clean water for at least 12 hours before use.' What is the primary technical reasoning behind this strict clause?

- A) To wash away the red color of the brick.
- B) To make the bricks heavier for structural stability.

- C) To prevent dry bricks from absorbing water from the wet cement mortar, which would weaken the bond.
- D) To cool down the bricks for the masons to handle easily.

Answer: C

29. A poorly written specification uses ambiguous language, leading to the use of substandard steel in a school building. If the contractor strictly followed the written words, who is generally held professionally responsible for the structural defect?

- A) The daily wage labourers
- B) The materials supplier
- C) The specifying engineer or consultant who drafted the document
- D) The school principal

Answer: C

30. A typical report for a village water supply system includes a population forecast. If the base year population is 10,000, and the design period is 30 years, why is this forecasted data absolutely critical for the estimate?

- A) It dictates the size of the water pipes, the capacity of the pumps/tanks, and consequently the entire project budget.
- B) It determines how many workers to hire for construction.
- C) It decides the color of the water tank.
- D) It is only required for political purposes, not engineering.

Answer: A

PART - B (Descriptive Questions)

1. Explain the necessity of writing specifications for civil engineering projects. What are the essential requirements of a good specification?

2. Differentiate between General (Brief) Specifications and Detailed Specifications. Provide suitable examples to illustrate the difference.

3. Write down the detailed specification for First Class Brickwork in Cement Mortar (1:5) in the superstructure of a building.

4. Discuss the important points to be considered while writing a technical report for an engineering project. List the supporting documents that normally accompany such a report.

5. The Government has sanctioned a new Primary Health Centre (Hospital) in a rural village. As the Assistant Engineer, draft the structural framework (headings and key descriptive contents) of the technical report you will submit for administrative and technical sanction. Highlight the specific components of the report related to site selection, accommodation requirements (wards, beds, doctor's rooms), and essential sanitary/water supply arrangements.