CBCS SCHEME

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21CV71

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Quantity Survey and Contract Management

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

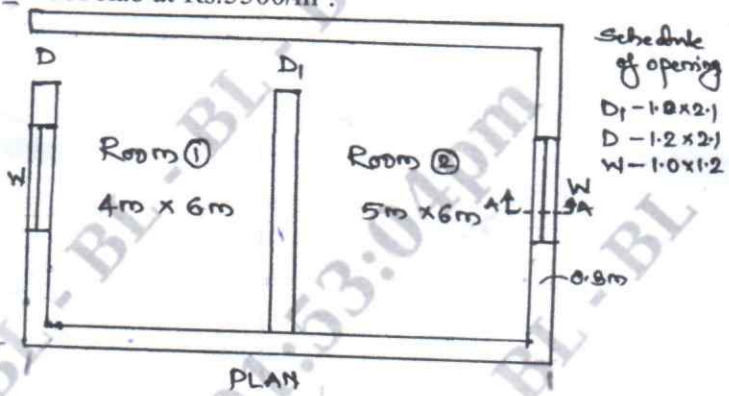
Module-1

1 Define estimate. Explain briefly purpose and different types of estimate (any three). **(20 Marks)**

OR

2 The details of two room building are shown in Fig.Q.2. Estimate the quantities and cost of the following items of work:

i) Earthwork excavation for foundation in ordinary soil @ Rs.400/m^3.
ii) Cement concrete bed 1:4:8 for wall foundation @ Rs.3800/m^3.
iii) SSM in CM 1:6 for foundation and basement @ Rs.3000/m^3.
iv) I^{st} class BBM work for super structure in CM 1:6 @ Rs.5800/m^3
v) RCC 1:1·5:3 roof slab at Rs.5500/m^3.



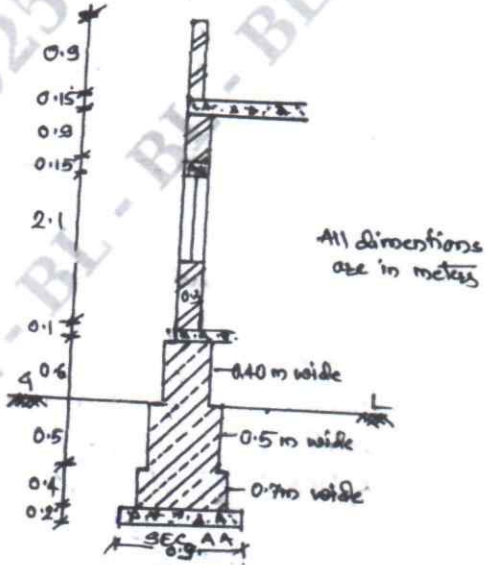


Fig.Q.2

(20 Marks)

Module-2

3 The details of a septic tank is as shown in Fig.Q.3. Estimate the quantities for the following items of work and work out the cost.

a. Earth work excavation in foundation @ Rs.400/m^3
b. Cement concrete 1:3:6 floor and foundation @ Rs.4000/m^3
c. First class brick work with cement mortar 1:4 @ Rs.6000/m^3.
d. 12 mm thick plaster for side walls @ Rs.200/m^2.

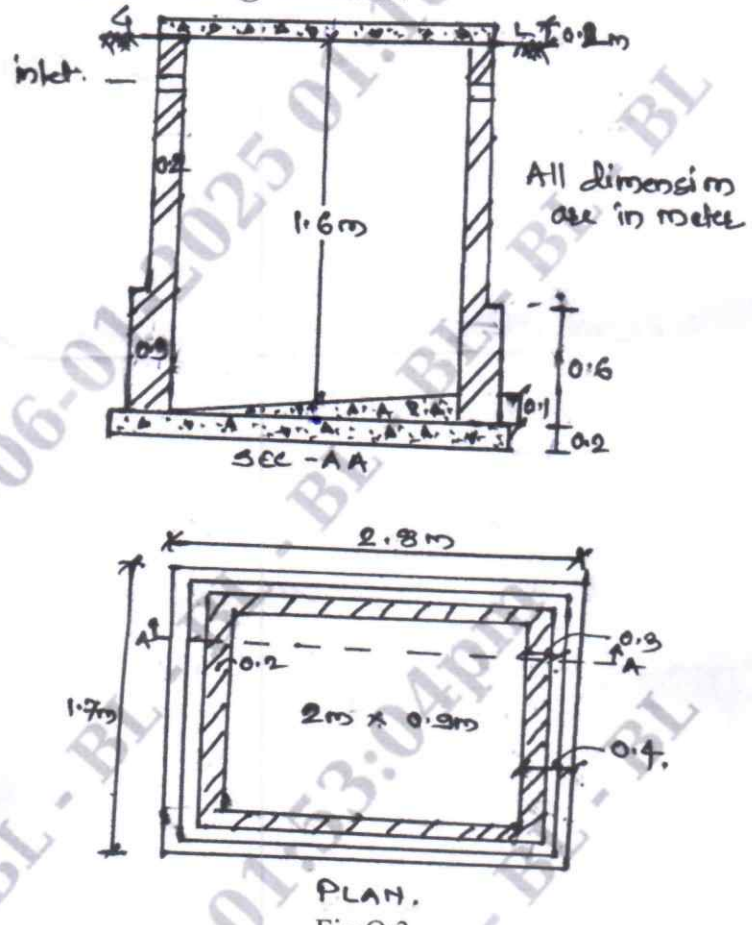


Fig.Q.3

(20 Marks)

OR

4 Reduced level (RL of ground along centerline of proposed road from chainage 10 to 20 chainage are given below. The formation level at the 10th chainage is 107 and the road is in down word gradient of 1 in 150 upto the chainage 14 and the gradient changes to 1 in 100 down word gradient. Formation width is 10m and side slope of banking are 2:1 (H:V). Length of chain is 30 m. Estimate the quantities and cost of earth at the rate for filling is Rs.250 and cutting Rs.140 by mid sec. method.

Chainage	10	11	12	13	14	15	16	17	18	19	20
RL of the GL	105.0	105.60	105.44	105.90	105.42	104.30	105.00	104.10	104.62	104.00	103.30
RL of FL	107.00										
Gradient	Down word 1 in 150					Down word 1 in 100					

(20 Marks)

Module-3

5 a. Define specification. Explain the objectives of writing specification. **(10 Marks)**

b. List the significances of microsoft excel in estimation. **(10 Marks)**

OR

6 Write detailed specification for following:

i) Bed concrete for foundation with M7.5 CC

ii) Size stone masonary for foundation in CM 1:6

iii) Plastering 12 mm thick with CM 1:5

iv) Floor filling with granite in CM 1:3 **(20 Marks)**

Module-4

7 a. Define rate analysis. Explain the purpose of rate analysis. **(10 Marks)**

b. Work out the rate analysis for R.C.C. for slab and beam in CC 1:1·5:3 and steel 1.2%. **(10 Marks)**

OR

8 Analyze rates from first principle for following:

i) Ashlar masonary for foundation in CM 1:6

ii) BBM for super structure in CM 1:6

iii) Plastering 20 mm thick in CM 1:4

iv) Pointing in CM 1:3. **(20 Marks)**

Module-5

9 a. Define contracts. Discuss the essentials of contracts. **(10 Marks)**

b. Write a note on tender documents and earnest money deposite. **(10 Marks)**

OR

10 Write short notes on following:

a. Administrative approval and technical sanction

b. Nominal muster roll

c. Security deposite

d. Running bills. **(20 Marks)**

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KLS VDIT, HALIYAL.

DEPARTMENT OF CIVIL ENGINEERING.

VII SEMESTER B.E DEGREE EXAMINATION DEC 24/JAN 25

QUANTITY SURVEY AND CONTRACT MANAGEMENT (21CV71).

QUESTION PAPER SOLUTION

FACULTY NAME: Prof. HARSHAVARDHAN.V.S ACADEMIC YEAR: 2024-2

Q1. Estimation or estimating is the process of calculating the quantities of various items of works involved in the project.

Estimate is a document which furnishes the quantities of different works involved, their rates & expenditure anticipate in a project.

The purpose of preparing an estimate is

1) It gives an idea of the cost of the work & hence its feasibility can be determined.
2) It gives an idea of time required for work completion
3) Estimate is required to invite the tenders & quotation
4) It is also required to arrange contract.
5) Estimate decides whether the proposed plan matches the funds available or not.
6) Estimate is required to obtain administrative & technical sanction of Budget from competant authority & to release the funds for construction.

The different types of estimate are

1) PRELIMINARY or APPROXIMATE ESTIMATE.

This estimate is prepared to decide financial aspect, policy & to give idea of the cost of the proposal to the competent sanctioning authority It should clearly show the necessity of the proposal. and how the cost has been arrived at. The data can be had from a similar construction already complete in nearby area by the department.

The approximate estimate is prepared from the practical knowledge & cost of similar works.
This estimate is prepared showing separately the approximate cost of all important items of works as cost of land, cost of each building, cost of roads, water supply, sanitary works, electrical works, etc.

The estimate is accompanied by a brief report explaining the necessity & utility of the project & showing how the cost of separate items have been arrived at.

2) DETAILED ESTIMATE.

It is an accurate estimate & consists of working out the quantities of each items of works & working the cost.
The dimensions length, breadth and height of each item are taken out correctly from drawing & quantities of each item are calculated & abstracting & billing are done.

The detailed estimate is prepared in 2 stages.

i) Details of measurement & calculation of Quantities.

The details of measurement of each item of work are taken out correctly from plan & drawings & quantities under each item are computed or calculated in a tabular form.

ii) Abstract of Estimated Cost.

The cost of each item of work is calculated in a tabular form from the quantities already computed & total cost is worked out in Abstract of Estimate form.

3) REVISED ESTIMATE.

Revised estimate is a detailed estimate & is required to be prepared under any one of the following circumstances.
i) When original sanctioned estimate is exceeded or likely to exceed by more than 5%.

ii) When the expenditure on a work exceeds or likely to exceed the amount of administrative sanction by more than 10%

iii) When there are material deviation from the original proposal even though the cost may be met from sanctioned amount.

Q2.

PARTICULARS OF ITEMS & DETAILS OF WORK	NO.	LENGTH (m)	BREADTH (m)	HEIGHT (m).	QUANTITY.	
1) EARTHWORK IN EXCAVATION	1	37.2	0.9.	1.1.	36.83 m^3	$6.3\times3+5.3\times2=38.1$. $38.1-2\times\frac{0.9}{2}=37$
2) PCC Bed for foundation	1	37.2.	0.9.	0.2.	6.7 m^3	
3) SSM in CM 1:6	1	37.4	0.7	0.4	10.47.	$38.1-2\times\frac{0.7}{2}=$
	1	37.6.	0.5	0.5	9.4.	$38.1-2\times\frac{0.5}{2}$
	1	37.7	0.4	0.9.	13.57.	$38.1-2\times\frac{0.4}{2}$.
					33.44.	
4) BBM. in CM 1:6.	1	37.8	0.3	3	34.02	$38.1-2\times\frac{0.3}{2}$.
5) RCC 1:1.5:3 Roof slab	1	9.9	6.6	0.15	9.80.	6.6×9.9.

PARTICULARS OF ITEMS.	QUANTITY	UNIT	RATE	AMOUNT.
1) EARTHWORK IN EXCAVATION	36.83	m^3.	Rs.400/m^3	Rs. 14,732/-
2) PCC 1:4:8 BED FOR WALL FOUNDATN	6.7	m^3	Rs.3800/m^3	Rs. 25,460/-
3) SSM in CM 1:6	33.44	m^3	Rs.3000/m^3	Rs 1,00,320/-
4) I CLASS BBM in CM 1:6	34.02	m^3	Rs.5800/m^3	Rs.1,97,316/-
5) RCC 1:1.5:3 for ROOF SLAB	9.8	m^3	Rs.5500/m^3	Rs. 53,900/-
				Rs.3,91,728/-
ADD 5% (3% for contingencies & 2% for Workcharged Estblish)				Rs. 19,586/-
				Rs.4,11,314/-

Q3.

PARTICULARS OF ITEM OF WORK	NO.	LENGTH (m)	BREADTH (m)	HEIGHT (m)	QUANTITY	REMARKS.
1) EARTHWORK EXCAVATION	01	2.8	1.7	1.85	8.81	
2) PCC 1:3:6.						
a) FOUNDATION BED	2.8	1.7	0.2	0.95		
b) FLOOR	2	0.9	0.05	0.09		
				1.04		
3) BBM						
a) 1st STEP.	7	0.3	0.6	1.26		
b) 2nd STEP.	6.6	0.2	1.05	1.386		
				2.646.		
4) PLASTERING	1	5.8		1.6	9.28	

PARTICULARS OF ITEMS OF WORK	QUANTITY	UNIT	RATE	AMOUNT.
1) EARTHWORK EXCAVATION	8.81	m^3	Rs. 400/m^3	Rs 3,524/-
2) PCC 1:3:6	1.04	m^3	Rs. 4000/m^3	Rs. 4,160/-
3) I CLASS BW in CM 1:4	2.646	m^3	Rs. 6000/m^3	Rs. 15,876/-
4) 12 mm Thick PLASTER	9.28	m^2	Rs. 200/m^2	Rs. 1,856/-
5) TOTAL				Rs. 25,416/-
6) ADD 5% (3% for contingences & 2% Work charge).				Rs. 266.9/
7) GRAND TOTAL.				Rs. 26,686.9/

Q4.

CHAINAGE	RL of GL	RL of FL	DEPTH(m) FL − GL	AREA $A = Bd + Sd^2$ (m^2)	MEAN AREA Am	VOLUME (m^3) $V = Am \times L$
10	105m	107m	2m	28		
11	105.6	106.8	1.2	14.88	21.44	643.2
12	105.44	106.6	1.16	14.29	14.586	437.6
13	105.9	106.4	0.5	5.5	9.89	296.8
14	105.42	106.2	0.78	9.016	7.258	217.7
15	104.30	105.9	1.6	21.12	15.068	452.0
16	105.00	105.6	0.6	6.72	13.92	417.6
17	104.1	105.3	1.2	14.88	10.8	324.0
18	104.62	105	0.38	4.088	9.485	284.6
19	104.00	104.7	0.7	7.98	6.035	181.1
20	103.3	104.4	1.1	13.42	10.7	321
					TOTAL :-	3575.6 m^3

PARTICULARS OF ITEM	QUANTITY	UNIT	RATE	AMOUNT
FILLING IN EARTHWORK	3576	m^3	Rs. 250/m^3	Rs. 8,94,000/-
ADD 5% (3% Contigencies & 2% Work charge Establishment)				Rs. 44,000/-
			GRAND TOTAL	Rs. 9,38,700/-

Q5.a. Specification specifies or describes the nature and the class of the work, materials to be used in the work, workmanship, etc & is very important for the execution of the work.

The objectives of writing specifications are

i) The cost of an unit quantity of work is governed by its specification.

ii) Specification serves as a guide to the supervising staff. of the contractor as well as to the owner to execute the work to their entire satisfaction.

iii) A work is carried out according to its specification & the contractor is paid for the same.

iv) Specification is necessary to specify the equipments, tools and plants to be engaged for work.

v) Specification specifies the workmanship & the method of doing the work.

vi) Specification is an essential contract document & is required for arbitration or court cases.

Q5.b. The significances of MS Excel in estimation are

i) It reduces human errors through built in formulas & functions

ii) It automates repetitive calculations like quantities & totals.

iii) It helps arrange data clearly in tables, making large datasets easier to read & analyze.

iv) It allows creation of reusable templates for different estimation projects.

v) Templates can be easily modified for changes in design & scope

vi) Data can be imported/exported to & from softwares like AutoCAD or project management softwares.

vii) It facilitates linking of quantity sheets with project schedules & (cost) data

viii) It uses charts, graphs & pivot tables to present data visually.

ix) It enables tracking of actual vs estimated costs.

x) It supports cash flow analysis & forecasting.

Q6. BED CONCRETE FOR FOUNDATION WITH M7.5 CC SPECIFICATION.

Materials:- Cement, Fine aggregate, Coarse aggregate, water.

Mix Proportion:- Common mix (1:3:6) by volume

Preparation:-
Remove all loose soil, roots & organic matter from the foundation trench.
Compact the bottom surface before placing concrete

Laying & Compaction
Place concrete immediately after mixing
Spread evenly & compact thoroughly by hand ramming or vibrator
Top surface should be finished smooth & leveled.
Curing must be done at least for 7 days.

SIZE STONE MASONRY FOR FOUNDATION in CM 1:6
Materials:- Cement, Sand, Stones, water.

Mortar Mix:-
Proportion by volume: 1C: 6S, Mix on clean platform until uniform colour & consistency is achieved.
Use mortar within 30 minutes after adding water.

Construction
Stones shall be hammer dressed to ensure proper contact.
Length of stone in the face shall not be less than its height
Lay stones in regular courses, breaking vertical joints.

Joints & Bonds
Thickness of joint is usually around 10-20mm.
Fully fill joints with mortar, no dry packing.
Rake joints on exposed faces to depth of 10mm for plaster
Curing must be done atleast for 7 days.

iii) PLASTERING 20mm thick in CM 1:4.

Materials :- Cement (OPC), Sand (River sand), water (potable)

Preparation of Surface.

The plastering shall be carried out after masonry joints are soaked out & well watered. To ensure uniform thickness. narrow strips of about 10 cm wide ~~Narrow~~ plaster shall be applied first.

Then gaps between such strips shall be immediately filled by mortar.

Proportion

1 part cement to 6 parts of sand by volume.

Application.

First coat of plaster shall be uniformly applied after applying water. Thickness of first coat shall be not less than 12mm & cured for 7 days.

Finish :-

Second coat shall be started at least 7 days & should be 8mm thick.

iv) POINTING in CM 1:3.

Materials :- Cement (OPC), ~~Sand~~ Sand (River sand), water (potable)

Preparation :-

Rake out joints to a depth 10-20mm

Remove dust, loose mortar & debris from joint

Dampen the surface lightly before application

Application

Fill mortar into the prepared joints with a small trowel.

Finish the surface as specified.

Q7.a. Rate Analysis is the process of calculating the unit cost of an item of work by systematically determining & summing up the cost of all its components: Materials, Labour, Equipment & Overheads & contractor's profit.

The purpose of rate analysis are.

i) To determine the unit cost of work

ii) It is essential for preparation of detailed estimate and tenders.

iii) It helps identify how much of cost is due to materials labour, tools & plants and overhead & profits.

iv) for works not covered in SR, RA provides a logical way to arrive at fair rates.

v) It helps in comparing different construction methods or materials based on cost.

vi) It provides reliable data to forecast cash flow & resource needs.

vii) It is used to check & justify contractor's claims or variations during execution.

Q7.b. RATE ANALYSIS FOR RCC for SLAB & BEAM in CC 1:1.5:3 & steel 1.2%.

Calculation of material per 10cum.

Mix proportion = 1+1.5+3 = 5.5.

Cement = $\frac{15.4}{5.5}$ = 2.8cum Sand = 1.5×2.8 = 4.2cum

Coarse aggregate = 3×2.8 = 8.4cum.

Steel = 1.2% of 10cum = $\frac{1.2}{100} \times 10 = 0.12\text{cum} \times 7850 \frac{\text{kg}}{\text{cum.}} = 942\text{kg}$

Cement = $\frac{2.8}{0.0347}$ = 81 bags

Sl.No.	Particulars	Quantity	Rate (Rs)	Amount (Rs)
1)	CA.	8.4	1600	13400.
	Sand.	4.2	2900.	12180.
	Cement.	81 bags.	400.	32400.
	Steel.	942 kg.	75.	70650.
	Scaffolding.	—	—	5000.
	Head Mason.	1	800	800.
	Mason.	3	700	2100.
	Mazdoor.	18	600	10800.
	Bhisti	4.	500.	2000
				1,47,530
			Water charges (1%)	1475.3.
				1,49,005.3
			Profit & Overhead	14900.
			GRAND TOTAL.	1,63,906/-

Q8. i) ASHLAR MASONRY FOR FOUNDATION in CM 1:6.

Take 10cum.

Ashlar stone = 12.5cum.

Volume of Dry mortar = 4cum.

Cement = $\frac{4}{1+6}$ = 0.57cum = 17 bags.

Sand = 0.57 × 6 = 3.4cum.

Sl.No	Particulars	Quantity.	Rate (Rs)	Amount (Rs.)
	Materials.			
1)	Stone.	12.5.	2200/m³	27,500.
	Cement.	17 bags	400/bag	6,800.
	Sand.	3.4cum.	2900/m³	9,860.
2)	Labour.			
	Head Mason.	1/3	800.	267.
	Mason.	13	700	9100.
	Mazdoor.	18	600	10800.
	Bhisti.	02.	500.	1000
			Total.	66,027.
			Water charge (1%)	660
				66687.
			Profit & Overhead (10%)	6668.7
			Grand Total	73355.7.

ii) BBM for SUPER STRUCTURE in CM 1:6.

Take 10cum.

No of Bricks having size 10cm×10cm×20cm with mortar.

$= \frac{10}{0.1 \times 0.1 \times 0.2}$ = 5000 Nos.

Size of Brick w/o mortar = 9cm × 9cm × 19cm.

∴ Volume of mortar = $10 - 5000 \times (0.09 \times 0.09 \times 0.19) = 2.3$cum.

Add 15% extra for frog filling.

∴ Volume of wet mortar = 2.3 + 15% = 2.64cum.

Volume of Dry mortar = 2.64 + 33% = 3.5cum.

Cement = $\frac{3.5}{1+6}$ = 0.5cum = 15 bags.

Sand = 0.5 × 6 = 3cum.

Sl.No.	Particular.	Quantity.	Rate(Rs).	
1	Materials.			
	Cement.	15 Bags	400	6,000.
	Sand.	3cum.	2900.	8,700.
	Bricks.	5000 Nos.	6	30,000.
2	Labour			
	Head Mason	0.5	800	400.
	Mason.	9.	700	6,300.
	Mazdoor	18	600	10,800
	Bhisti.	2.	500.	1,000.
				57,800.
				578
				58,378.
				5,837.8
				64,215.8

Q9.a. A contract is an agreement enforceably by law made between 2 or more competant parties to do or not to do a particular act.

The essentials of a contract are

i) offer Letter and Acceptance letter by employer & contractor respectively.

ii) Both parties intend to create binding obligations like timely completion, quality etc.

iii) Payment agreed in return for execution of work.

iv) Contractor must be legally registered & competent client must be authorized entity.

v) Agreement must include Detailed Specification & drawi

vi) It should also include Bill of Quantities (BOQ).

vii) It should have time schedules & milestones.

viii) It should include Penalties for delay (liquidated damages).

ix) It should also have payment terms & rates.

Q9.b. Tender documents are a set of paper prepared & issued by the client inviting bids from contractors to execute specific construction works.

They form the legal & technical basis for the contract & helps ensure clarity, fairness & transparency in the bidding process.

Tender documents typically include.

1) Notice to Tender
2) Instruction to Bidders.
3) Form of Tender
4) General Conditions.
5) Special Conditions
6) Technical specification.
7) Drawings
8) Bill of Quantities (BOQ). etc.

The purpose of the tender document is to clearly define scope, quality standards & conditio To enable fair & competitive bidding.

EARNEST MONEY DEPOSIT.

is a security amount. that must be submitted by each bidder along with their tender.

The purpose of EMD is ensure only serious and financially capable contractors participate. & to protect client against withdrawal or modification of bids by the bidder during the tender validity period.

Usually it is calculated as a small percentage of the estimated cost (1-2%).

It is paid usually through bank draft, pay order demand draft or bank guarantee.

If contractor withdraws or alters the bid during validity, the EMD is forfeited.

For unsuccessful bidders, EMD is refunded after finalization of tender.

For successful bidder, EMD is usually adjusted against the performance SD. or retained until execution of the agreement.

Q10. ADMINISTRATIVE APPROVAL & TECHNICAL SANCTION.

For every work initiated by or connected with the requirements of another department, it is first necessary to obtain the concurrance of the department concerned to the proposal.

The formal acceptance by the dept. concern is termed "administrative approval" of the work & is in effect an order to execute certain specified works at a stated sum to meet the administrative needs of the department acquiring the work.

Such approval should not however be accorded until the professional authorities have intimated that the proposals are sufficiently correct for the purpose.

In case of works required to meet the administrative needs of PWD, administrative approval should be accorded in that department.

NOMINAL MUSTER ROLL.

A nominal musted roll is an official register or record maintained at a construction site record the daily attendance & payment of labourers employed on a project.

The purpose of nominal musted roll is

i) to keep authentic records of daily wage labourers employed on site.
ii) To calculate wages payable. based on actual attendance.
iii) To ensure transparency & accountability in expenditure.
iv) It acts as supporting document for bill payment.

SECURITY DEPOSITY. (SD)

It is an amount retained by employer from the contractor as an financial guarantee to ensure proper performance, faithful execution & completion of the contract as per terms, specification & within stipulated time.

It acts as safeguard for employer against default by the contractor, substandard work & non-fulfillment of contractual obligations.

The purpose of SD is to protect clients interest if contractor fails to complete the work or rectify defect & to ensure that the contractor executes the work faithfully & makes good any defects during maintannie period & does not violate contract conditions.

RUNNING BILLS.

Running bills are interim payment bills prepared and submitted by the contractor to the client during the progress of work to claim payment for the part of work executed & measured upto a certain date.

They help contractors recieve payments progressively instead of waiting untill the entire project is completed.

The purpose of Running bills is to maintain the cash flow for the contractor during construction. To pay for work actually completed & measured so far. To reduce financial burden on the contractor & keep the project moving.

(HARSHAVARDHAN.V.S).

HOD

(Dr. G Hatti)