SCHEME & SOLUTION 10CV73.

Part B

2 a. **DIFFERENT TYPES OF ESTIMATE:**

- Preliminary estimate or approximate estimate or Abstract estimate or Rough cost estimate.
- Plinth Area estimate
- Cube Rate estimate
- Approximate Quantity method estimate
- Detailed estimate or Item rate estimate
- Revised estimate
- Supplementary estimate
- Supplementary & Revised estimate
- Annual repair & Maintenance estimate

PRELIMINARY ESTIMATE OR APPROXIMATE ESTIMATE OR ABSTRACT ESTIMATE OR ROUGH COST ESTIMATE:

This is an approximate estimate that is made to find out an approximate cost in short time and thus enable to consider the financial aspects of the project for sanction of the same. It is prepared from practical Knowledge and comparing the cost of similar works.

PLINTH AREA ESTIMATE:

In this method, the plinth area is calculated by taking the external dimensions of the structure at the plinth level. Courtyards and other open areas should not be included in the plinth area. After calculating the plinth area, the plinth area is multiplied by the plinth area cost to get the plinth

CUBE RATE ESTIMATE:

This estimate is prepared on the basis of the cubical contents of the building. The cube rate is determined from the cost of a similar building having similar specifications and construction in the locality. The length, breadth and depth are then multiplied to find the cubical contents of the building and then multiplied by the cube rate.

APPROXIMATE QUANTITY METHOD ESTIMATE:

In this method, the approximate total length of the walls is found in running meter and the total length of the walls is multiplied by the rate per running meter of the wall which gives a fairly accurate cost. For this method, the plan or line plan of the structure should be available.

DETAILED ESTIMATE OR ITEM RATE ESTIMATE:

It is an accurate estimate and consists of working out the quantities of each item of work and finding out the cost. The detailed estimate is calculated in two stages:

- **QUANTIFICATION**

Sl No.	Description of work	No	L	B	D	Unit	Qty	Total

- **ABSTRACT**

Sl No.	Description of work	Qty	Unit	Rate	Amount

The rates for different items of work are taken from the Schedule of rates or from the rate analysis. A 3% addition is added for unforeseen expenditures and another 2% is added to meet the work charges and establishment expenses. The grand total thus obtained is the final estimated cost of the work. A detailed estimate is always to be accompanied by (a) Report (b) Specification (c) Detailed drawings containing plan, section, elevation, design and other calculations (e) Basis of rates adapted in the estimate.

This estimate is usually prepared for administrative approval and technical sanction and also for the execution of a contract with the contractor.

REVISED ESTIMATE:

This estimate is prepared under any one of the following circumstances:

- When the original sanctioned estimate exceeds or is likely to exceed by more than 5%.
- When the expenditure on a work exceeds or is likely to exceed the amount of administrative approval and technical sanction by more than 10%.
- When there is a material deviation from the original proposal but not due to material deviation of structural nature.
- When it is found that the sanctioned estimate is more than actual estimate requirement.

SUPPLEMENTARY ESTIMATE:

It is a detailed estimate and is prepared when additional works are required to supplement the original works or when further development is required during the progress of the work. The

abstract should show the amount of the original estimate and the total amount including the supplementary amount for which the sanction is required.

SUPPLEMENTARY AND REVISED ESTIMATE:

This estimate is prepared when it is required to revise the original estimate due to the increased volume of work as well as additional works are included. For such a case, a revised estimate is prepared for the increased volume of work and a detailed estimate for the supplementary works not included in the original schedule. The total amount of revised estimate includes the amount for supplementary works also.

ANNUAL REPAIR & MAINTENANCE ESTIMATE:

It is a detailed estimate which is prepared to maintain the structure in proper order and in safe condition. For a building, this includes whitewashing, color washing, painting, minor repairs etc. For road works, this includes patch repairing, renewal works, repair of bridges, culverts etc.

2 b. **Cost of Materials:** The cost of a material includes (i) raw material cost (ii) Transport of raw material cost (iii) Manufacturing cost (iv) Labour cost (v) cost F.O.B on site.

The final cost of material = Sum of (i) + (ii) + (iii) + (iv) + (v).

3. QUANTITY ESTIMATE:

Sl. No	Description of work	No	L (m)	B (m)	D (m)	Unit	Qty	Total
1.	Earth work excavation							
	(a) Septic tank	1	2.80	1.70	1.95	Cu.m	9.28	
	(b) Soak pit	1	$(0.7854)*2.00^2$		3.00	Cu.m	9.42	
	(c) Soak pit (lower portion)	1	$(0.7854)*1.40^2$		0.20	Cu.m	0.31	19.01
2.	CC1:3:6 works							
	(a) Foundation	1	2.80	1.70	0.20	Cu.m	0.95	
.	(b) Floor	1	2.00	0.90	0.05	Cu.m	0.09	1.04
3.	First class brick masonry in CM 1:4							
	(a) Long walls step 1	2	2.60	0.30	0.60	Cu.m	0.94	
	(b) Short walls step 1	2	0.90	0.30	0.60	Cu.m	0.32	
	(c) Long walls step 2	2	2.40	0.20	1.15	Cu.m	1.10	
	(d) Short walls step 2	2	0.90	0.20	1.15	Cu.m	0.41	2.77
4.	Plastering with CM 1:4 for inside							
	(i) Inside walls only	1	5.80		1.70	Sq.m	9.86	
	(ii) Baffle wall	1	0.90		0.98	Sq.m	0.88	10.74
5.	CC 1:2:4 Flooring	1	2.00	0.90		Sq.m	1.80	1.80

4. a) Bricks shall be of standard specification, regular shape and size with sharp edges and corners.

- Bricks shall have an average compressive strength of 1 to 1.25 MPa.
- Mortar shall be prepared by mixing cement and sand in specified proportion. Cement is taken as 0.035 Cu.m per bag of 50 Kg and sand in the specified proportion shall be measured in Farma boxes 35x25x40 cm size and on the basis of dry volume.
- All bricks shall be soaked for at least 4 hours in water by submerging them in clean water before use.
- Laying shall be in English bond unless specifically mentioned. A layer of mortar not less than 1.2mm shall be spread on full width over a suitable length of the lower course. Each brick shall be properly bedded with frog up and set in position by gently tapping with the handle of trowel or by wooden mallet. Its inside faces shall be buttered with mortar before the next brick is laid and pressed against it. On completion of a course, all vertical joints shall be fully filled from the top with mortar. Half or cut bricks shall not be used except where necessary to complete the bond. No damaged or broken bricks shall be used. The brickwork shall be true to line, plumb and all vertical joints shall be truly vertical. Thickness of the brick course shall be uniform. The work done per day should not be more than 1 meter high. Raking back to bond shall be at an angle not steeper than 45 degrees. All iron fixtures, pipes, outlets of water, holdfasts of doors and windows which are required to be built in walls shall be embedded in mortar or concrete as specified in their correct position as per directions as the work proceeds.
- Bricks shall be so laid that all the joints are full of mortar with thickness of the mortar joints not exceeding 10mm.
- 4 b. Coarse aggregate shall be stone chips well graded from 12mm down, free from dust, dirt etc. hard and rough. Sand shall be coarse 5mm maximum size, clean, free from dirt etc. Cement used shall be fresh Portland cement. All the materials stated above and water shall comply with the standard specifications.
- The sub grade shall be provided with slopes required for roofing. Flooring in veranda, h, kitchen, bath, water closet and courtyard etc. shall invariably be provided with suitable slope to drain off waste and rainwater.
- The sub grade course shall be CC1:4:8, 40mm thick rammed and compacted hard. It shall be allowed to set for 7 days and flooring shall be laid in the next 3 days. In all the cases, the sub grade shall be wetted with a coat of cement slurry@ 2kg of cement spread over an area of 1 Sq.m so as to get a good bond between the concrete and the subgrade floor.
- CC 1:2:4 is mixed wherein the mixing of concrete shall be done by hand or a mechanical mixer. Water at the rate of 32 liters as per the water-cement ratio shall be added slowly and gradually to mix the concrete wet and to have a uniform plastic mix. The mixture shall have a slump of not more than 40mm. Concrete for only one panel shall be mixed at one lot.

- Flooring of specified thickness shall be laid in the pattern as given in the drawings or as directed by the engineer in charge. The panel shall be of uniform size and no dimension of a panel shall exceed 2m and the area of the panels shall not be more than 2 Sq.m. The whole operation of laying in one panel shall be completed within 30 minutes. The whole of flooring is done in one operation using a glass or plain asbestos sheet strips at the junction of two panels. The freshly cast panels are then allowed to set for 24 hours. The surface shall be left for sometime till the moisture disappears from it.

- Water proofing compound is then taken at the rate of 2kg per bag of cement and is then mixed with cement in dry condition thoroughly. The dry mixture is then added with 30 kg of water and mixed thoroughly to prepare cement slurry. It is then applied over the set panels of concrete with a brush in 2 to 3 coats properly pressed and finished smooth spread over an area of 1Sq.m of flooring while the concrete is still green. The men engaged in the finishing operations shall be provided with a wooden platform to sit upon so as to prevent damage to new work.

- Curing shall be done for a minimum period of 10days and shall not be recommended be until the top layer has hardened. Covering with empty gunny bags should be avoided as the color is likely to be bleached with the remains of cement matter from the bags.

- 4. c. The distemper shall be of the color as specially mentioned and shall be thoroughly mixed with the quantity of water as prescribed by the manufacturer. Only the required quantity (generally 12kg.per 100 Sq.m for the first coatand7.50 kg.per 100 Sq.m for the subsequent coats) shall be mixed at a time as required for the day's work. It shall be well stirred before and during use to maintain even consistency.

- Surface preparation is achieved by ensuring that the new plastered surface is thoroughly brushed free from mortar droppings and other foreign matter and rubbed with sand paper. Before distempering, efflorescence if any shall be wiped out and cleaned with a clean cloth. New plastered surface shall be allowed to dry up before any operation for distempering and the surface shall be washed with a solution of 1kg zinc sulfate mixed in 10 liter of water. The washed surface is allowed to dry up.

- In case of old works, all loose pieces, scales etc. shall be removed by rubbing with sand paper. The surface shall be cleaned of all grease, dirt, etc. Pits in plastering shall be made good with Plaster of Paris (POP) and mixed with dry distemper of the color to be used. The surface shall be then rubbed down again with a fine sand paper and finished smooth. A coat of the distemper shall be then applied over the patches. The prepared surface shall be allowed to dry thoroughly before the application of the regular coat.

- Application is made such that it is not applied in hot weather. It shall be applied with proper distemper brushes and not with white wash brushes, first horizontally and then immediately crossed off vertically which together shall constitute one coat.

- The subsequent coats shall be applied only after the previous coat has dried. The finished surface shall be even and uniform and shall not show any brush marks. The application of a coat in each room shall be finished in one single operation and no work shall be

started in any room which cannot be completed on the same day. At the end of the day's work, the brush shall be washed with hot water and kept dry.

- 4.d. Before the earth work is started, the whole area where the work is to be done shall be cleaned of grass, roots of trees and other organic matter.
- It shall be carried out exactly in accordance to the dimensions of the drawings or such other dimensions as the engineer in charge may decide.
- Sides of trenches shall be vertical and its bottom perfectly leveled both longitudinally and transversely.
- During excavation, if rock or rocky soil is found, they shall be leveled as far as possible and the small spaces which are difficult to fill shall be filled with concrete.
- If the excavation is in earth, the bottom of the trenches shall be sprinkled with a little water and rammed.
- No material excavated from the foundation trenches shall be placed nearer than 1 meter to the outer edges of the foundation.
- Water in trenches must be bailed out or pumped out and where it is apprehended that the sides may fall down, arrangements shall be made for adequate timber shoring.
- When it is specified that the work is to be carried out without removing the pipes, cables, sewers etc. all of them shall be temporarily shored and saved from any damage.
- Materials and valuables found during excavation shall be the property of the Government.
- The cost of all materials and labor required for fencing in and protection against risk due to accidents during open excavation shall be provided.

5. a) **We consider 10 Cu.m for analysis**.

Sl No.	Description of work	Qty	Unit	Rate per Unit(Rs)	Amount (Rs)
1	**Materials only**				
	a) Cement	44	Bags	Rs 450	Rs 19800.00
	b) Sand (FA)	4.59	Cu.m	Rs 2600	Rs 11934.00
	c) Coarse Agg (CA)	9.18	Cu.m	Rs 1800	Rs 16524.00
2.	**Labor only:**				
	a) Head Mason	0.25	No	Rs 500	Rs 125.00
	b) Mason	2.00	No	Rs 500	Rs 1000.00
	c) Mazdoor	10.00	No	Rs 300	Rs 3000.00
	d) Bhisti	2.00	No	Rs 250	Rs 500.00
				Total	Rs 52883.00
			Water Charges @1% of the total		Rs 528.83
			Profits and overheads @ 10% of the Total		Rs 5288.30
				Grand Total	Rs 58700.13

Rate per Cu.m = (Rs 58700.13/10) = Rs 5870.01 = Rs 5870.

5. b. We consider 10 Cu.m for analysis. **Standard size of 1 brick is 20x10x10cm.**

Calculation of Materials:

Number of bricks $= \dfrac{10}{(0.2*0.1*0.1)} = \mathbf{5000}$ No.

Volume of bricks without mortar = 5000x0.19x0.09x0.09 = 7.70 Cu.m

Volume of wet mortar = 10.00 – 7.70 = 2.30 Cu.m

Add 35% extra to wet mortar in order to get volume of dry mortar.

Volume of dry mortar = 1.45(2.30) = 3.34 Cu.m

Sum of proportions = 1+4 = 5

Cement $= \dfrac{3.34}{1+4} = \dfrac{3.34}{5} = 0.67$ **Cu.m** $= \dfrac{0.67}{0.035} = 19.06$ **bags = 19 bags**

Sand $= (4)\left(\dfrac{3.34}{1+4}\right) = 4*\dfrac{3.34}{5} = 2.67$**Cu.m.**

Sl No.	Description of work	Qty	Unit	Rate per Unit(Rs)	Amount (Rs)
1	**Materials only**				
	a) Cement	19	Bags	Rs 450	Rs 8550.00
	b) Sand (FA)	2.67	Cu.m	Rs 2600	Rs 6942.00
	c) Bricks	5000	No	Rs 7	Rs 35000.00
	d) Contingencies			Lumpsum	Rs 3000.00
2.	**Labor only:**				
	a) Head Mason	0.50	No	Rs 500	Rs 250.00
	b) **Mason**	8.00	No	Rs 500	Rs 4000.00
	c) **Mazdoor**	15.00	No	Rs 300	Rs 4500.00
	d) **Bhisti**	2.00	No	Rs 250	Rs 500.00
				Total	Rs 62742.00
				Water Charges @1% of the total	Rs 627.42
				Profits and overheads @ 10% of the Total	Rs 6274.42
				Grand Total	Rs 69643.84

Rate per Cu.m = (Rs 69643.84/10) = Rs 6964.38 = Rs 6964.

5 c. We consider 100 Sq.m of area for analysis.

Volume of wet mortar = Area x thickness = 100 x 0.12 = 1.20 Cu.m

Add 20% extra for filling up the joints, undulations, wastages etc.

Therefore, Volume of wet mortar = 1.20 x1.20 = 1.44 Cu.m

For volume of dry mortar, add 30% extra.

Volume of dry mortar = 1.30 x 1.44 = 1.87 Cu.m

Sum of Proportions = 1+6 =7

$$\textbf{Cement} = \frac{1.87}{1+6} = \frac{1.87}{7} = \textbf{0.27 Cu.m} = \frac{0.27}{0.035} = \textbf{7.63 bags} = \textbf{8 bags}$$

$$\textbf{Sand} = (3)\left(\frac{1.87}{1+6}\right) = 6 * \frac{1.87}{7} = \textbf{1.62 Cu.m.}$$

Sl No.	Description of work	Qty	Unit	Rate per Unit(Rs)	Amount (Rs)
1	**Materials only**				
	a) Cement	8	Bags	Rs 450	Rs 3600.00
	b) Sand (FA)	1.62	Cu.m	Rs 2600	Rs 4212.00
	c) Contingencies			Lumpsum	Rs 800.00
2.	**Labor only:**				
	a) Head Mason	0.50	No	Rs 500	Rs 250.00
	b) **Mason**	10.00	No	Rs 500	Rs 5000.00
	c) **Mazdoor**	15.00	No	Rs 300	Rs4500.00
	d) **Bhisti**	3	No	Rs 250	Rs750.00
				Total	Rs 19112.00
			Water Charges @1% of the total		Rs 191.12
		Profits and overheads @ 10% of the Total			Rs 1911.20
				Grand Total	Rs 21214.32

Rate per Sq.m = (Rs 21214.32/100) = Rs 212.14 = Rs 212.

5 d. **We consider 100 Sq.m of area for analysis.**

Volume of Concrete = Area x thickness = 100 x 0.025 = 2.50 Cu.m

Add 10% extra for unevenness of base concrete = 1.10 x 2.50 = 2.75 Cu.m

Add 45% extra for dry volume, Volume of concrete in dry condition = 1.45 x 2.75 = 3.99 Cu.m

Sum of proportions = 1+2+4 =7

$$\textbf{Cement} = \frac{3.99}{1+2+4} = \frac{3.99}{7} = \textbf{0.57 Cu.m} = \frac{0.57}{0.035} = \textbf{16.28 bags} = \textbf{17 bags}$$

Sl No.	Description of work	Qty	Unit	Rate per Unit(Rs)	Amount (Rs)
1	**Materials only**				
	a) Cement for flooring	17	Bags	Rs 450	Rs 7650.00
	b) Cement for finishing	7	Bags	Rs 450	Rs 3150.00
	c) Sand (Coarse)	1.14	Cu.m	Rs 2600	Rs 2964.00

	d) Stone chips 12.5mm and down size	2.28	Cu.m	Rs 800	Rs 1824.00
	e) Contingencies			Lump sum	Rs 1000.00
2.	**Labor only:**				
	a) Head Mason	0.50	No	Rs 500	Rs 250.00
	b) **Mason**	10.00	No	Rs 500	Rs5000.00
	c) **Mazdoor**	12.00	No	Rs 300	Rs3600.00
	d) **Bhisti**	2.00	No	Rs 250	Rs 500.00
				Total	Rs 25938.00
			Water Charges @1% of the total		Rs 259.38
			Profits and overheads @ 10% of the Total		Rs 2593.80
				Grand Total	Rs 28791.18

Rate per Sq.m = (Rs 28791.98/100) = Rs 287.91 = Rs 288.

6. BY MID SECTION AREA METHOD:

Rl of FL = 101.00m.Rising gradient of 1 in 400.

Incremental increase $= \left(\frac{1}{400}\right) 40 = 0.10\text{m}$

Chainage (m)	0	40	80	120	160	200	240	280
RL of GL (m)	100.60	100.20	99.80	100.20	100.80	101.90	102.40	102.50
RL of FL (m)	101.00	101.10	101.20	101.30	101.40	101.50	101.60	101.70
Depth of fill (m)	0.40	0.90	1.40	1.10	0.60			
Depth of cut (m)						0.40	0.80	0.80

B = 10m, S=2 for banking, S=1.50 for cutting								
Sl No	Dist(m)	Depth (d) in m	Mean depth(d_m) in m	$B(d_m)$ In Sq.m	$S(dm)^2$ In Sq.m	$B(d_m) + S(dm)^2$ In Sq.m	L (m)	Vol = $(B(d_m) + S(dm)^2)L$ In Cu.m
								In Filling	In Cutting
1	0	0.40	0.00	0.00	0.00	0.00	0		
2	40	0.90	0.65	6.50	0.85	7.35	40	293.80	
3	80	1.40	1.15	11.50	2.65	14.15	40	565.80	
4	120	1.10	1.25	12.50	3.13	15.63	40	625.00	
5	160	0.60	0.85	8.50	1.45	9.95	40	397.80	
6	184	0.00	0.30	3.00	0.18	3.18	24	76.32	
7	200	0.40	0.20	2.00	0.06	2.06	16		32.96
8	240	0.80	0.60	6.00	0.54	6.54	40		261.60

9	280	0.80	0.80	8.00	0.96	8.96	40		358.40
								1958.72	652.96

7 a. **EARNEST MONEY DEPOSIT (EMD):**

When the contractor submits his tender for the work, he has to deposit a certain amount of money which is usually about 2% of the estimated cost of the project as a guarantee of the tender. This deposit is taken to ascertain the earnestness of the contractor to do the work. This amount also acts as a check on the contractor so that he does not refuse to accept the work or run away when the tender is accepted.

If the contractor does not undertake to do the work after his tender is accepted, then his EMD will not be returned to him. The EMD of all other contractors whose tenders have been refused will be returned to the respective contractors. The EMD can be accepted in the form of cash or Government securities and should be submitted to the department.

SECURITY DEPOSIT (SD):

Once the tender is accepted, the contractor has to deposit 10% of the tendered amount as security to the department. This amount includes the EMD already deposited. This amount acts as a check so that the contractor fulfills all the terms and conditions of the contract and carries out all the works and completes them satisfactorily as per the specifications within the specified time.

If the contractor fails to satisfy the terms and conditions of the agreement, the complete amount of the security deposit or part of it may be forfeited by the owner. However, if the contractor completes the work satisfactorily, as per the terms and conditions of the contract, within the specified time, the security deposit will be refunded to the contractor. Instead of collecting the entire amount of security deposit in one instalment before the start of the work, this amount may be collected gradually from the running account bill of the contractor.

7 b. **TECHNICAL SANCTION:**

It is the sanction of the detailed estimate, design quantities, design calculation of works, rate and cost of the work by the competent authority of the engineering department. After the technical sanction of the estimate is given, then only the project is taken up for execution. This sanction guarantee that the proposals are structurally sound and the estimate is accurately calculated based on adequate data.

7 c. **MEASUREMENT BOOK:**

It is an initial record of all the works that are susceptible to measurements. A typical form of the measurement book is shown below:

PROCEDURE FOR RECORDING THE MEASUREMENT BOOK:

- The measurement has to be recorded by the site engineer to whom the MB has been issued.
- The measurement of works should be taken accurately and recorded differently for different items of work in different columns.
- All measurements are to be taken in a steel or metallic tape and entered in ink directly into the MB at the site itself.
- For material supplied, the quantities supplied and received are measured by counting or weighing and recorded in the MB.
- Copying of the MB from a notebook must be avoided.
- Erasing or reentering is not allowed.
- When any measurement is cancelled, the cancellation must be duly attested by the site engineer and the reasons must be entered in the remarks column.
- All the measurements must be done continuously without leaving a blank page. If a blank page is left out by mistake, then that page must be cancelled by drawing diagonal lines attested with dated initials.
- Each MB must be provided with an index and must be kept up to date.
- The person recording the measurements must put his signature at the end of the measurements book thereby certifying "measured by me".

7d. Method of valuation: **The contractor's method of valuation is not as well-known as some of the other commercial property valuation techniques that are more commonly used to determine property values.**

In fact, very few property investors are aware that there is such a thing as a contractor's valuation approach… however under certain circumstances it can be a particularly helpful commercial property valuation tool where other methods fail to deliver.

Generally however, the most common commercial property valuation techniques include the comparison method, the residual and profit technique, and the investment method; with most of these used to help property investors and developers calculate commercial property values prior to a purchase, investment appraisal or similar activity.