T.Y. Diploma : Sem. V
[CE/CR/CS/CV]

Estimating and Costing

Time: 4 Hrs.] Prelim Question Paper Solution **[Marks : 100**

Q.1(a)Attempt any THREE of the following : [12]

Q.1(a)(i)What is estimating & costing and state two purpose of estimating & costing. [4]

Ans.: Estimating: It is the process of calculating the quantities and costs of various items required for satisfactory completion of the work.

Costing: The process of Calculating the actual cost of work before its execution is called as 'Costing'.

Purposes of estimating:

- To know the approximate cost of proposed work.
- To obtain administrative approval and technical sanction.
- To know the requirement of tools, plants and equipment.
- To fix up the completion period.
- To draw up a construction schedule and programme.
- To invite tender for execution of work.
- To keep control over expenditure during construction.

Purpose of Costing:

- To arrange the finance for proposed work.
- To know the probable cost of project before the execution.
- For valuation of existing property
- To know the cost of various items, well in advance, to be constructed

Q.1(a)(ii) Differentiate between Revised and Supplementary estimate. [4]

Ans.:

Revised estimate	Supplementary estimate
Prepared when there is change of rate or quantity of materials or Major addition/alterations are introduced in original work	Prepared when additional work is required to supplement the original work during the progress of work
When the original sanctioned estimate is likely to exceed by more than 5% or When the expenditure on a work exceeds or likely to exceeds the amount of administrative sanctioned by more than 10%	The fresh detailed estimate of additional work is prepared in addition to the original estimate
Abstract sheet of original estimate need to be changed due to change in the rates or quantity of the item	The abstract sheet should show the amount of original estimate & the total amount including the supplementary amount, for which sanction is required.

Q.1(a)(iii) State the modes of measurement for following item of work: [4]

(1) Skirting (2) Expansion joint

(3) Dado (4) Brick wall (100 mm thick)

Ans.:

Skirting	- Rmt (for less than 30 cm height) or Sq.m (for more than 30 cm height)
Expansion joint	- Rmt
Dado	- Sq.m
Brick wall (100 mm thick)	- Sq.m

Q.1(a)(iv) State the rules of desired accuracy in taking measurement as per IS1200. [4]

Ans.: Desired Accuracy in taking measurements:

To achieve the desired accuracy in measurements, following points must be observed.

1) Dimensions shall be measured to the nearest 0.01m except
a) Thickness of slab measured nearest to 0.005m
b) Wood work is to be measured nearest to 0.002m
c) Reinforcement, to the nearest 0.005m
d) Thickness of roadwork less than 200mm, is measured nearest to 0.005m.

The tolerances in measurements are

a) For volumes ----- 0.01 cu.m
b) For areas ---------- 0.01 sq.m
c) For lengths ---------- 0.01 rmt
d) For weights ---------- 0.001 ton or 1kg.

Fraction less than one half is neglected.

Fraction equal to one half or more than one half is considered as one.

Q.1(b) Attempt any ONE of the following : [6]

Q.1(b)(i)List different types of detailed estimate. [6]

Ans.: 1) Fresh/New Detailed Estimate.
2) Revised Estimate.
3) Supplementary Estimate
4) Revised & Supplementary Estimate.
5) Maintenance & Repair Estimate.

Q.1(b)(ii) What is bar bending schedule? State any two advantages of preparing bar bending schedule. [6]

Ans.: Bar bending schedule - It is a list of reinforcement bars in a tabular form, prepared for all types of R.C.C. Members.

Sr. No.	Particulars of bar	Shape	Dia (∅)	No.	Length (m)	Total Length (m)	Wt. (kg/m)	Total Wt. (kg)

Advantages of Bar Bending Schedule

1) Helps to convert the diameter vise measured length of reinforcement in terms of weight.
2) The requirement of different size of bars in terms of weight can be known for procurement from market.
3) Helps the bar bender to cut & bent reinforcement accurately at site.
4) It facilitates the site engineer to check the actual reinforcement placed in structural member & for fast preparation of bills.

Q.1(b)(iii) State the local rate of following materials : [6]
Murrum, Traditional Bricks, Cement, Rubble

Ans.: 1) Murum - Rs.500 to Rs.750 Per Cu.m.
2) Traditional Bricks - Rs.5 to 9 Per No
3) Cement – Rs.280 to 325 Per Bag
4) Rubble - Rs.600 to 800 Per Cu.m

(Note: Rates may differ place to place hence examiner should give proportionate marks)

Q.2 Attempt any TWO of the following : [16]

Q.2(a) Describe the procedure for preparing approximate estimate of road project. [8]

Ans.: Procedure for preparing approximate estimate of road project:

1) Reconnaissance Survey is conducted to determine best possible route & to collect information like extent of waterway, high flood level, no's & length of bridges, total alignment length, probable amount of earthwork, geological characteristics & land value etc

2) Preliminary Survey along the selected route is conducted to determine the various distances, heights & angles

From the above survey reports, maps & data, approximate estimate is prepared per 'km' basis by adding following heads:

i) Cost of earthwork in excavation, embankment, hauling etc. is worked out by using contour map
ii) Cost of bridges & culverts is calculated by multiplying its span by cost per meter span of similar existing structure.
iii) Cost of sub-base consisting of soling & edging according to nature of soil selected is worked out for road width per 'km'
iv) Cost of base-course including premix carpet is worked out per 'km' basis
v) Cost of boundary stones/pillars is taken as lump sum per 'km'
vi) Total cost of heads i) to v) is calculated
vii) Contingencies- 15% & W.C.- 5% added to above Total cost
viii) Cost of permanent land is added finally to work out the approximate total estimated cost of the road project

Q.2(b) Prepare approximate estimate of a bridge having 5 spans of 40 m each using following data : [8]

(i) Cost of existing bridge ₹ 1.2 cr.

(ii) Existing bridge having 3 span of 50 m each.

Ans.: Cost of existing bridge = Rs. 1.2 Cr. = 1,20,00,000/-

Total length of existing bridge = 3 x 50 = 150 m

$$\text{Cost of existing bridge Per 'm' length} = \frac{1,20,00,000}{150}$$

$$= \textbf{Rs. 80,000/- per 'm'}$$

Total length of new bridge = 5 x 40 = 200 m

Approximate cost for new bridge = 80,000 x 200

= Rs.1,60,00,000/-

Approximate Estimated Cost of Bridge = Rs. 1.6 Cr.

Q.2(c) (i) Describe in brief long wall short wall method for taking out quantities. [8]

(ii) Describe in brief prismoidal method for finding out earthwork quantities.

Ans.: (i) Long wall short wall method For taking out the quantities.

This method is also known as out to out and in to in method.

Step1: First prepare foundation plan showing center lines.

Step2: Determine center to center lengths of wall from plan.

Step3: consider long wall which is measured outer to outer and short wall which is measured inner to inner.

Step4: Calculate length of long wall at particular layer by using equation,

Length of long wall = c/c length of wall + width of wall at particular layer.

Step 5 Calculate the length of short wall at particular layer by using the equation,

Length of short wall= c/c length of wall - width of wall at particular layer.

Step6: The lengths of long walls and short walls are multiplied separately by the width and height of corresponding layer and added to get the quantity.

The length of long wall decreases from earthwork to brickwork of superstructure and length of short wall increases. This method is simple and most accurate. There are less chances of mistake in calculation. This is adopted in PWD hence called as PWD method.

(ii) Prismoidal Method for finding out earthwork quantities.

Prismoidal Method for finding out earthwork quantities is based on calculating the volume of prismoids formed between successive cross sections. A prismoid is defined as a solid having ends of plane figures and of not necessarily the same number of sides, lying in parallel planes and having longitudinal faces as trapezoids.

From mensuration volume of prism having end faces in parallel planes will be equal to

$$V = L/6(A_1 + A_2 + 4A_m)$$

Where A_1 and A_2 are the areas at the ends and A_m is the area of mid section parallel to ends.

L is the length between ends.

This prismoidItem No. Description of Itemal formula is applicable to calculate the quantity of earthwork for a single strip having three cross sections A_1, A_m and A_2.

Prismoidal formula for calculating the quantity of earthwork having more than cross sections at a regular intervals will be

V= L/3(First area + Last area + 4 sum of even areas + 2sum of odd areas

This can be used only for odd number of cross sections.

For even number of cross sections, the volume of end strip is calculated by trapezoidal formula and it is added to the volume of odd number of cross sections obtained by prismoidal formula to get total volume.

Q.3 Attempt any FOUR of the following : [16]

Q.3(a) A R.C.C. Lintel size 250 × 150 mm & clear span of 1.5 m is reinforced with 4 bars of 10 mm ϕ @ bottom & 3 bars of 8 mm ϕ @ top. The stirrups of 6 mm ϕ are provided 150 mm c/c. Bearing of lintel is 150 mm. Calculate the total quantity of steel reinforcement. [4]

Ans.: B = 250mm D = 150 mm,

T_L = Clear span + 2 x bearing

= 1.50 + 2 x 0.15 = 1.8m

Assume clear cover = 20mm

Effective depth, d = D - 2x clear cover

= 150- 2 x 20 = 110 mm

(i) Length bottom of straight bar

$L_{SB} = T_L - 2 \times$ side cover $+ 2 \times 9\phi$

= 1800 – 2 x 20 + 2 x 9 x 10

=1940 mm = 1.940 m (4 Nos)

(ii) Length of anchor Bar

$L_{AB} = T_L - 2 \times$ side cover $+ 2 \times 9\phi$

= 1800 – 2 x 20 + 2 x 9 x 8

= 1904 mm = 1.904 m (3 Nos)

(iii) Length of Stirrups

A = 250 – 2 x 20 = 210

B = 150 – 2 x 20 = 110

$L_{ST} = 2 (A + B) + 24 \phi$

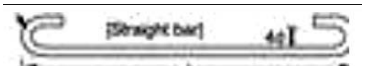
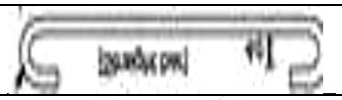
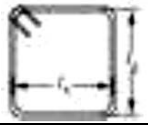
= 2 (210 + 110) + 24 x 6

= 784 mm = 0.784 m

(iv) Number of stirrups = $\frac{TL - 2\times Clear\ cover}{Spacing} + 1$

$= \frac{1800 - 2\times 20}{150}$ = 13 Nos

Bar Bending Schedule:

Sr. No.	Description	Shape of bar	Dia (ϕ)	No.	L	Total Length	Wt Kg/m	Total Wt (kg)
1	Bottom straight bar		10	4	1.940	7.760	0.617	4.787
2	Top anchor bar		8	3	1.904	5.712	0.395	2.256
3	Stirrups		6	13	0.784	10.192	0.222	2.262
								9.305 kg

Q.3(b) What is prime cost & pay work? **[4]**

Ans.: (i) Prime Cost:

Prime cost is the actual cost of articles at shop and refers to supply of articles only and not to carrying out work.

During preparation of an estimate, it is not always possible to specify exact types of articles required, for ex: water supply fittings, sanitary fittings, door and window fittings, etc. are to be decided during the time of actual fitting according to the choice of the owner or Engineer-In- Charge. For the execution of such items reasonable amount is kept in the estimate as Prime Cost.

(ii) DayWork:

The term Day work is used to denote a procedure of costing or valuing an item of work on the basis of actual labours and material required.

Certain types of work cannot be paid by measurement viz. special types of architectural works, dismantling partition wall, taking out root of trees during earthwork in excavation for foundation trenches etc. are paid on the basis of actual quantity of materials and labour hours required to complete the job are denoted by Day Work.

Q.3(c) Enlist any four software used for estimation in Civil Engineering. **[4]**

Ans.:

1. Build-Quant
2. Build-Master
3. Civil estimator
4. Turbo Bid
5. Intelli Bid
6. Pro Est
7. B2W (BID2Win)
8. STACK estimating

Q.3(d) What is work charged establishment & contingencies? **[4]**

Ans.: (i) Work Charged Establishment: During the construction of a project/work some supervisory staff such as supervisors, watchman, store clerk etc. are appointed on temporary basis. The wages to be paid to this staff is charged directly to the estimate of the work. To meet this expenditure a provision is made in the estimate of every work, which is known as work charged establishment. It is about 2 to 2.5 % of the estimated cost of the work.

(ii) Contingencies: It is the incidental expenses of a miscellaneous character which cannot be reasonably predicted during preparation of estimate and to meet such unforeseen expenses an additional amount of 3% to 5% of the estimated cost of the works is provided in the total estimate.

Q.3(e) Define : (i) Day work (ii) Lead and Lift [4]
(iii) Work change establishment (iv) Task work

Ans.: (i) Day Work: The term Day work is used to denote a procedure of costing or valuing an item of work on the basis of actual labours and material required. Certain types of work cannot be paid by measurement viz. special types of architectural works, dismantling partition wall, taking out root of trees during earthwork in excavation for foundation trenches etc. are paid on the basis of actual quantity of materials and labour hours required to complete the job are denoted by Day Work.

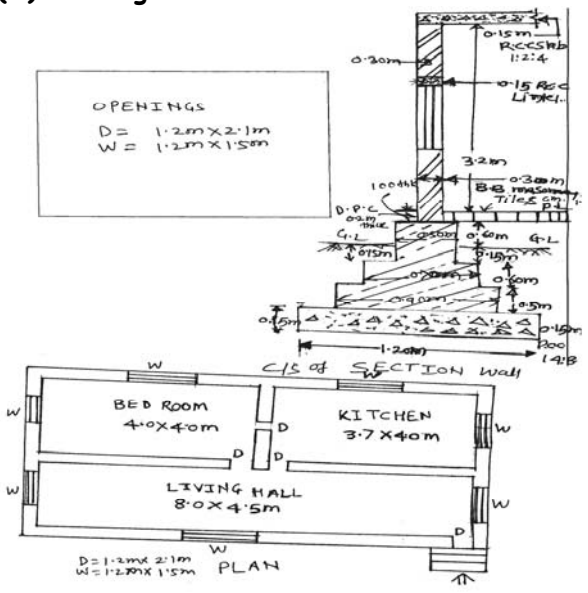
(ii)
- **Lead:** Lead shall be Horizontal straight practicable distance through which the excavated earth can be carried or transported to place of soil heap. The measurement shall be taken separately for every 30 m (100 ft.) lead.
- **Lift:** Lift shall be measured from bottom of excavation to the ground level and measured separately for every 1.5 m lift.

(iii) Work Charged Establishment: During the construction of a project/work some supervisory staff such as supervisors, watchman, store clerk etc. are appointed on temporary basis.
The wages to be paid to this staff is charged directly to the estimate of the work. To meet this expenditure a provision is made in the estimate of every work, which is known as work charged establishment. It is about 2 to 2.5 % of the estimated cost of the work.

(iv) Task work: The capacity of doing work by a skilled labour in the form of work per day is known as task work.

Q.4(a) Attempt the following : [12]

Q.4(a)(i) Workout quantities of following any three items and enter the same is standard format for measurement sheet with description of item Refer Fig. (any four): [4]
(i) Earthwork in excavation
(ii) P.C.C. in foundation bed
(iii) U.C.R. masonry in foundation and plinth
(iv) Brick masonry
(v) Internal plaster
(vi) Flooring



Ans.: By Long wall Short wall Method :

Assume horizontal wall as long wall & vertical walls as short wall

L = 0.3/2 + 4 + 0.3 + 3.7 + 0.3/2 = 8.3M (3Nos)

S_1 = 0.3/2 + 4 + 0.3/2 = 4.3M (3Nos)

S_2= 0.3/2 + 4.5 + 0.3/2 = 4.8M (2Nos)

Sr. No.	Description of item of work	No.	Length L (m)	Breadth B (m)	Depth D (m)	Quantity	Total Quantity
1	**Earthwork in excavation**						
	Long wall	3	9.50	1.20	1.40	47.88	
	L_1= 8.30 + 1.20 = 9.50m						
	Short wall						
	S_1 = 4.30 – 1.20 = 3.10m	3	3.10	1.20	1.40	15.624	
	S_2 = 4.80 – 1.20 = 3.60m	2	3.60	1.20	1.40	12.096	
							75.60 cu.m
2	**P.C.C. (0.15m thick)**						
	Long wall						
	L_1 = 8.30 + 1.20 = 9.50m	3	9.50	1.20	0.15	5.13	
	Short wall						
	S_1 = 4.30 - 1.20 = 3.10m	3	3.10	1.20	0.15	1.674	
	S_2 = 4.80 - 1.20 = 3.60m	2	3.60	1.20	0.15	1.296	
							8.10 cu.m
3	**UCR masonry in foundation and plinth**						
	Step-I						
	Long wall						
	L_1= 8.30 + 0.90 = 9.20m	3	9.20	0.90	0.50	12.42	
	Short wall						
	S_1 = 4.30 - 0.90 = 3.40m	3	3.40	0.90	0.50	4.59	
	S_2 = 4.80 - 0.90 = 3.90m	2	3.90	0.90	0.50	3.51	
	Step-II						
	Long wall						
	L_1 = 8.30 + 0.70 = 9.00m	3	9.00	0.70	0.60	11.34	
	Short wall						
	S_1 = 4.30 - 0.70 = 3.60m	3	3.60	0.70	0.60	4.536	
	S_2 = 4.80 - 0.70 = 4.10m	2	4.10	0.70	0.60	3.444	
	Step-III						
	Long wall						
	L_1 = 8.30 + 0.50 = 8.80m	3	8.80	0.50	0.75	9.90	
	Short wall						
	S_1 = 4.30 - 0.50 = 3.80m	3	3.80	0.50	0.75	4.275	
	S_2 = 4.80 - 0.50 = 4.30m	2	4.30	0.50	0.75	3.225	
							57.24 cu.m
4	**Brick masonry**						
	Long wall						
	L_1 = 8.30 + 0.30 = 8.60m	3	8.60	0.30	3.30	25.542	
	Short wall						
	S_1 = 4.30 - 0.30 = 4.00m	3	4.00	0.30	3.30	11.88	
	S_2 = 4.80 - 0.30 = 4.50m	2	4.50	0.30	3.30	8.91	
	Deduction:						
	D-	4	1.20	0.30	2.10	(-) 3.024	
	W-	7	1.20	0.30	1.50	(-) 3.78	

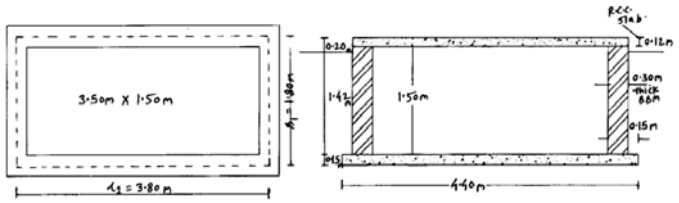
	Lintel over D- Lintel over W-	4 7	1.50 1.50	0.30 0.30	0.15 0.15	(-) 0.27 (-) 0.473	
							38.785 cu.m
5	**Internal Plastering** **Ceiling:** Bed room Kitchen Living	 1 1 1	 4.00 3.70 8.00	 4.00 4.00 4.50	 ---- ---- ----	 16.00 14.80 36.00	
	Walls:- Bed room Kitchen Living Deduction D- 0.50x W- 0.50x	 4 2 2 2 2 7 7	 4.00 3.70 4.00 8.00 4.50 1.20 1.20	 ---- ---- ---- ---- ---- ---- ----	 3.20 3.20 3.20 3.20 3.20 2.10 1.50	 51.20 23.68 25.60 51.20 28.80 (-) 8.82 (-) 6.30	**66.80 Sqm**
							165.36 sqm
6	**Flooring** Bed room Kitchen Living Near Door Sill	 1 1 1 4	 4.00 3.70 8.00 1.20	 4.00 4.00 4.50 0.30	 ---- ---- ---- ----	 16.00 14.80 36.00 1.44	
							68.24 sqm

Q.4(b) Attempt any ONE of the following : **[6]**

Q.4(b)(i) Work out the quantity of following items for septic tank having internal size 1.5 m × 3.5 m and height 1.50 m. The top of slab of septic tank is 20 cm above ground level. **[6]**

(i) Earthwork in excavation.
(ii) P.C.C. (M15) 15 cm thick
(iii) B.B. masonry in C.M. (1:6) 300 mm thick.
(iv) R.C.C. slab M20 on septic tank 12 mm thick
15 cm offset is provided for P.C.C. on all sides of septic tank.

Ans.:



PLAN SECTION

1) Assume horizontal wall as long wall & vertical walls as short wall

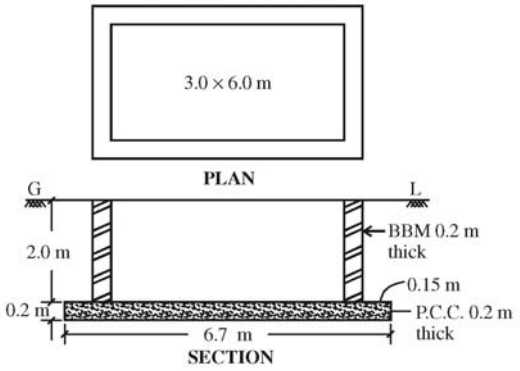
l_1 = 0.30/2 + 3.50 + 0.30/2 = 3.80 m

s_1 = 0.30/2 + 1.50 + 0.30/2 = 1.80 m

No.	Description of item of work	No.	Length L (m)	Breadth B (m)	Depth D (m)	Quantity	Total Quantity
1	Earthwork in excavation L = 3.50 + 2 x 0.30 + 2 x 0.15 = 4.40m	1	4.40	2.40	1.57	16.58	
	B = 1.50 + 2 x 0.30 + 2 x 0.15 = 2.40m						
							16.58 cu.m

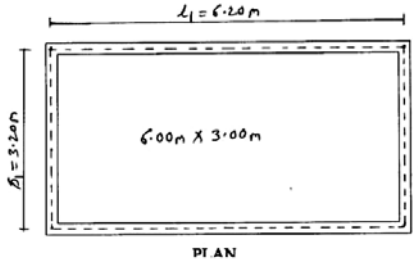
2	P.C.C.	1	4.40	2.40	0.15	1.58	
							1.58 cu.m
3	B.B. masonry in C.M. (1:6)						
	Length of Long wall L_1= 3.80 + 0.30 = 4.10m	2	4.10	0.30	1.50	3.69	
	Length of Short wall S_1 = 1.80 - 0.30 = 1.50m	2	1.50	0.30	1.50	1.35	
							5.04 cu.m
4	R.C.C. slab L= 3.50 + 2 x 0.30 = 4.10m B = 1.50 + 2 x 0.30 = 2.10m	1	4.10	2.10	0.12	1.03	
							1.03 cu.m

Q.4(b)(ii) Find quantity of brickwork, P.C.C., excavation and internal plaster for a underground water tank. (Fig. 1) **[6]**



All dimensions are in metre.

Ans.:



1) Assume horizontal wall as long wall & vertical walls as short wall
l_1= 0.20/2 + 6.00 + 0.20/2= 6.20 m
s_1=0.20/2 + 3.00 + 0.20/2= 3.20 m

Sr. No.	Description of item of work	No.	Length L (m)	Breadth B (m)	Depth D (m)	Quantity	Total Quantity
1	Brickwork 0.2m thick						
	Long wall L_1 = 6.20 + 0.20 = 6.40m	2	6.40	0.20	2.00	5.12	
	Short wall S_1= 3.20 - 0.20 = 3.00m	2	3.00	0.20	2.00	2.40	
							7.52 cu.m

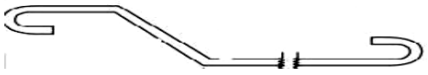
2	P.C.C. (0.20 m thick) L = 6.00 + 2 x 0.20 + 2 x 0.15 = 6.70m	1	6.70	3.70	0.20	4.96	
	B = 3.00 + 2 x 0.20 + 2 x 0.15 = 7.70m						
							4.96 cu.m
3	Excavation	1	6.70	3.70	2.20	54.54	
							54.54 cu.m
4	Internal plaster for wall L = 2 x (3.00 + 6.00) = 18m	1	18.00	------	2.00	36.00	
							36.00 sqm

Q.5 Attempt any TWO of the following : **[16]**

Q.5(a) R.C.C. slab of overall size 5500 mm × 3000 mm and thickness 175 mm is provided with 12 mm main bars bent-up alternately and placed at distance 150 mm c/c. The distribution steel of 8 mm diameter is provided at distance 200 mm c/c. Find out the quantity of steel, prepare bare bending schedule take cover 15 mm. **[8]**

Ans.: L = 5500mm, B = 3000mm, d = 175mm, cover 15mm

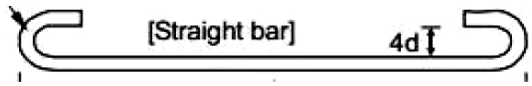
a) Main Bar(12 mm dia @ 150 c/c)



1) Length = 3000 - (2 X 15) + (18 X 12) + (0.42 X 145)
= 3246 mm = 3.246 m

2) No. Of Main bars = (5500 - 2 X 15)/150 + 1
= 38 Nos

b) Distribution Bar (8 mm dia @ 200 c/c)



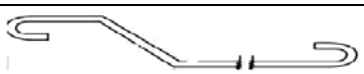
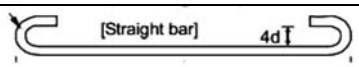
1) Length = 5500 - (2 x 15) + (18 x 8)
= 5614 mm = 5.614 m

2) No. of Distribution Bar at Bottom = (3000 - 2 x 15)/200 + 1 = 16 Nos

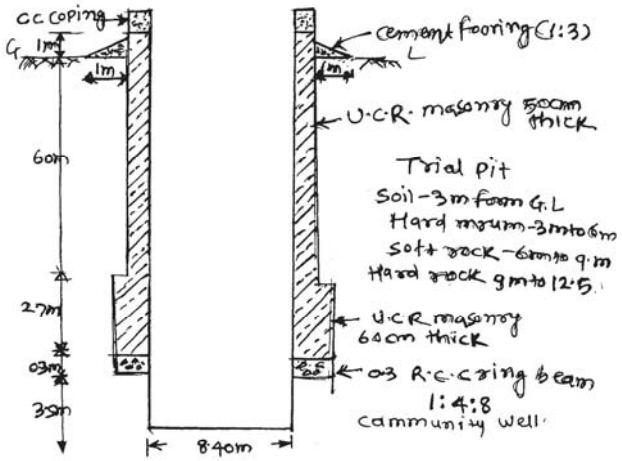
No. of Distribution Bar at Top = 2 + 2 = 4

Nos. Total Distribution Bar = 16 + 4 =20 Nos

Bar Bending Schedule:-

Sr No.	Description	Shape of bar	No	Dia	L	Total Length	Wt Kg/m	Total Wt
1	Main Bar		38	12	3.246	123.348	0.889	109.659
2	Distribution bar		20	8	5.614	112.280	0.395	44.358
							Total Wt	**154.014 kg**

Q.5(b) Calculate the quantity of excavation and UCR masonry work and enter in standard measurement sheet with brief description of item of work for community well as shown in Figure. **[8]**



Ans.:

Sr. No.	Description	No.	L	B	H	Qty	Total Qty
1	Excavation						
A	Excavation in soil from 0 to 1.5 m depth	1	$\pi/4$ X 9.6^2		1.50	108.573	**108.573 Cum**
B	Excavation in soil from 1.5to3.0 m depth	1	$\pi/4$ X 9.6^2		1.50	108.573	**108.573 Cum**
C	Excavation in hard murum from 3.0 to 4.50 m depth	1	$\pi/4$ X 9.6^2		1.50	108.573	**108.573 Cum**
D	Excavation in hard murum from 4.5 to 6.0 m depth	1	$\pi/4$ X 9.6^2		1.50	108.573	**108.573 Cum**
E	Excavation in soft rock from 6.0 to7.5 m depth	1	$\pi/4$ X 9.6^2		1.50	108.573	**108.573 Cum**
F	Excavation in soft rock from 7.5 to 9.0 m depth	1	$\pi/4$ X 9.6^2		1.50	108.573	**108.573 Cum**
G	Excavation in hard rock from 9.0to10.5 m depth	1	$\pi/4$ X 8.4^2		1.50	83.127	**83.127 Cum**
H	Excavation in hard rock from 10.5 to 12.0 m depth	1	$\pi/4$ X 8.4^2		1.50	83.127	**83.127 Cum**
I	Excavation in hard rock from 12.0 to 12.5 m depth	1	$\pi/4$ X 8.4^2		0.50	27.709	**27.709 Cum**
2	**UCR Masonry**	1	$\pi/4$ (9.60^2 - 8.40^2)		2.70	45.804	
		1	$\pi/4$ (9.40^2 - 8.40^2)		7.00	97.861	**143.665 Cum**

Q.5(c) Prepare rate analysis for brick work in superstructure in c.m (1:6) proportion. **[8]**

Ans.: Rate Analysis for Brick Work in Super Structure in C.M (1:6) in Super Structure

Assume Volume of Brick Masonry = 10 cu.m

1) Calculation of materials

a) Dry Volume = 30% of volume of masonry = $\frac{30}{100} \times 10$ = 3.00 cu.m

b) Volume of Cement = $\frac{\text{Dry Volume}}{\text{Sum of Mix Proportion}} \times \text{Content of cement in proportion}$

Volume of Cement = $\frac{3.0}{1+6} \times 1$ = 0.4285 cu.m

No. of Cement Bags = $\frac{0.4285}{0.035}$ = 12.24 bags = approximately = 13 bags

c) Volume of Sand = $\frac{\text{Dry Volume}}{\text{Sum of Mix Proportion}} \times \text{Content of Sand in proportion}$

Volume of Sand = $\frac{3.0}{1+6} \times 6$ = 2.571 cu.m

d) Number of Bricks

Size of one Bricks = 19cm × 9cm × 9cm = 0.19m × 0.9m × 0.9m

Add thickness of Mortar throughout – 1cm

Size of Bricks with mortar = 0.2m × 0.1m × 0.1m

Number of Bricks = $\frac{10}{02 \times 0.1 \times 0.1}$ = 5000 Nos.

Sr. No.	Particular	Quantity	Rate	Per	Amount
A	Material				
1	Cement	13	300	Bag	3900
2	Sand	2.571	1950	Cum	5013.45
3	Bricks	5000	7	Nos	35000
				Total (A)	43913.45
B	Labour				
1	Head	0.5	600	Day	300
2	Mason	8	500	Day	4000
3	Male Mazdoor	8	350	Day	2800
4	Female Mazdoor	10	250	Day	2500
5	Bhisti	2	350	Day	700
6	Scaffolding, Sundries T. & P.	L.S.	L.S.	L.S.	700
				Total (B)	11500
				Total Cost of Material & Labour (C) = Total (A + B)	54913.45
				Add Water Charges @ 1.5% of Total Cost of Material & Labour =	823.70
				Overall Cost = Total Cost + Water Charges =	55737.15
				Add Contractor Profit @ 10% of Overall Cost (E) =	5573.71
				Grand Total = Overall Cost + Contractors Profit =	61310.86
				Rate per cu.m = Grand total / Assumed Volume of U.C.R. Masonry =	6132.0 per cum

{Note:- 1) Examiner should keep in mind that rates of materials and labours differs from place to place and time to time, proportionate marks should be given for following the correct procedure of preparing rate analysis.

Q.6 Attempt any FOUR of the following : [16]

Q.6(a) How will you consider electrification work, plumbing work in estimation? [4]

Ans.: While preparation of detailed estimate specifications of electrification work & plumbing services are not known. Therefore some provisions are made for the electrification work & plumbing services in the detailed estimate.

Generally For Electrification work of building generally-8 to 10 % of estimated cost is provided For water supply & sanitary installation i.e. plumbing services of building generally-8 to 10 % of estimated cost is provided.

Q.6(b) Define rate analysis, state purpose of rate analysis. [4]

Ans.: Rate Analysis: It is a method of determination of rate of an item of work from cost of material, cost of labour, hire charges Tools and plants and other miscellaneous expenses.

Purpose of Rate Analysis:

1. To know the cost of various item of work for preparation of detailed estimate
2. To find the actual cost of an item per unit
3. To know the rate of an extra item of work
4. To prepare revised and supplementary estimate
5. To know the economical use of material in construction
6. To check the reliability of rates quoted by contractor in tender.

Q.6(c) Write down the approximate percentage of steel required for various R.C.C. members. [4]

Ans.: Percentage of steel for various RCC work in terms of volume of concrete in cum

1. Lintel and slab : 0.7 to 1 % of volume of concrete in cum
2. Beam : 1 to 2 % of volume of concrete in cum
3. Column : 1 to 5 % of volume of concrete in cum
4. Foundation and Footing : 0.5 to 0.8 % volume of concrete in cum.

Q.6(d) Explain prismoidal formula method for finding earth work for road. [4]

Ans.: Prismoidal Formula:

Computation of volume of earthwork by prismoidal formula

V = D/3 (first area + Last area + 4 x Sum of Odd area + 2 x Sum of even area)

= D/3 (A0 + An + 4 x (A1 + A3 + ... An-1) + 2 X (A2 + A4 + ... An-2)

Where L = Length of chainage,

A_0= first area

A_n= last area

In this case of Prismoidal formula it is necessary to have odd number of sectional areas. If there are even numbers of sections, the end strip should be calculated separately & the remaining strip should be calculated by using following formula:

$Q = L/6 (A_1 + A_2 + 4A_m)$

Q.6(e) Define: (i) Centage charges (ii) Prime cost [4]
(iii) Load factor (iv) Task work

Ans.: (i) Centage charges: These are the charges or cost of establishment, planning and design of project. It also included supervision charges. Generally 10 to 15 % of estimated cost is provided as centage charges.

(ii) Prime cost: Prime cost is the actual cost of articles at shop and refers to supply of articles only and not to carrying out work. During preparation of an estimate, it is not always possible to specify exact types of articles required, for ex: water supply fittings, sanitary fittings, door and window fittings, etc. are to be decided during the time of actual fitting according to the choice of the owner or Engineer-In-Charge. For the execution of such items reasonable amount is kept in the estimate as Prime Cost.

(iii) Load factor: It is the load carrying capacity of a particular vehicle in transportation of material. It depends on type of vehicle and road

(iv) Task work: The capacity of doing work by a skilled labour in the form of work per day is known as task work

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