MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)
(ISO/IEC - 27001 - 2005 Certified)

WINTER – 14 EXAMINATIONS

Subject Code: 17501 **Model Answer** **Total Pages: 15**

Important Instruction to Examiners:-

1) The answers should be examined by key words & not as word to word as given in the model answers scheme.

2) The model answers & answers written by the candidate may vary but the examiner may try to access the understanding level of the candidate.

3) The language errors such as grammatical, spelling errors should not be given more importance.

4) While assessing figures, examiners, may give credit for principle components indicated in the figure.

The figures drawn by candidate & model answer may vary. The examiner may give credit for any equivalent figure drawn.

5) Credit may be given step wise for numerical problems. In some cases, the assumed contact values may vary and there may be some difference in the candidate's answers and model answer.

6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidates understanding.

7) For programming language papers, credit may be given to any other programme based on equivalent concept.

Q NO	SOLUTION	MARKS
1.A	**Attempt any three of the following**	
a.	**State any four purposes of detailed estimate**	
Ans.	**i)** To know the necessary amount required by the owner to complete the proposed work. **ii)** To know the quantities of items required for construction and arranging the programme for their timely procurement. **iii)** To calculate the numbers of labors of different categories require for completion of work within scheduled time. **iv)** To arrange the funds required according to the construction scheduled programme **v)** To justify benefit cost ratio. **vi)** To invite tenders and prepare bills of payment. **Note: The examiner should give proportionate marks for any 4 purposes and consider any valid other than above mentioned purposes.**	**1 mark for each (For any Four)**
b.	**Types of approximate estimate** • Plinth area method • Cubical content method • Service unit method • Approximate quantity method • Typical bay method **Service unit method:-** In service unit method no. of service unit is decided for calculating approximate estimate. such as per kilometer for a highway, per meter of a span for a bridge, per classroom for school building , per bed for hospital , per liter for water tanks, per seats for cinema hall etc. These units are considering first then approximate cost is calculated by multiplying the cost per service unit by the no. of service unit in the structure. Approximate estimate = No. of service unit x Cost per service unit	**2 Marks for any Four** **2 marks**
c.	Given:- Plinth Area of proposed Building: 390Sqm Known cost of similar structure : 19,35,000/- Plinth area= 215 Sq.m Plinth area Rate = Construction Cost / Plinth Area = 19,35,000 / 215 = 9000 Rs per Sq.m Approximate cost of proposed building= Plinth Area x Plinth Area Rate = 390 x 9000 = **Rs 35,10,000 /-**	**1m** **1m** **1m** **1m**
d)	Modes of Measurement of following items of work i) Iron Gate = Square meter or m^2 ii) Woodwork for door frame = Cubic meter or m^3 iii) Pointing = Square meter or m^2 iv) Skirting = Running meter for up to 30cm height & sq.m. for above 30cm height.	**1m for each**

B	**Attempt any one of the following**	
a)	**Rules for Deduction as per IS 1200** **Plastering** – Deductions in plastering are done in following manner: i) No deduction is made for end of beams, posts, rafters etc. ii) No deduction is made for openings up to 0.5 sq.m and no addition is made for jambs, soffits and sills of these openings. iii) For openings more than 0.5 sq.m and up to 3 sq.m deductions is made for one face only. No addition for jambs, soffits and sills of these openings. iv) For openings above 3 sq.m deduction is made for both the faces of opening and the jambs, soffits and sills shall be added of these openings. **Masonry work in superstructure** - No deduction is made for the following i) Openings up to 0.1 sq.m ii) End of beams, posts, rafters, purlin etc. up to 0.05 sq.m in section iii) Bed plates, wall plates, bearing of chajjas where thickness does not exceed 10cm. iv) Bearing of floor and roof slab are not deducted from masonry in superstructure	½ ½ 1 1 ½ ½ 1 1
b)	**Provisional Sum:** Certain amount provided by experience estimators in the estimated cost of the project for some special type of work whose details are not known at the time of preparing estimate call provisional sum. Some special works are listed below. Shifting of water lines. Installation of air conditioner and its fittings **Prime Cost:** Prime cost is the actual cost of articles at shop and refers to the supply of articles only and not to carrying out work. During preparation of an estimate , it is not always possible to specify the exact types of articles required, for ex: water supply fittings, sanitary fittings, doors 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. **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 labors and materials required. Certain types of work cannot be paid by the measurements viz. special types of architectural works, dismantling partition of walls, taking out root of trees during earthwork in excavation for foundation trenches etc. are paid on the basis of actual quantity of materials and labor hours required to complete the job and are denoted by Day Work.	**2M** **2M** **2M**
Q. 2	**Attempt any Two of the following**	
a)	**Procedure for Preparing approximate estimate of a water supply project:** **Steps: - a)** Statement of Objective. **b)** Collection of Data (Physical, hydrologic, geological, i.e. people and institutions, Municipal and industrial) **c)** projections for planning **d)** project formulation, **e)** project evaluation are involved to draw up approximate estimate.	**Any four steps 4M**

Q2 a cont.	**Procedure: -** i) The project evaluation is worked out on the basis of project area or on the basis of population within the area. ii) The project area in sq.km is multiplied by existing rate of similar project per sq.km iii) Approximate Estimate of water supply project = Project area x Project area rate. iv) The existing rate of concerned department should be the basis to prepare the approximate estimate. Population served for the project.	**1M** **1M** **1M** **1M**
b)	**Approximate of the school building:** Number of Classroom: 12 Area of Each Classroom: 50 m2 Area of other facilities: 150 m2 Total Area for Given School building = (12 x 50) + 150= 750m2 Plinth area rate= Estimated cost of structure / Total built or Plinth area = 71,25,000 / 750 = 9500/- Rs Approximate cost of school building= Plinth area rate x Total plinth area = 9500 x 750 = 71,25,000/- **Approximate cost of school building = 71,25,000/- Rs**	2M 2M 2M 2M
c)	Given :- Formation level at starting point = 470.00 m Falling Gradient = 1 to 60 i.e.= 1/60 Formation Width of road (b) = 12m Side Slope = 1:2 in Embankment and 1: 1.5 in Cutting Condition of road surface = No cross slope Denoting depths of cutting by –ve signs and height of embankment by +ve signs. Depth of cutting or Height of banking = F.L. – G.L. Formation level per chainage 30 m with falling gradient 1 in 60 is subtracted by 1/60 x 30= 0.5m	**1M**

Q2 c cont.

F.L.at next chainage = F.L.at previous chainage – (Gradient x Chainage interval) **1M**
= 470 – (1/60 x 30)
= 469.5m

Mean Sectional Area Method-

Chainage	0	30	60	90	120	150
G.L.	466.50	467.20	468.10	468.20	469.70	469.00
F.L.	470.00	469.5	469.00	468.5	468.00	467.5
Depth	3.5	2.3	0.9	0.3	-1.7	-1.5

2M

Chainage	Depth or Height	Area of central Portion BD (m2)	Area of sides Sd2 (m2)	Total Area (Bd + Sd2) (m2)	Mean Sectional Area Am	Length L (m)	Quantity (Am x L)	
							Cutting	Bank
0	3.5	42	24.5	66.5		30		
30	2.3	27.6	10.58	38.18	52.34	30		1570.2
60	0.9	10.8	1.62	12.42	25.3	30		759
90	0.3	3.6	0.18	3.78	8.1	30		243
94.5	0	00	00	00	1.89	4.5		8.505
120	-1.7	20.4	4.335	24.735	12.3675	25.5	315.37	
150	-1.5	18	3.375	21.375	23.055	30	691.65	
						Total	**1007.02**	**2580.70**

3M

Total Earthwork in Banking = 2580.70 m3

Total Earthwork in Cutting = 1007.02 m3

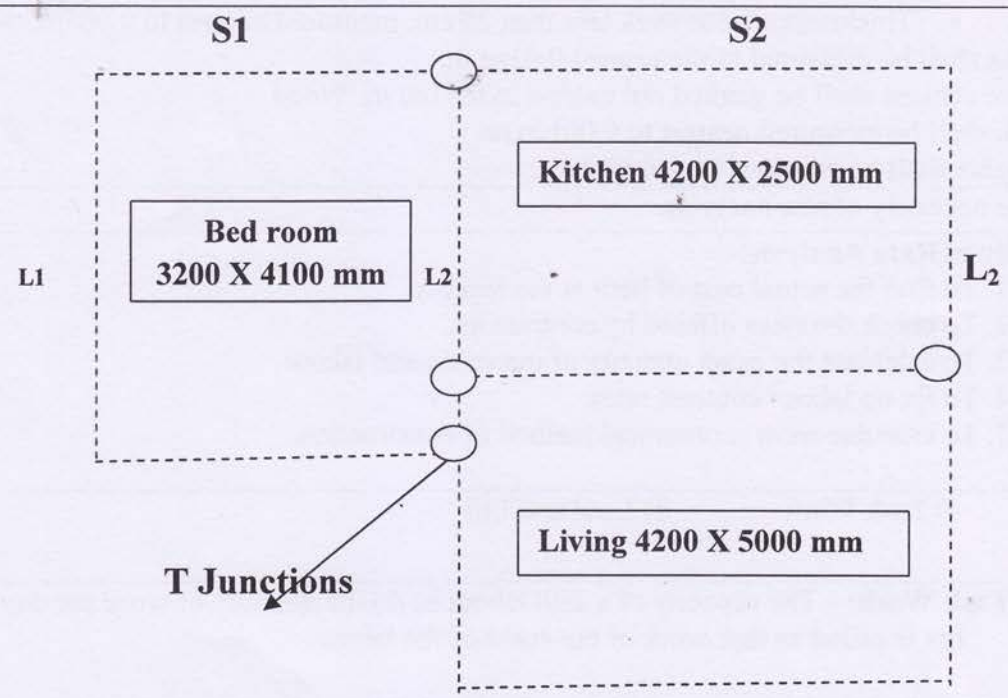
1M

Q.3	**Attempt any Four of the following**	**16**
a)	State the desired accuracy in taking measurement of work as per IS 1200.	
Ans.	To achieve the desired accuracy in measurements, following points shall be observed, 1. Dimensions shall be measured to the nearest 0.01 m except the following: • Thickness of slab measured nearest to 0.005 m. • Wood work to nearest 0.002m.	**01 marks each**

Q.3 a. Cont --	• Reinforcement to nearest 0.005 m. • Thickness of roadwork less than 20 cm, measured nearest to 0.005m. 2. Areas shall be measured to the nearest 0.01sq.m. 3. Cubic content shall be worked out nearest to 0.01cu.m. Wood work shall be measured nearest to 0.001cu.m. 4. Weights shall be workout to nearest 1 kg.	
b)	State the necessity of rate analysis.	
Ans.	**Necessity of Rate Analysis:-** 1. To find the actual cost of item at the locality. 2. To check the rates offered by contractors. 3. To calculate the exact quantity of materials and labour. 4. To fix up labour contract rates. 5. To examine most economical method of construction.	**01 marks each for any 4 pt.**
c)	Define: i) Task Work ii) Lead and Lift	
Ans.	i) **Task Work: -** The capacity of a skill labour to do the quantity of work per day or 8 hrs is called as task work or out-turns of the labour. ii) **a) Lead:-** It is the horizontal distance between the trench pit and the place where excavated material is deposited. Normally lead is taken as 30m.Separate measurements are taken for every 30m lead. **b) Lift:-** It is the depth of excavation or the vertical movement of material is called lift. Normally lift is taken as 1.5m. Separate measurements are taken for every 1.5m lift.	**2marks** **1marks** **1marks**
d)	**Give market rates for the following materials:** **1.** Sand – Rs 800/m^3 **2.**12mm steel- Rs 4500 Per Quintal **3.** Oil paint- Rs 250 per liter **4.** Cement bag- Rs 320/bag **Note:- Market rate may vary from place to place. Examiner may give proportionate marks**	**01 marks each**
e)	Enlist any eight software's available for civil engineering estimate.	
Ans.	**List of software's :-** 1. QE-Pro 2. 2002 CD Estimator 3. Chief Estimator 4. ICE 2000 5. TECS 6. Estimator 2.0 7. Estimate Master 5.13 8. Build Soft **Note: - Examiner may consider any other software's for giving proportionate marks**	**1/2 marks each**
4.	A. Work out quantities of following **any three** items of work from fig.	**12 Marks**
	a) Excavation for foundation. b) Brickwork in superstructure in C.M. (1:6). c) Internal Plastering. d) R.C.C. for slab (1:2:4).	

Ans.	Long Wall :- L_1 = 4.4 m, L_2 = 8.1m & Short Wall :- S_1 = 3.5 m, S_2 = 4.5m	1M

Q.4 a cont..



Q.4 a cont..

Sr. No.	Description	No.	Length m	Width m	Height m	Qty	Total Qty	
	Long Wall – Short Wall Method							
1.	**Excavation for foundation**							
	L_1= 4.4+1.0=5.4	1	5.4	1	1.15	6.21		
	L_2=8.1+1.0=9.1	2	9.1	1	1.15	20.93		
	S_1= 3.5-1.0=2.5	2	2.5	1	1.15	5.75		
	S_2=4.5-1.0=3.5	3	3.5	1	1.15	12.075		3M
					Net Qty		**44.965 m^3**	
2.	**Brickwork in super structure in C.M.(1:6)**							
	L_1= 4.4+0.3=4.7	1	4.7	0.3	3	4.23		
	L_2=8.1+0.3=8.4	2	8.4	0.3	3	15.12	**36.45**	1M
	S_1= 3.5-0.3=3.2	2	3.2	0.3	3	5.76	**m^3**	
	S_2=4.5-0.3=4.2	3	4.2	0.3	3	11.34		
	Deductions for openings							
	D	3	1	0.3	2.1	1.89		
	W	2	1.8	0.3	1.2	1.296	**5.346**	1M
	W_1	5	1.2	0.3	1.2	2.16	**m^3**	
	Deductions for Lintels							
	D	3	1.3	0.3	0.15	0.177		
	W	2	2.1	0.3	0.15	0.189	**0.703**	1M
	W_1	5	1.5	0.3	0.15	0.337	**m^3**	
					Net Qty		**30.401m^3**	1M
	Note:- 1) Total brick work without lintel =31.104m^3 may consider.							
3.	**Internal Plastering for rooms**							
	Living Room	1	18.4		3	**55.2**	**139.2 m^2**	1M
	Kitchen	1	13.4		3	**40.2**		
	Bed room	1	14.6		3	**43.8**		
	Internal Plastering for ceiling							
	Living Room	1	4.2	5		**21**		1M
	Kitchen	1	4.2	2.5		**10.5**	**44.62 m^2**	
	Bed room	1	3.2	4.1		**13.12**		
						Total internal plaster	**=183.82 m^2**	
	Deductions							
	D	2.5	1	-	2.1	5.25		1M
	W	1	1.8	-	1.2	2.16	**11.01 m^2**	
	W_1	2.5	1.2	-	1.2	3.6		1M
						Net Qty	**172.81 m^2**	
	Note:-Total internal plaster Excluding ceiling =128.19 m^2							
4.	**R.C.C. SLAB**	1	56.77		0.15	**8.515**		
	A1=4.7*3.5=16.45							4M
	A2=8.4*4.8=40.32							
					Net Qty		**8.515 m^3**	

Note : - Consider any Three Quantities for giving proportionate marks.

Q.4 a. Cont..

Sr. No.	Description	No.	Length m	Width m	Height m	Qty	Total Qty
	Centre Line Method						
	Total C/L Length TL= 8.1*2+4.5*3+3.35*2+4.4 = 41.1m						
	No. of junctions = 4						
1.	**Excavation for foundation**						
	TL=41.1-1/2*4*1 = 39.1m	1	39.1	1	1.15	44.965	**44.965 m^3**
					Net Qty		
2.	**Brickwork in super structure in C.M.(1:6)**						
	TL=41.1-1/2*4*0.3 =40.5m	1	40.5	0.3	3	36.45	**36.45 m^3**
	Deductions for openings						
	D	3	1	0.3	2.1	1.89	
	W	2	1.8	0.3	1.2	1.296	**5.346**
	W	5	1.2	0.3	1.2	2.16	**m^3**
	Deductions for Lintels						
	D	3	1.3	0.3	0.15	0.177	
	W	2	2.1	0.3	0.15	0.189	**0.703**
	W_1	5	1.5	0.3	0.15	0.337	**m^3**
					Net Qty		**30.40 m^3**
	Note:- 1) Total brick work without lintel =31.104m^3 may consider.						
3.	**Internal Plastering for rooms**						
	Living Room	1	18.4		3	**55.2**	**139.2 m^2**
	Kitchen	1	13.4		3	**40.2**	
	Bed room	1	14.6		3	**43.8**	
	Internal Plastering for ceiling						
	Living Room	1	4.2	5		**21**	**44.62 m^2**
	Kitchen	1	4.2	2.5		**10.5**	
	Bed room	1	3.2	4.1		**13.12**	
	Total internal plaster = 183.82 m^2						
	Deductions						
	D	2.5	1	-	2.1	5.25	**11.01 m^2**
	W	1	1.8	-	1.2	2.16	
	W_1	2.5	1.2	-	1.2	3.6	
	Net Qty=172.81 m^2						
	Note:-Total internal plaster Excluding ceiling =128.19 m^2						
4	**R.C.C. SLAB**	1	56.77	0.15		**8.515**	
	A1=4.7*3.5=16.45						
	A2=8.4*4.8=40.32						
					Net Qty		**8.515 m^3**

4M 4M 4M 4M

B) Attempt any one of the following — **6 M**

a) A R.C.C. beam 300mm wide and 450mm deep and length 5000mm is reinforced with 4 number of 12mm ø bar placed in one row, out of 4, 2 bars are straight and 2 bars are bent up respectively. In addition to this, 2 anchor bars of 10mm ø are provided at top. 6mm ø stirrups are provided at 150 mm c/c. the overall cover provided to the beam is 25mm.Calculate the total quantity of steel and also prepare bar bending schedule.

Ans.

b=300mm & d= 450mm , L = 5m

a) Straight bar 2 Nos. of 12 mm ø

L=5.000 – 2x 25+12x18=5000-50+216= 5166 mm — 1M

b) Bent up = (5000-50)+2(0.42x400)+216=5502mm — 1M

c) Anchor bars = 5000-50+2x9x10= 5130mm — 1M

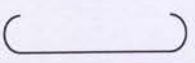
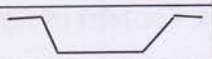
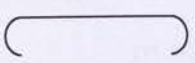
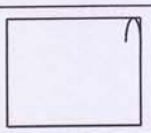
d) Stirrups = 2(A+B)+24x6

A= 300-50=250 & B=450-50=400mm

L= 2x(250+400)+24x6= 1444mm — 1M

No. of stirrups= (TL-2x25)/spacing +1

5000-50/150+1 = 34 nos.

Sr. No.	Description	Shape of bar	No.	ø	L	T.L.	Wt.	Total Wt.
1	Main Bar		2	12	5.166	10.332	0.89	9.195
2	Bent up		2	12	5.502	11.004	0.89	9.79
3	Anchor bars		2	10	5.130	10.26	0.62	6.36
4	Stirrups		34	6	1.444	49.096	0.22	10.80
							Total wt.	**36.147**

2M

b) Calculate the quantity of cement, sand and coarse aggregate for 80 m^3 cement concrete having proportion (1:1.5:3).

Ans.

Wet volume of RCC= 80m^3

Dry volume=52% more of wet volume

= (52/100x80)+80=121.6m^3 — ½ M

Vol. of cement=121.6/1+1.5+3 = 22.109m^3 — 1/2M

Q.4 B. b. cont.	No. Of Bags = 22.109/0.0347 = 637.14= 638 bags	1M
	Vol. of sand= 121.6/1+1.5+3 x1.5 = 33.15 m^3	2M
	Vol. of coarse aggregates = 121.6/1+1.5+3 x 3 = 66.3 m^3	2M
	Note: Student may Consider Volume of One bag of cement = 0.034 or 0.0347 or 0.035 m3 . Examiner may consider for giving proportionate marks	

Q .NO		MARK
5	**Attempt any Two**	16

a) Rate Analysis for R.C.C. Work (1:2:4)

Assume Wet Volume of R.C.C = 10 m^3

a) Dry Volume = 52% more of Wet volume

$$= \frac{52}{100} \times 10 + 10 = 15.2 \text{ cu.m.}$$

b) Volume of Cement = $\frac{\text{Dry Volume}}{\text{Sum of Mix Proportion}}$ x Content of cement in proportion — 1M

Volume of Cement = $\frac{15.2}{1+2+4} \times 1 = 2.1714$ cu.m

No. of Cement Bags = $\frac{2.1714}{0.0347} = 62.576$ bags

= approximately = 63 bags

c) Volume of Sand = $\frac{\text{Dry Volume}}{\text{Sum of Mix Proportion}}$ x Content of Sand in proportion — 1M

Volume of Sand = $\frac{15.2}{1+2+4} \times 2 = 4.3428$ cu.m

d) Volume of Aggregates = $\frac{\text{Dry Volume}}{\text{Sum of Mix Proportion}}$ x Content of Aggregates in proportion — 1M

Volume of Aggregates = $\frac{15.2}{1+2+4} \times 3 = 8.6857$ cu.m

e) Assume 1% Steel Reinforcement

Volume of Steel = $\frac{1}{100} \times 10 = 0.1m^3$

Weight of Steel = 0.1 x 7850 = 785 Kg — 1M

Binding Wire = 10 x 0.785 = 7.85Kg

Sr. No.	Particulars	Quantity	Rate Rs. P	Per	Amount Rs. P
1	**Material**				
	Cement	63	350	Bag	22,050
	Sand	4.3428	650	M^3	2822.82
	Aggregates	8.6857	900	M^3	7817.13

Q.5 a. cont..

	Steel	785	40	kg	31400	
	Binding Wire	7.85	35	Kg	274.75	1M
					64,364.70	
2	**Labor**					
	Head Mason	1.5	180	Day	270	
	Mason	3	170	Day	510	
	Male Mazdoor	13	160	Day	2080	
	Female Mazdoor	10	150	Day	1500	
	For Reinforcement Blacksmith	15	170	Day	2550	1M
	Bhisti	2	150	Day	300	
	Contingencies T& P	Lump Sum	Lump Sum	Lump Sum	200	
					7410	
3	**Centering & Shuttering**					
	Carpenter	10	170	Day	1700	
	Mazdoor	10	160	Day	1600	1M
	Nails	Lump Sum	Lump Sum	Lump Sum	300	
					3600	
				Total	**75374.7**	
4	Water Charges			1.5%	1130.6205	
5	Profit & Overhead			10%	7537.47	
				Grand Total	**84042.7905**	1M

Rate Per Cubic Meter = $\frac{84042.7905}{10}$ = **8404.279 Rs.**

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

Assume 1st Class Brickwork

Assume Volume of Brick Masonry = $10m^3$

a) Dry Volume = 35% of volume of masonry

$= \frac{35}{100} \times 10 = 3.5$ cu.m.

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

Volume of Cement = $\frac{3.5}{1+6} \times 1 = 0.5$ cu.m 1M

No. of Cement Bags = $\frac{0.5}{0.0347} = 14.409$ bags

= approximately = 15 bags

c) Volume of Sand = $\frac{\text{Dry Volume}}{\text{Sum of Mix Proportion}}$ x Content of Sand in proportion 1M

Volume of Sand = $\frac{3.5}{1+6} \times 6 = 3$ cu.m

d) Number of Bricks

Size of one Brick = 19cm x 9cm x 9 cm = 0.19m x 0.9m x 0.9m

Add thickness of Mortar through out = 1cm

Size of Brick with mortar = 0.2m x 0.1m x 0.1m 1M

Q.5 b. Cont..

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

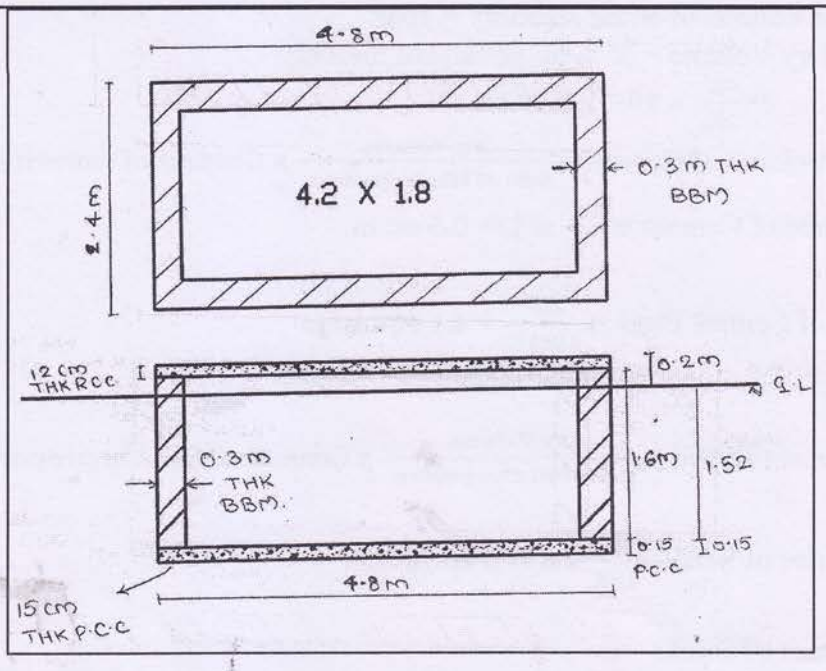
Assume 5% wastages = $\frac{5}{100} \times 5000 + 5000 = 5250$ Nos.

Sr. No.	Particulars	Quantity	Rate Rs. P	Per	Amount Rs. P
	Material				
	Cement	15	350	Bag	5250
1	Sand	3	650	M^3	1950
	Bricks	5000	5	No.	25000
	Scaffolding	Lump Sum	Lump Sum	Lump Sum	100
					32300
	Labor				
	Head Mason	1.5	180	Day	270
	Mason	8	170	Day	1360
	Male Mazdoor	8	160	Day	1280
2	Female Mazdoor	5	150	Day	750
	Bhisti	2	150	Day	300
	Contingencies T& P	Lump Sum	Lump Sum	Lump Sum	200
					4160
				Total	**36460**
3	Water Charges			1.5%	546.90
	Profit & Overhead			10%	3646.0
4				**Grand Total**	**40652.9**

Rate Per Cubic Meter = $\frac{40652.9}{10}$ = **4065.29 Rs.**

2M 2M 1M

c



2M

Q.5 C. Cont--

Item No.	Description of Item	No	Length (m)	Breadth (m)	Depth (m)	Quantity (m^3)	Total (m^3)	
1	Earthwork in Excavation up to 1.75m depth	1	2.4	4.8	1.67		19.24	2M
2	P.C.C. (1:3:6)	1	2.4	4.8	0.15		1.728	1M
3	B.B. Masonry in C.M (1:6) , 0.3m wide a) c/c length of long wall = 4.5+0.3=4.8	2	4.8	0.3	1.6	4.608		1M
	b) c/c length of short wall = 2.1-0.3 = 1.8	2	1.8	0.3	1.6	1.728		1M
							6.336	
4	R.C.C. Slab (1:2:4)	1	2.4	4.8	0.12		1.3824	1M

Q.6 Attempt Any Four — **16 M**

a **Standard Format of Measurement Sheet** — 2M

1	2	3	4	5	6	7	8
Item No.	Description of Item	Number	Length (m)	Breadth (m)	Depth (m)	Quantity (m)	Total

Abstract Sheet

1	2	3	4	5	6
Sr.No.	Particulars	Quantity or Number	Rate Rs. P	Per	Amount Rs. P

2M

b **"Long Wall and Short Wall" Method: -** — 1 Mark for Eac (for any Four Points)

1. In this method the longer walls in the building (generally in one direction) are considered as long walls and measured from out to out. The shorter or partition walls in a perpendicular direction of the long walls are considered as short walls are measured from in to in for a particular layer of work.
2. These lengths of long wall and short wall are multiplied separately by the breadth and height of corresponding layer and are added to get the quantity.
3. To calculate the lengths of long and short wall determine first their center to center length individually from the plan. Then the length of long wall out to out may be calculated after adding half breadth of the wall at each end to its center to center length.
4. Thus the length of short wall measured in to in may be found out after subtraction of half breadth at each end from its center to center length. The length of long wall generally decreases from earthwork to brickwork in superstructure and in case of short wall its length increases.
5. A) Length of long wall = Center to Center length of Long Wall + Width of Item.
   B) Length of short wall = Center to Center length of Short Wall – Width of Item.

c **Excavation Calculation for Community Well: -**

Item No.	Description of Item	No	Length (m)	Breadth (m)	Depth (m)	Quantity (m^3)	Total (m^3)
.1	Excavation in soft soil for lead 30m and lift 1.5m	1	$A = \frac{\pi}{4} 7.9^2$		1.5	73.525	

Q. 6 c. Cont...

	below ground level **upto 1.5m**						
	Excavation in soft soil for lead 30m and lift 1.5m below ground level from 1.5 to 3m	1	$A = \frac{\pi}{4} 7.9^2$		1.5	73.525	
	Excavation in soft soil for lead 30m and lift 1.5m below ground level from **3m to 3.3m**	1	$A = \frac{\pi}{4} 7.9^2$		0.3	14.705	1M
							161.755
2	Excavation in Hard Murum for lead 30m and lift 1.5m below ground level from **3.3m to 4.8m**	1	$A = \frac{\pi}{4} 7.9^2$		1.5	73.525	
	Excavation in Hard Murum for lead 30m and lift 1.5m below ground level from **4.8m to 6.3m**	1	$A = \frac{\pi}{4} 7.9^2$		1.5	73.525	
	Excavation in Hard Murum for lead 30m and lift 1.5m below ground level from **6.3m to 6.7m**	1	$A = \frac{\pi}{4} 7.9^2$		0.4	19.607	1M
							166.657
3	Excavation in Hard Rock for lead 30m and lift 1.5m below ground level from **6.7m to 8.2m**	1	$A = \frac{\pi}{4} 7.9^2$		1.5	73.525	
	Excavation in Hard Rock for lead 30m and lift 1.5m below ground level from **8.2m to 9.7m**	1	$A = \frac{\pi}{4} 7.9^2$		1.5	73.525	1M
	Excavation in Hard Rock for lead 30m and lift 1.5m below ground level from **9.7m to 10.4m**	1	$A = \frac{\pi}{4} 7.9^2$		0.7	34.312	
							181.362
						Total	**509.774**

1M

1M

1M

d **Brick Work Calculation for Community Well: -**

Item No.	Description of Item	No	Length (m)	Breadth (m)	Depth (m)	Quantity (m^3)	Total (m^3)
1	Brickwork in soft soil for 0.35m wide upto 3.3m depth	1	$A = (\frac{\pi}{4} 7.3^2 - \frac{\pi}{4} 6.6^2)$ =7.642		3.3	25.219	
	Brickwork in Hard Murum for 0.5m wide from 3.3m to 6.7m depth	1	$A = (\frac{\pi}{4} 7.6^2 - \frac{\pi}{4} 6.6^2)$ =11.153		3.4	37.920	

1M

1M

Q.6 d. Cont.-		Brickwork in Hard Rock for 0.65m wide from 6.7m to 10.4m depth	1	$A = (\frac{\pi}{4}7.9^2 - \frac{\pi}{4}6.6^2)$ =14.8046	3.7	54.777		1M
						Total	**117.916**	1M

e

Standard Flooring Calculation for Community Well:-

Item No.	Description of Item	No	Length (m)	Breadth (m)	Depth (m)	Quantity (m^3)	Total (m^3)	
1	(Shahabad Flooring 2.2m wide) External Diameter = 6.6+0.35+0.35+2.2+ 2.2 = 11.7m Internal Diameter = 6.6 +0.35+0.35 = 7.3m	1	$A = (\frac{\pi}{4}11.7^2 - \frac{\pi}{4}7.3^2)$ =65.659		-	-	65.659	2M (for Descrip ion) 2M (for Calcula ion)
						Total	65.659	