C.M.R.
INSTITUTE
OF TECHNOLOGY

Department of Civil Engineering

CBCS SCHEME

USN | | | | | | | | | | |

18CV71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Quantity Surveying 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 The details of the two room building are shown in the Fig.Q1. Estimate the quantities and cost of the following items of works:
i) Earth work excavation for foundation in ordinary soil at Rs. 390/m^3.
ii) Cement concrete bed 1:4:8 for wall foundations at Rs.3600/m^3.
iii) SSM (Size Stone Masonry) in CM 1:8 for foundation and basement at Rs. 2600/m^3.
iv) First class BBM (Burnt Brick Masonry) work for super structure in CM1:6 at Rs. 5400m^3
v) RCC 1 : 1½ : 3 roof slab at Rs. 4800/m^3.

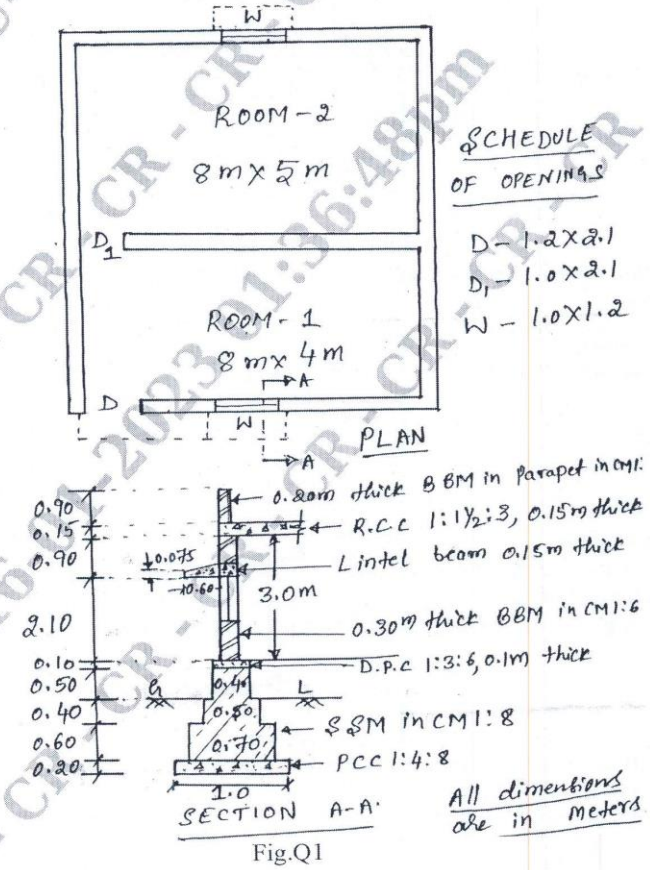

Fig.Q1 **(20 Marks)**

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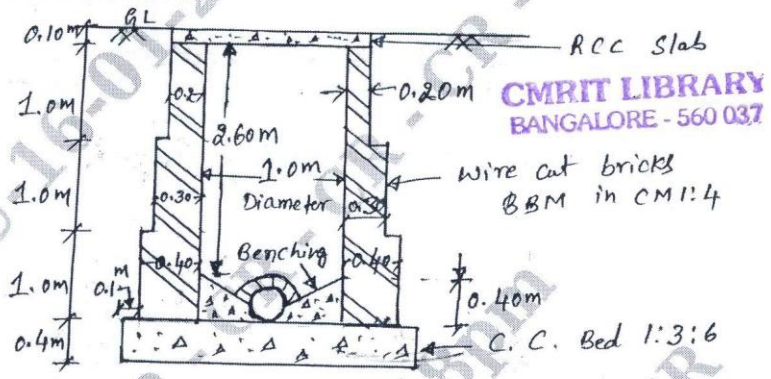
OR

2 What is an estimate? Explain briefly purpose and different types of estimate (any three). **(20 Marks)**

Module-2

3 The details of manhole is given in Fig.Q3. Estimate the quantities of the following items:
i) Earthwork excavation for foundation in hard soil
ii) B.B.M in CM 1 : 4 for walls
iii) RCC roof slab in C.C 1 : 2 : 4
iv) Plastering in CM 1 : 3 for inside walls
v) Bed concrete in CC 1 : 3 : 6.



Manhole Cross Section Details
Fig.Q3 **(20 Marks)**

OR

4 Estimate the quantities and cost of earth work for a portion of the road from the following data:

Distance in 'm'	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
R.L. of ground	114.50	114.75	115.25	115.20	116.10	116.85	118.00	118.25	118.10	117.80	117.75	117.90	117.50
R.L. of formation	115	← Upward gradient 1 in 200 →						← Downward gradient 1 in 200 →					

Formation width of road is 10m. Side slope 2 : 1 in banking and 1.5:1 in cutting. Use Mid sectional area method. Cost of earthwork in banking at Rs.300/m^3 and cost of earthwork in cutting is at Rs.400/m^3. Draw longitudinal profile of the road. **(20 Marks)**

Module-3

5 Write detailed specification for following :
i) Earthwork excavation for foundation
ii) Burnt brick masonry for super structure in CM 1 : 6.
iii) Plastering work in CM 1:6, 12mm thick
iv) R.C.C work proportion 1 : 2 : 4. **(20 Marks)**

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OR

6 Workout from the first principles the rate per unit of the following items of works.
i) PCC 1 : 4 : 8 for foundation
ii) BBM in CM 1:6 for super structure
iii) RCC roof slab 1 : 1½ : 3 with 1% steel
iv) 12mm thick plastering for inside walls in CM 1 : 6. **(20 Marks)**

Module-4

7 List the types of contract. Briefly explain any three types of contract. **(20 Marks)**

OR

8 Write short notes on :
a. Tender and its process
b. Administrative approval
c. Prequalification
d. Elements of Standard tender document. **(20 Marks)**

Module-5

9 Write short notes on :
a. EMD and SD
b. Sinking fund
c. Suspension of work
d. Mobilization and Equipment advance **(20 Marks)**

OR

10 What is valuation? Explain briefly purpose and methods of valuation of buildings. **(20 Marks)**

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SOLUTION

1. The details of the two-room building are shown in the fig. Q1 estimate the quantities and cost of the following items of works:
   i. Earth work excavation for foundation in ordinary soil at Rs 390/m³.
   ii. Cement concrete bed 1:4:8 for wall foundation at Rs 3600/m³.
   iii. SSM (Size Stone Masonry) in CM 1:8 for foundation and basement at Rs 2600/m³.
   iv. First class BBM (Burnt Brick Masonry) work for super structure in CM 1:6 at Rs 5400/m³
   v. RCC 1:1½:3 roof slab at Rs 4800/m³.

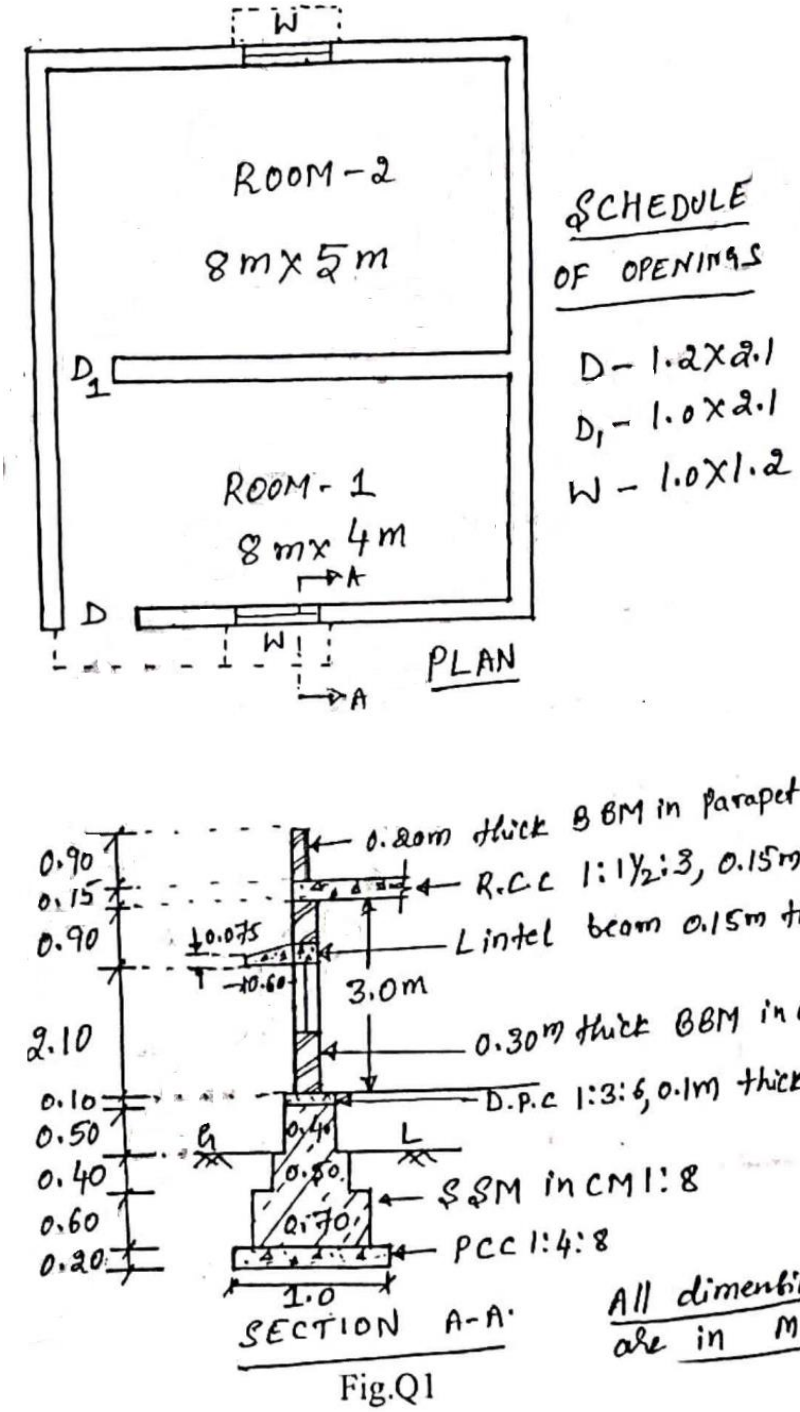


Fig.Q1

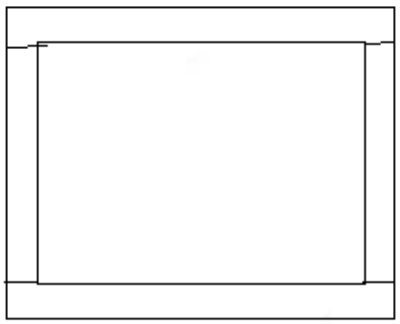
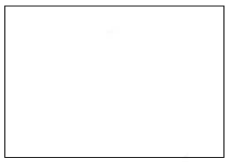
Solution:

Step 1: Calculation of total centre line distance

Total centre to centre length of 30cm wall = 3(0.30/2 + 8 0.30/2) + 2(0.30/2 +4 + 0.30 + 5 + 0.30/2)

= 44.10m

Number of junctions for 30cm wall with 30cm wall (n) = **2**

Item no.	Particulars of items	No.	**L**	B	H	Q	REMARKS
1	**Earth work excavation for foundation in ordinary soil**						
	30cm wall	1	43.10	1.00	1.20	51.72	L=44.10 – 2(1/2) H=0.20+0.60+0.40
						51.72m³	
2	**Cement concrete bed 1:4:8 for wall foundation**						
	30cm wall	1	43.10	1.00	0.20	8.62	L=44.10 – 2(1/2)
						8.62m³	
3.	**SSM (Size Stone Masonry) in CM 1:8 for foundation and basement**						
	30cm wall-step 1	1	43.4	0.70	0.60	18.23	L=44.10 – 2(0.70/2)
	Step - 2	1	43.6	0.50	0.40	8.72	L=44.10 – 2(0.50/2)
	basement	1	43.7	0.40	0.50	8.74	L=44.10 – 2(0.40/2)
					total	**35.69m³**	
4	**First class BBM (Burnt Brick Masonry) work for super structure in CM 1:6**						
	30cm wall	1	43.8	0.30	3.00	39.42	L=44.10 – 2(0.30/2)
	Parapet wall						
	Long wall	2	8.60	0.20	0.90	3.096	L=8+0.30+0.30
	Short wall	2	9.50	0.20	0.90	3.420	L=0.1+4+0.30+5+0.10=9.50
					total	**45.936m³**	
	Deduction						
	Door D	1	1.20	0.30	2.10	-0.756	
	Door D1	1	1.00	0.30	2.10	-0.630	
	Window w	2	1.00	0.30	1.20	-0.720	
	lintel						
	Door D	1	1.5	0.30	0.15	-0.0675	L=1.2+.15+.15
	Door D1	1	1.3	0.30	0.15	-0.0585	L=1+.15+.15
	Window w	2	1.3	0.30	0.15	-0.1170	L=1+.15+.15
				total	deduct	**-2.349**	
				grand	**total**	**43.587m³**	
5	**RCC 1:1½:3 roof slab**						
	slab	1	8.60	9.90	0.15	12.771	
					total	**12.771m³**	

ABSTRACT

Item no.	Particulars of items	quantity	unit	rate	per	amount
1	**Earth work excavation for foundation in ordinary soil**	**51.72**	**m^3**	390	**m^3**	20170.80
2	**Cement concrete bed 1:4:8 for wall foundation**	**8.62**	**m^3**	3600	**m^3**	31032.00
3	**SSM (Size Stone Masonry) in CM 1:8 for foundation and basement**	**35.69**	**m^3**	2600	**m^3**	92794.00
4	**First class BBM (Burnt Brick Masonry) work for super structure in CM 1:6**	**43.587**	**m^3**	5400	**m^3**	235369.80
5	**RCC 1:1½:3 roof slab**	**12.771**	**m^3**	4800	**m^3**	61300.80
					total	423074.20
				Add 5%		21153.71
				grand	total	444227.91

2. What is an estimate? Explain briefly purpose and different types of estimate (any three)

Solution: Estimate: An estimate is the anticipated or proble cost of a work and is usually prepared before the construction is taken up.

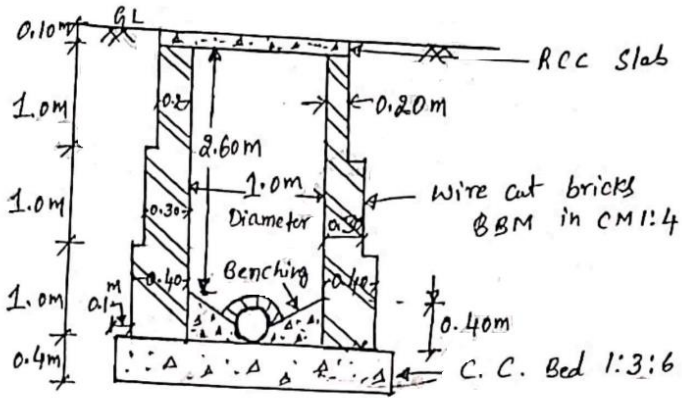
Purpose:

- To know the following before the actual construction
  - Quantity of materials required
  - Requirement of labour
  - Duration of project completion
  - Project cost

Different types of estimates are

1. Preliminary estimate
2. Plinth area estimate
3. Cube rate estimate
4. Approximate quantity method estimate
5. Detailed estimate
6. Revised estimate
7. Supplementary estimate
8. Annual repair and maintenance estimate

3. The details of manhole are given in fig Q3. Estimate the quantities of the following items:
   i. Earthwork excavation for foundation in hard soil
   ii. BBM in CM 1:4 for wall
   iii. RCC roof slab in CC 1:2:4
   iv. Plastering in CM 1:3 for inside walls
   v. Bed concrete in CC 1:3:6



Manhole Cross Section Details
Fig.Q3

Item no.	Particulars of items	No.	**L**	B	H	Q	REMARKS
1	Earthwork excavation for foundation in hard soil						
		1	A = 3.14m^2		3.5m	**10.99m^3**	D=0.1+0.4+1.0+0.4+0.1 = 2.0m A=(π/4)D^2 = (π/4)2^2= 3.14m^2 H = 0.40+1.00+1.00+1.00+0.10 = 3.5m
2	BBM in CM 1:4 for wall						
	Step 1	1	4.398	0.40	1.00	1.759m^3	D=diameter of centre line of step 1 wall=0.40/2+1+0.40/2=1.40m Perimeter = πD = π1.40 = 4.398m
	Step 2	1	4.084	0.30	1.00	1.225m^3	D=diameter of centre line of step 2 wall=0.30/2+1+0.30/2=1.30m Perimeter = πD = π1.30 = 4.084m
	Step 3	1	3.770	0.20	1.00	0.754m^3	D=diameter of centre line of wall=0.20/2+1+0.20/2=1.20m Perimeter = πD = π1.20 = 3.77m
					total	**3.738m^3**	
3	RCC roof slab in CC 1:2:4						
		1	A=1.539m^2		0.10	**0.153m^3**	D=0.2+1.0+0.2 = 1.40m A=(π/4)D^2 = (π/4)1.40^2= 1.539m^2
4	Plastering in CM 1:3 for inside walls						
		1	P=3.14	-	2.60	**8.164m^2**	D=1.0m P=πD=πx1.0=3.14m
5	Bed concrete in CC 1:3:6						
		1	A = 3.14m^2		0.40	**1.256m^3**	D=0.1+0.4+1.0+0.4+0.1 = 2.0m A=(π/4)D^2 = (π/4)2^2= 3.14m^2

4. Estimate the quantity and cost of earth work for a portion of the road from the following data:

Distance in 'm	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
R.L. of ground	114.50	114.75	115.25	115.20	116.10	116.85	118.00	118.25	118.10	117.80	117.75	117.90	117.50
R.L. of formation	115	← Upward gradient 1 in 200 →						← Downward gradient 1 in 200 →					

Formation width of road is 10m side slope 2:1 in banking and 1.5:1 in cutting. Use mid sectional area method. Cost of earthwork in banking at Rs 300/m^3 and cost of earthwork in cutting is at Rs 400/m^3. Draw longitudinal profile of the road.

Solution:

Calculation for formation level

1. Determination of change in RL of formation from chainage 0 to 600with upward gradient of 1 in 200

Increase in RL of formation for 100m = (1/200)*100 = **0.50m**

2. Determination of change in RL of formation from chainage 600 to 1200 with downward gradient of 1 in 400

Decrease in RL of formation for 100m = (1/200)*100 = **0.50m**

Calculation of height / depth

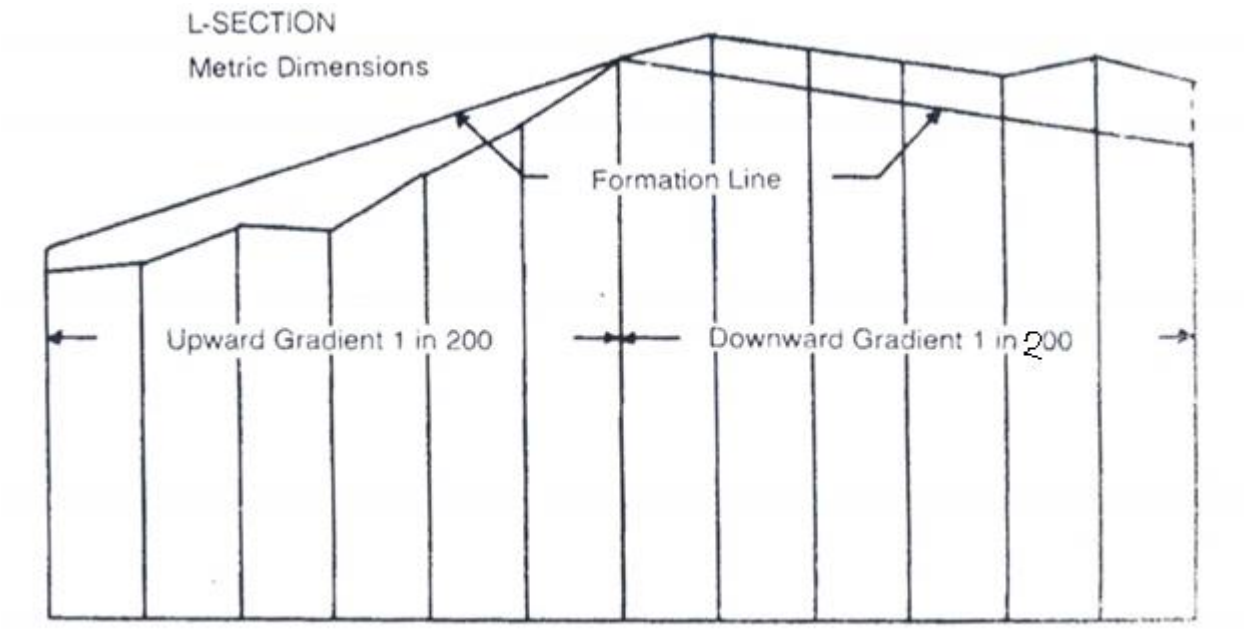
Distance	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
RL of Ground	114.50	114.75	115.25	115.20	116.10	116.85	118.00	118.25	118.10	117.80	117.75	117.90	117.50
RL of Formation	115.00	115.50	116.00	116.50	117.00	117.50	118.00	117.50	117.00	116.50	116.00	115.50	115.00
Height of bank	0.50	0.75	0.75	1.30	0.90	0.65	0.00						
Depth of cutting								0.75	1.10	1.30	1.75	2.40	2.50

Calculation of quantities of earthwork

Station	Distance	Height/ Depth	Mean; Depth	Sectional area $Bd+sd^2$	Distance between section	Quantity in Banking	Quantity in cutting
0	0	0.50	-	-	-	-	-
1	100	0.75	0.625	7.03	100	703	
2	200	0.75	0.750	8.63	100	863	
3	300	1.30	1.025	12.35	100	1235	
4	400	0.90	1.100	13.42	100	1342	
5	500	0.65	0.775	8.95	100	895	
6	600	0.00	0.325	3.46	100	346	
7	700	-0.75	0.375	3.96	100		396
8	800	-1.10	0.925	10.53	100		1053
9	900	-1.30	1.200	14.16	100		1416
10	1000	-1.75	1.525	18.74	100		1874
11	1100	-2.40	2.075	27.21	100		2721
12	1200	-2.50	2.45	33.50	100		3350
					Total	5384	10810

Abstract of Estimated cost

Item No.	Particulars of Item	Quantity	Unit	Rate	Per	Cost
1	Earth work in bnaking	5384	Cu.m	300.00	cu.m	1615200
2	Earthwork in cutting	10810	Cu.m	400.00	cu.m	4324000
					Total	5939200
					Add 5%	296960
					Grand total	6236160



5. Write detailed specification for following:
    i. Earthwork exaction for foundation

1. Earthwork excavation:

Excavation:

1. The excavation for the foundation trenches shall be carried out in all sort of soil as per plan approved at site. For that, necessary working of Centre line shall be done.
2. The sides of foundation trenches shall be truly vertical and bottom shall be uniformly leveled.
3. If the soil is not good, sides should be sloped back or timber shoring is provided.
4. The excavated material shall be stacked away from the sides of trench of the excavation by at least 1m.

Finish of the trench:

1. The bed of the trenches shall be lightly watered and will ram.
2. It should be level both longitudinally and transversely.
3. Soft or defective spots shall be dug out and removed and filled with concrete or with stabilized soil.
4. The excavation shall be measured as per exact length and width of lowest footing (as per the drawings).The depths of trench shall be measured vertically.

Finds:

1. The material of valuable things during excavation shall be property of the Government.

Trench filling:

1. The excavated material shall be filled in the plinth in layers of 15cms watered and well-rammed.
2. The excess (surplus) material shall be spread out uniformly up to lead of 100m leveled and dressed..

Water:

1. Water, if any accumulates in the trench, should be pumped out without any extra payment and necessary precautions shall be taken to prevent surface water to enter into the trench.

Excavation in saturated soil

1. Pumping or bailing out of water and removal of slush should also be considered.
2. Any extra support required for trench support should also be accounted for.

Measurement:

1. The rates of excavation include all timbering and other supports, which are necessary for securing the sides of the trenches.
2. Measurement of earthwork is taken in m^3.
3. Rates shall be for complete work for 30 m lead and 1.5 m lift including all tools and plants for its excavation.

ii. Brunt brick masonry for super structure in CM 1:6

3. Brickwork I class or (Burnt brick masonry 1:6)

Bricks:

1. Bricks shall be free from cracks and flaws and nodules of free lime.
2. Bricks shall have smooth rectangular faces with sharp corners.
3. Thoroughly burnt, and shall be of deep cherry red or copper colour.
4. Water Absorption Shall not be more than 20% by weight up to class 12.5 and 15% by weight for higher classes.
5. Efflorescence shall not be more than 'moderate' up to class 12.5 and 'slight' for higher class.
6. Compressive Strength Compressive strength of any individual brick shall not be less than the minimum compressive strength for the corresponding class of brick as per 1077 (1992).

Class designation	35	30	25	20	17.5	15	12.5	10	7.5	5	3.5
Avg compressive strength N/mm^2	35	30	25	20	17.5	15	12.5	10	7.5	5	3.5

Mortar:

1. For cement mortar cement shall be fresh Portland cement and confirms IS 12269(1987).
2. Sand shall be clean and free from organic and foreign matters.
3. Proportion of cement sand mortar may be of(1:3 to 1:6 as specified).
4. Materials for mortar shall be measured with measuring box and first mixed dry to have a uniform colour in a clean masonry platform and then mixed thoroughly by turning at least three times.
5. Fresh mixed mortar shall be used, old and stale mortar shall not be used.
6. For lime mortar, lime shall be fresh and slaked and screened at site of work.

Soaking of brick:

1. Soaking of brick- bricks shall be fully soaked in clean water by submerging in a tank for a period of 2 hours immediately before use, otherwise bricks will absorb water from mortar and mortar become weak.

Laying:

1. Bricks shall be well bonded and laid in English bond unless otherwise specified. Vertical joints of consecutive course shall not come directly over one another; vertical joints in alternate course shall come directly over one another.
2. Mortar joints shall not exceed 10 mm.
3. Closers shall be clean cut and best shaped bricks shall be used for face work.
4. Bricks should be laid with frogs upwards except in the top course where frogs shall be placed downward.
5. Brickwork shall not be carried out to more than 1 m height at a time.
6. When one part of the wall has to be delayed, stepping shall be left at an angle of 45°.
7. Projections if made should not be more than ¼ brick projections in one course.
8. All joints should be raked and faces of wall cleaned at the end of each day's work.

Curing:

1. The brickwork shall be kept wet for a period of at least 10 days after laying.

iii. Plastetring work in CM 1:6, 12mm thick

2. Plastering cement mortar or lime mortar:

***Preparation of the surface*:**

1. The joints of the brickwork shall be raked out to a depth of 18mm (3/4") and the surface of the wall shall be washed and kept for two days before plastering.

Batching and mixing:

1. The materials of mortar, cement and sand or kankar lime shall conform to standard specifications.
2. The materials shall be first dry mixed, by measuring with boxes to have the required proportion, and then water added slowly and gradually and mixed thoroughly.

Process of plastering

1. The thickness of plastering shall be as specified usually 12mm applied in two or three coats. To ensure uniform thickness of plaster, patches of 15cm strips 1m apart or 10cm wide plaster shall be applied first at about 2cm apart to act as a guide.
2. First mortar shall be dashed and pressed over the surface and then brought to a true smooth and uniform surface by means of float and trowel.
3. External plastering shall be started from top and worked down towards floor.
4. Internal plastering shall be started wherever the building frame is ready and centering of the roof slabs has been removed.
5. Ceiling plastering shall be completed before starting of wall plaster. All corners and edges shall be rounded. The plastered surface shall be kept wet for 10 days. The surface should be protected from rain, sun, frost, etc.
6. The second coat shall then be applied on the wetted surface of the second coat and finish smooth to true even surface by float and trowel.

Finishing:

1. The work shall be tested with a straight edge and plumb bob. At the end of the day the plaster shall be left cut clean to line.
2. When the next day's plastering is started the edge of the old work shall be scrapped, cleaned and wetted with cement slurry. At the end of the day the plastering shall be closed on the body of the wall and not nearer than 15cm to any corner.

Curing:

1. Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered. Any defective plaster shall be cut in rectangular shape and replaced.

iv. RCC work proportion 1:2:4

Materials:

1. The coarse aggregate shall be hard or tough and free from dust, dirt, etc . The stone ballast shall be of 20 mm size or down and retained on 4.75 mm square mesh and well graded such that the voids do not exceed 42%. The size of coarse aggregate depends on the nature of the work.
2. The sand shall be coarse of 4.75mm maximum size and down, well graded, clean and free from dust, dirt, and organic matters.
3. Cement shall be fresh ordinary portland cement of standard I.S.I specifications and shall have required tensile and compressive stresses and fineness.
4. Water shall be clean and free from alkaline and acid matters.

Proportion:

1. Proportion of concrete shall be 1:2:4 as cement: sand: stone ballast by volume with boxes .
2. Minimum compressive strength of concrete shall be 140 kg per sq cm on 7 days.
3. Stone aggregate and sand shall be measured by volume with boxes. Cement is measured in bags of 50 kg each.
4. All materials shall be dry. If moist sand is used additional weight has to be taken to account for bulking of sand.

Mixing:

1. Mixing of concrete shall be either by hand mixing or by machine mixing.
2. Hand mixing is generally done on masonry platform or on an iron tray.
3. Initially sand and cement are mixed. After that this mix is placed over aggregate and water is gradually added. Water is added at the rate of 25-30 litres per bag of cement.
4. The mix shall be mixed thoroughly to give a uniform concrete.
5. In a mechanical mixer, the cement, fine aggregate and stone aggregate are mixed in dry condition. After dry mixing water is added gradually at the rate of 25-30 litres per bag of cement.

Slump

To ensure workability slump test is performed. A slump of 7.5-10 cm is allowed for building work and 4-3 cm is allowed for road work.

Formwork:

1) Formwork centering and shuttering shall be provided to support or to keep concrete in position.
2) Inner surface should be oiled to prevent concrete sticking to it
3) Base of formwork over which concrete is laid shall be sprinkled with water before concrete is laid.
4) Forms should not be removed before 14 days , however side forms may be remove after 3 days of concreting.
5) Formwork should be removed carefully without actual disturbance of concrete.

Laying:

1. Concrete shall be placed gently in layers not exceeding 15 cm and compacted by mechanical vibrators till a dense concrete is obtained.
2. Concrete should be laid continuously, is laying is suspended for rest or for the following day, the end shall be sloped at an angle of 30° and made rough for further jointing.
3. Before persuing with the work on the next day, the previous sloped portion is roughened, cleaned and watered and a grout of neat cement shall be applied before fresh concrete is laid.
4. For successive layer, the upper layer shall be placed before the lower layer is set.

Curing:

1. Once the concrete gets hardened, it has to be covered with wet gunny bags or wet sand for 24 hrs and then cured by flooding with water by making mud walls high or by covering with wet sand or earth and kept damp continuously for 15 days.

6. Workout from the first principles the rate per unit of the following items of works

   i. PCC 1:4:8 for foundation

Take 10 m^3 unit = 1 m^3

Calculation for dry ingredients of concrete:

We know that **to get 10m^3 of compacted concrete we require 15.2 m^3 of dry ingredients of concrete.**

Cement = {15.2 / (1+4+8)}*1*30 = **35.07 bags**

Fine Aggregate = {15.2 / (1+4+8)}*4 = 4.67 m^3

Coarse Aggregate = {15.2 / (1+4+8)}*8 = 9.353 m^3

Particulars	Quantity	Rate	Cost
Materials			
i) Cement	28.5 bags	Rs 350 per bag	9975.00
ii) Sand	4.75 m^3	Rs 250 per m^3	1187.50
iii) Coarse aggregate	9.5 m^3	Rs 300 per m^3	2850.00
Labour			
Head Masson	1	Rs 500 per day	500.00
Masson	4	Rs 450 per day	1800.00
Mazdoor (heavy)	8	Rs 350 per day	2800.00
Mazdoor (light)	6	Rs 300 per day	1800.00
Bishti/ water man	6	Rs 250 per day	1500.00
Tools and plants	lumpsum	Rs 500.00	500.00
		Total	22912.50
	Add 10%	Contractors profit	2291.25
	Add 1.5%	Water charges	343.68
	Grand Total		25547.53
Rae per cubic meter of concrete = 25547.53/10 =	Rs 2554.75 per m3		

ii. BBM in CM 1:6 for super structure

Take 10 m^3 unit = 1 m^3

Calculation for dry ingredients of mortar:

We know that **for 10 m^3 of brick masonry we require 3 m^3 of dry ingredients of mortar.**

Cement = {3/ (1+6)}*1*30 = **12.9 bags**

Fine Aggregate = {3 / (1+6)}*6 = **2.58 m^3**

Particulars	Quantity	Rate	Cost
Material			
i) Cement	12.9 bags	Rs 350 per bag	4515.00
ii) Sand	2.58 m^3	Rs 250 per m^3	645.00
iii) Bricks	5000 No.	Rs 3 per brick	15000.00
Labour			
Head Masson	½ no.	Rs 500 per day	250.00
Masson	10 no.	Rs 450 per day	4500.00
Mazdoor (heavy)	12 no.	Rs 350 per day	4200.00
Mazdoor (light)	5 no.	Rs 300 per day	1500.00
Bishti/ water man	2 no.	Rs 250 per day	500.00
Tools and Plants	lumpsum	Rs 100	100.00
		Page total	31210.00
	Total		31210.00
	Add 10%	Contractors profit	3121.00
	Add 1.5%	Water charges	468.15
	Grand total		34799.15
Rate per 1 m3 of brickwork = 34799.15 / 10 =	Rs 3479.91/-	Per m3	

iii. RCC roof slab 1:1½:3 with 1% steel

Take 10 m^3 unit = 1 m^3

Calculation for dry ingredients of concrete:

We know that **to get 10m^3 of compacted concrete we require 15.2 m^3 of dry ingredients of concrete.**

Cement = {15.2 / (1+1.5+3)}*1* 30 = **82.90 bags**

Fine Aggregate = {15.2 / (1+1.5+3)}*1.5 = 4.145 m^3

Coarse Aggregate = {15.2 / (1+1.5+3)}*3 = 8.290 m^3

Particulars	Quantity	Rate	Cost
Material			
i) Cement	82.90 bags	Rs 350 per bag	29015.00
ii) Sand	4.145 m^3	Rs 250 per m^3	1036.25
iii) Coarse aggregate	8.290 m^3	Rs 300 per m^3	2487.00
Steel (1 % of 10 m^3 of concrete) = 0.1 m^3 @ 78.5q/m^3 = 7.85q	7.85 q	2500 per q	19625.00
Binding wire	1.5 kg	20 per kg	30.00
Labour			
Head Masson	½ no.	Rs 500 per day	250.00
Masson	3 no.	Rs 450 per day	1350.00
Mazdoor (heavy)	3 no.	Rs 350 per day	1050.00
Mazdoor (light)	20 no.	Rs 300 per day	6000.00
Bishti/ water man	6 no.	Rs 250 per day	1500.00
Bending cranking and binding @ 150/- per quintal	7.85 q	150 per q	1177.50
Centring and shuttering @ 200/m3	10 m3	200 per m3	2000.00
Tools and plants	lumpsum	500.00	500.00
	Total		66020.75
	Add 10%	Contractors profit	6602.07
	Add 1.5%	Water charges	990.31
	Grand total		73613.13
Unit rate for RCC beam = 73613.13/ 10 =	Rs 7361.31	Per m3 of RCC	

iv. 12mm thick plastering for inside walls in CM 1:6

Take 100 m^2 unit = 1 m^2

Calculation for dry ingredients of mortar:

We know that **for 100 m^2 of 12mm plastering we require 2 m^3 of dry ingredients of mortar.**

Cement = {2/ (1+6)}*1*30 = **8.57 bags**

Fine Aggregate = {2 / (1+6)}*6 = **1.71 m^3**

Particulars	Quantity	Rate	Cost
Material			
i) Cement	8.57 bags	Rs 350 per bag	2999.50
ii) Sand	1.71 m^3	Rs 250 per m^3	427.50
Labour			
Head Masson	½ No.	Rs 500 per day	250.00
Masson	10 No.	Rs 450 per day	4500.00
Mazdoor (heavy)	10 No.	Rs 350 per day	3500.00
Mazdoor (light)	5 No.	Rs 300 per day	1500.00
Bishti/ water man	2 No.	Rs 250 per day	500.00
Tools and Plants	lumpsum	Rs 100	100.00
	Total		13777.00
	Add 10%	Contractors profit	1377.70
	Add 1.5%	Water charges	206.65
	Grand total		15361.35
Rate per 1 m2 of Plastering =15361.35/100	Rs153.61	Per m2	

7. List the types of contract. Briefly explain any three types of contact.

Types of Contracts

1. Item of contract
2. Percentage rate contract
3. Lump sum contract
4. Labour contract
5. Materials supply or contracts for the supply of materials
6. Piece work agreement
7. Turn key job or combined engineering and construction contract
8. Measured contract or schedule contract
9. Rate contract

1. **Item rate contract:** it is also called as unit price contract or schedule contract. For item rate contract, contractors are required to quote rates for individual at items of work on the basis of schedule of quantities furnished by the department. This schedule indicates full nomenclature of the items as per sanctioned estimate, estimated quantities etc. while filing up the rates, the contractor are required to express the amount in figures and words and also to work out the cost against each item this type of contract is followed by railway department.
2. **Percentage rate contract:** this type of contract is convenient as the lowest rate and comparative position of the contractor are readily known just on the opening of the tender. This is also called as cost plus contract. In this type of contract, the rate for various items are fixed by the department and the contractor agrees to do the works at a percentage above or below the fixed rates. This method is adopted for works at places where a complete schedule of rates is available.
3. **Lump-sum contract:** In this type of contract the contractors have to quote a lumpsum figure for completing the work according to the given specifications and drawings etc. this type of contracts are given only in exceptional cases. The contracts must include necessary condition to safeguard and protect the interest of the government.

   Advantages:
   1. The cost of the work is known before hand.
   2. Detailed measurement of the work done is not required except in case of any addition and alteration.
   3. Proper planning and efficient management for execution of work is more convenient.

   Disadvantages
   1. Making an intermediate payment to contractor is not possible.
   2. Detailed drawing with full information and specification is essential to avoid any dispute.

8. Write short notes on:
   i. Tender and its process

Tender: is a written offer submitted by the contractor to execute certain work like tender for designing a structure.

- Pre-Tender action: include all the activities prior to the announcement of **Tender**, which involves
  - Preparation of Documents
    - Layout plan
    - Set of the drawing
    - Specification
    - Schedule of rates
    - Conditions of contract
    - Security deposit
    - Mode of payment
  - Preparation of 'Notice Inviting Tender'(NIC)(Form – 6), 'Invitation for Tender'(IFT) or 'Invitation to Tender'(ITT)
  - Printing Tender form with standard conditions of contract
  - Issue or publication of Tender Notice in NEWS paper, Notice board, web site(bbmp.gov.in/tender)

Post-Tender action: means the activities which follows after the issue of Tender Notice

- Bid submission
- Opening of Tender
- Acceptance of Tender
- Award of Contract

ii. **Administrative approval:** it denotes the formal acceptance by the department concerned (authority) of the proposal, and after the administrative approval is given the engineering department take up the work and prepares detailed designs, plans, estimates and execute work. This approval authorises the engineering department to take up the work. This is the last stage in the investment decision making before execution of project starts. authority to sanction the proposal may be chief executive of the plant, Chairman of the company, Board of directors, Ministry of finance for public sector etc.

iii. **Prequalification:** Sometimes works are awarded on the basis of quotations invited from a group of 'selected tenderer' (a group of known reputed contractors) who are considered suitable for that job. This method is known as 'pre-qualification' and saves a lot of time. In the advertisement itself it must be mentioned that only contractors having experience in the particular work should submit the tender.

iv. **Elements of standard tender document:**

- Notice Inviting Tender (NIT)
- Tender form
- Schedule of quantities of work, material, tools and plants to be supplied by the department
- List of terms and conditions of contract
- Specification of work
- One set of approved drawings
- DD for EMD

All the above documents are signed by tenderer page by page

9. **Wrote short notes on:**

i. **EMD and SD**

Earnest Money Deposit (EMD): While submitting a tender the contractor is to deposit a certain amount, about 2% of the estimated cost, with the department, as guarantee of the tender. This amount is for a check so that the contractor may not refuse to accept the work or run away when his tender is accepted. In case the contractor refuses to take up the work his EMD is forfeited. EMD of the tenderer whose tender has not been accepted is refundable.

Security Deposit (SD): on acceptance of the tender, the contractor has to deposit 10% of the tendered amount as security money with the department which is inclusive of the earnest money already deposited. This amount is kept as a check so that contractor fulfil all the terms and conditions of the contract and carries out the work satisfactorily according to the specifications and maintain progress and complete the work in time. If the contractor fails to fulfil the terms of contract his whole or part of the security money is forfeited by the department. The security money is refunded to the contractor after the satisfactory completion of the whole work after a specified time, usually after one rainy season or six months of the completion of the work. Instead of collecting the whole SD in one instalment before starting the work, this can be collected gradually by deducting from the running account bill of the contractor. Usually the earnest money is taken as part of the security money and the balance amount of the security money is collected by deduction from the running account bill of the contractor at 10% of the every running bill, up to the extent of 10% of the total cost of whole work.

ii. **Sinking fund**

The fund which is gradually accumulated by way of periodic (annual) deposit for the replacement of the building or structure at the end of its useful life, is termed as sinking fund. The object of sinking fund is to accumulate sufficient money to meet the cost of construction after its utility period. The sinking fund is created by regular annual deposits in compound interest bearing investment, which will form the amount of replacement at the end of the utility period of the property. The calculation of sinking fund depends on the life of the building and scrap value of the building for the cost of old materials. The cost of land is not taken into account in calculating sinking fund as land remains intact.

$$s = \frac{S.i}{(1+i)^n - 1}$$

Where s = sinking fund instalment (annual)

S = total amount of sinking fund to be accumulated

i = rate of interest in decimals

n = number of years required to accumulate the sinking fund

iii. Suspension of work

Due to some unavoidable circumstances, the owner may request the contractor to stop the work for a certain period. A clause is therefore inserted to give such power to the owner and it should contain the two following important points:

1. Extension of time limit to be granted for the actual period of suspension.
2. Owner to pay amount to the contractor for damages due to such delay.
   A typical clause can be framed as follows: the owner reserves the right to suspend the whole work or part of the work under this contract at any time. It is agreed that the extension of time for completion equal to the actual period of suspension by the owner shall be granted to the contractor and the owner shall also pay the amount for the damages or the losses suffered by contractor due to such suspension. Such amount shall be claimed by the contractor in writing and the engineer shall fix a fair and reasonable amount for such claim.

iv. Mobilization and Equipment advance

Mobilizaton and equipment advances: the basic purpose of mobilization advance payment is to extent financial assistance within the terms of contract to the contractor to mobilize the man and material resources for timely and smooth take off of the project or procurement of the equipment material or other services contract.

10. What is valuation? Explain briefly purpose and methods of valuation of building.

Valuation is a technique of establishing the fair price or value of a property such as a building, factory, land etc. It is the method of determining the present value of the property. Valuation of personal property is based on principles of economics (supply and demand).

Valuer: A person doing the work of valuation.

Purpose of Valuation

i. Sales and purchase of property
ii. Mortgage of site or building for money
iii. To calculate Insurance premium
iv. Fixing the property Tax
v. To fix flat Rent.
vi. Compensatory amount calculation during Compulsory acquisition of land for the construction of public infrastructure.
vii. To asses Betterment charges to be laved on property owners by municipal autorities
viii. To Court fee when two parties go to court for settlement of property disputes.
ix. Reinstatement of building
x. To recalculate the building value due to speculation.

Methods of Valuation:

1. Rent return method:

   To workout capitalised value by rent return method, the following information is required to be collected.

   a. Land and its tenure: area of land and whether it is free hold or on lease.
   b. Cubic content of the building: length, width and height of constructed building.
   c. Future life of building: expected future life to account for sinking fund.
   d. Gross rent: rent as realised if the property is let out.
   e. Out goings: like taxes, maintenance
   f. Year's purchase: It is worked out by knowing rate of interest, life of property and sinking fund coefficient.
   g. Land value: present value of land is obtained by knowing the present rate of land from revenue records, prevalent rate of interest and future life of property.

   We know that

   Net rent = gross rent – out going

   Knowing future life of the property and rate of interest, year's purchase can be calculated as:

   $Y.P = 1/(i + S_c)$ where S_c = coefficient of Sinking fund

   Capitalised value = Net rent x Y.P.

2. Valuation of land and building basis:

   When rent cannot be ascertained by direct method for building like schools, clubs etc the valuation is done on the cost of land to which the depreciated cost of the building is added.

   Cost of the land is approximately determined by taking the average of the sale deeds of the near past. Suitable increase or decrease is allowed tot he cost arrived by above method according to the location of the plot, its topography, shape and ratio of its length to depth, mode of payment etc.

   Depreciated cost of the building is arrived at by knowing its life and its age. From the capitalised cost of the building worked out from its cubical content or otherwise, the depreciation as per present age of the building or otherwise, the depreciation as per present age of the building is deducted to get the depreciated cost of the same.

   Sinking fund deposited is also taken as depreciation for the purpose of calculation of net value of a property.

   Calculation of value of a property by taking sinking fund as depreciation is also called as replacement cost of method of valuation.

3. Development method or residual method of valuation: a big plot of land is divided into small available units which are planed and provided with best of amenities but at least possible expenses. The plot to develop will fetch more money as compared to the whole plot developed as one unit.

   Almost 30% of the land should be provided for necessary amenities like roads, garden, parks, electric sub-station, water facility etc. In an existing building if some improvements are to be made, the development method of valuation may be used.

4. Valuation on profit basis: this valuation generally done for commercial buildings like hotels, cinemas, theatres and it is based on the profit of business in such properties. Net interest of capital invested by the owner of the business and remuneration of his labour. This net profit taken as net rent which can be scanning realised and capitalised value is determined by multiplying it with year's purchase.

5. Valuation based on cost: in this method the cost of providing a new construction at the prevailing rate or in possessing the property is taken as the bases to determine the value of the property. In such case necessary depreciation should be allowed. Finally the cost of land and adjusted reproduction cost are added together to get the value of the property.

6. Depreciation method of valuation : According to this method the depreciated value of the property on the present day rates is calculated by

$$D = P\{(100 – rd)/100\}^n$$

Where D = depreciated value

P = cost at present market rate

Rd = fixed percentage of depreciation

n = the no. Of years the building had been constructed

the value of rd may be taken as

for building or structures having life 75 to 199 years = 10

" " " " " 50 to 75 years = 13

" " " " " 25 to 50 years = 20

" " " " " 20 to 25 years = 40

" " " " " up to 20 years = 50

To find total valuation of the property, the present value of land, water supply, electric and sanitary fitting etc. Should be added to above value.