Pinnacle
DEGREE & DIPLOMA
ENGINEERING

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)

(ISO/IEC -270001 – 2005 certified)

WINTER -2019 EXAMINATION

Subject code: 22503 **Model Answer**

Important Instructions to examiners:

1) The answers should be examined by keywords and not as word-to-word as given in the model answer scheme.

2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.

3) The language error such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and communication skill).

4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figure drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.

5) Credits may be given step wise for numerical problems. In the some cases, the assumed constant values may vary and there may be some difference in the candidate's answer 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 program based on equivalent concept.

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Q. No.	Sub Q. No.	Question and Model Answers	Marks
1		**Attempt any FIVE of the following:**	10
	a)	**State mode of measurement for following items of work as per I.S. 1200**	
		Ans: i. Inspection chamber ---------- Numbers (Nos.) ii. Ironwork in truss ---------- Kg or Quintal or Tone iii. Timbering of trenches -------- Square meter / m2 iv. PCC in foundation ---------- Cubic meter / m3	**1/2 M For each**
	b)	**State any four purposes of preparing approximate estimate**	
		Ans: 1. To give the rough idea of probable expenditure in short time without calculating the actual quantities, from the cost of similar structure having similar specification, construction & locality. 2. In case of Government & public bodies, for sanctioning of the expenditure required for the project in the form of Administrative approval. 3. In case of commercial projects to study the cost-benefit ratio. If it is justified the project is carried out. 4. For BOT/PPP Systems approximate estimates plays important role for decision making & for preparation of Feasibility Report of Project	**1/2 M each (for any four)**

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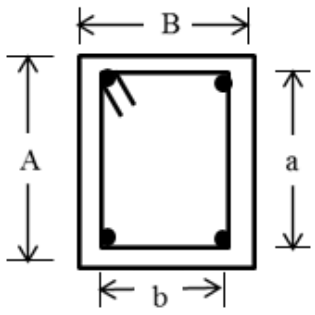
		5. For framing Tax Schedule & Insurance requirement. 6. For buying & sailing and Rent Fixation.	
	C)	**Define i) Administrative approval ii) Technical Sanction:-**	
		Ans: i) Administrative approval:- It is the permission given by the highest authority of the user department for the execution of proposed project on the basis of approximate estimate of the project. ii) Technical Sanction:- It is the sanction given by the highest authority of the executive department to the detailed estimate of th proposed project prepared by executive division.	**1 M each**
	d)	**State the meaning of work charged establishment and give its general percentage**	
		Ans: The work charge establishment are the establishment which is directly connected with work. During the construction of a project/work some supervisory staff such as supervisors, watchman, store clerk etc. are appointed on temporary basis. 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	**1 M** **1M**
	e)	**Define i) Lead ii) Lift**	
		Ans: **Lead:-** The horizontal distance between the trench pit and the place where excavated earth is placed is called as lead. Generally standard lead is taken 30 m **Lift:-** It is the vertical distance between point of excavation and point of disposal. . Generally standard lead is taken 1.5m	**1 M each**
	f)	**Suggest the method of approximate costing for**	
		Ans: i. Steel bridge :- Typical bay method ii. Highway an Roads :- Service unit method iii. RCC Retaining Wall :- Service unit method or Approximate quantity method **iv.** Irrigation Canal ;- Service unit method	**1/2 M For each**
	g)	**Draw section of two legged stirrup and state formula for finding total length of stirrup**	
		 **a=A-(2 X Cover)** b = B - (2 x cover) Total length of stirrup = 2 x (a+ b) + 24 x d where, d = diameter of stirrup	**1 M** **1 M**

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2		**Attempt any THREE of the following:**	**12 M**
	a)	**State the rules for deduction of plaster works as per IS 1200.**	
		Ans: i. No deduction is made for ends of beams, posts, rafters, purlins etc. ii. No deduction is made for opening up to 0.5 sq. m. and no addition is made for jambs, soffits, and sills of these openings. iii. For opening more than o.5 sq. m. and up to 3 sq. m. deduction is made for one face only. No addition for jambs, soffits, and sills of these openings. **iv.** For opening above 3 sq. m. deduction is made for both faces of openings and the jambs, soffits, and sills shall be added.	**1 M each**
	b)	**State & explain data required for preparing detailed estimate**	
		Ans: i. Drawing: Quantities of various items are calculated on the basis of given drawing ii. Specification: Specification gives description of material to be used, mode of execution quality of work etc. The rates are varies according to specification iii. Rates: The rates of various materials used in the construction and the wages of different categories of labour should be available for preparing estimate. iv. Modes of measurement: Mode of measurement for different item of work are taken with reference to IS 1200.	**1 M each**
	C)	**Prepare approximate estimate for a Government office building with given data**	
		Ans: Total area of rooms = area of each room x no. of rooms = 60 x 14 = 840 Sq.M.	**1 M**
		Area of other facilities = 150 Sq.M.	
		Total area = area of rooms + Area of other facilities = 840 + 150 = 990 Sq.M.	**1 M**
		$\text{Built up area rate} = \frac{\text{Cost of construction of existing similar office}}{\text{Built up area of existing similar office}}$ $\text{Built up area rate} = \frac{35500000}{1100}$	
		Built up area rate = 32272.727 Rs. / Sq.M	**1 M**
		Approximate estimate = Total area x Built up area rate = 990 x 32272.727 = 31950000 = 3.195 Crores	
		Approximate estimate for a Government office building = Rs. 3.195 Crores	**1 M**

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	d)	**State the desired accuracy in taking measurements of items of works as per IS : 1200**	
		Ans: To achieve the desired accuracy in measurements, following points must be observed. A) 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. B) 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	**2 M** **2 M**
3		**Attempt any THREE of the following:**	**12**
	a)	**Prepare preliminary estimate of a building project with a total plinth area of all building of 1400 Sq. M.** **Given-** **i) Plinth area rate = Rs. 3800/- per Sq. M.** **(ii) Special architectural treatment = 1.5% of the building cost.** **(iii) Water supply and sanitary installations = 5% of the building cost.** **(iv) Internal installations = 14% of building cost.** **(v) Other services = 6% of the building cost.** **(vi) Contingencies = 3%** **(vii) Supervision charges = 8%**	
		Ans: **Preliminary Estimate of a building** – Building Cost = Plinth area x Plinth area rate = 1400 x 3800 = Rs.5320000/- Add for	**1/2 M**
		1) Special Architectural treatment (1.5%) = 1.5/100 x 5320000 = Rs.79800/- 2) Water supply and sanitary installations (5%) = 5/100 x 5320000 = Rs.266000/- 3) Internal installations (14%) = 14/100 x 5320000 = Rs.744800/- 4) Other Services (6%) = 6/100 x 5320000 = Rs.319200/-	**2 M**
		Total Cost = Building Cost + $\sum(Sr.No.1\ to\ 4)$ = 5320000 + (79800 + 266000 + 744800 + 319200) = Rs.6729800/- Add (i) Contingencies (3%) = 3/100 x 6729800 = Rs. 201894/- (ii) Supervision Charges (8%) = 8/100 x 6729800 = Rs. 538384/- Grand Total or Estimated cost of the building = 6729800 + 201894 + 538384 = **Rs.74,70,078/-**	**1/2 M** **1/2 M** **1/2 M**

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b) Explain the term – 'Spot items' and give any two examples of it.

Spot items – These are certain items, for which it is not possible for the estimator to fix an amount without seeing and studying them in detail. Such items are known as spot items. **01 M**

Estimate of spot items can be prepared only after inspection and taking detailed measurements at site. **01 M**

Examples –

1) Construction of an opening in existing wall.
2) Demolishing existing structure.
3) Connecting an old building with new building.
4) Dewatering of trenches.

01 M EACH (for any two)

c) Distinguish between Long Wall – Short Wall method and centre line method. (any four points of differences)

Ans:

Sr. No.	Long wall-Short wall Method	Centre line method
1)	In this method structure is divided into long walls and short walls.	In this method structure is not divided into any category but treated as a whole.
2)	Centre to centre distance for long walls and short walls are to be calculated.	Total centre line length is to be calculated.
3)	No consideration is given to the no. of junctions.	Due consideration is given to no. of junctions.
4)	Calculations by this method are lengthy.	Calculations in this method are less and easy.
5)	This method is used for calculating quantities of any type of building.	This method is suitable for calculating quantities of rectangular, circular and polygonal buildings.
6)	It is more accurate when there are more no. of junctions.	When there are more no. of junctions and varying widths, method may create confusion.
7)	Total Quantity of item = (No. x length of long wall x width x height) + (No. x length of short wall x width x height)	Total Quantity of item = Net centre line length x width x height

1 M each (for any four)

d) For a RCC framed structure, there are six columns of size 230 x 300 mm and length of column 3.60 m each. Work out the total approximate quantity of steel required for all columns.

Ans:

Given- Size of column = 230 x 300 mm **01 M**

Length of column = 3.60 m

No. of columns = 6

Volume of concrete columns = No. of columns x Volume of one column **01 M**

= 6 x (0.23 x 0.30 x 3.60)

= 1.4904 Cu.M **02 M**

Assume approximate quantity of steel = 1%

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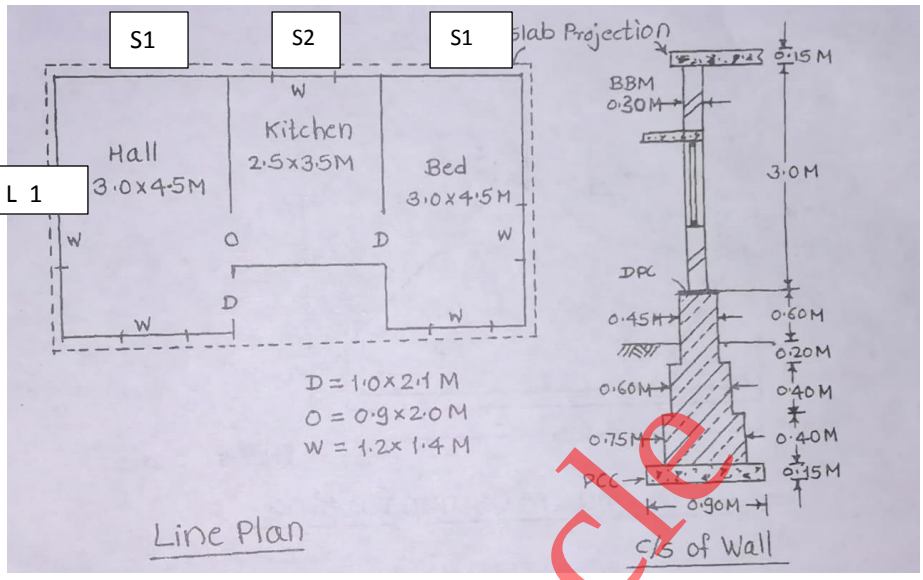
		Quantity of Steel = 1/100 x 1.4904 x 7850 = **116.9964 kg. Say 117 kg** = 0.117 Tonne **Note :- Students may assume different approximate quantity of steel**	
4		**Attempt any <u>THREE</u> of the following:**	**12**
	a)	**Calculate the quantity of excavation for foundation for structure shown in Figure No. 1.**	
		Ans:  Ans: **<u>By long wall and short wall method:</u>** C/c distance for Long walls L1 = 4.5 + 0.3 = 4.8 m (04 Nos.) C/c distance for Short walls S1 = 3.0 + 0.3 = 3.3 m (04 Nos.) S2 = 2.5 + 0.3 = 2.8 m (02 No.)	**01 M**

<u>Measurement Sheet</u>

Sr. No	Description of Item	No	Length (m)	Breadth (m)	Ht. or dep (m)	Quantity	Total Quantity
1)	Excavation for foundation						
	L1= 4.80+0.90= 5.70m	4	5.70	0.90	1.15	23.598	
	S1= 3.30-0.90= 2.40m	4	2.40	0.90	1.15	9.936	37.467 CuM
	S2= 2.80-0.90= 1.90m	2	1.90	0.90	1.15	3.933	

03 M

<u>OR</u>

OR

<u>By Centre Line method:</u>

Total centre line length = 4(4.50+0.30) + 4(3.00+0.30) + 2(2.5+0.30)
= 38.00 m

01 M

No. of junctions = 4

Length = (Total centre line length -1/2 x no. of junctions x width at corresponding layer)

<u>Measurement Sheet</u>

Sr. No	Description of Item	No	Length (m)	Breadth (m)	Ht. or dep (m)	Quantity	Total Quantity
1)	Excavation for foundation						

03 M

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			Net centre line length = 38 – 1/2x4x0.90 = 36.20m	1	36.20	0.90	1.15	37.467	37.467 CuM	
	b)	**Calculate the quantity of B.B.M. in CM 1:6 for structure shown in Figure No. 1.**								

Ans:

By long wall and short wall method: **01 M**

C/c distance for Long walls L1 = 4.5 + 0.3 = 4.8 m (04 Nos.)
C/c distance for Short walls S1 = 3.0 + 0.3 = 3.3 m (04 Nos.)
S2 = 2.5 + 0.3 = 2.8 m (02 No.)

Measurement Sheet

Sr. No	Description of Item	No	Length (m)	Breadth (m)	Ht. or dep (m)	Quantity	Total Quantity
1)	Construction of BBM in Superstructure						
	L1= 4.80+0.30= 5.10m	4	5.10	0.30	3.00	18.36	
	S1= 3.30-0.30= 3.00m	4	3.00	0.30	3.00	10.80	
	S2= 2.80-0.30= 2.50m	2	2.50	0.30	3.00	4.50	
	Deductions for						
	Door	2	1.00	0.30	2.10	1.26	
	Opening	1	0.90	0.30	2.00	0.54	29.34 CuM
	Window	5	1.20	0.30	1.40	2.52	

03 M

OR **OR**

By Centre Line method: **01M**

Total centre line length = 4(4.50+0.30) + 4(3.00+0.30) + 2(2.5+0.30)
= 38.00 m

No. of junctions = 4

Length = (Total centre line length -1/2 x no. of junctions x width at corresponding layer)

Measurement Sheet

Sr. No	Description of Item	No	Length (m)	Breadth (m)	Ht. or dep (m)	Quantity	Total Quantity
1)	Construction of BBM in Superstructure						
	Net centre line length = 38 – 1/2x4x0.30 = 36.20m	1	36.20	0.30	3.00	33.66	
	Deductions for						
	Door	2	1.00	0.30	2.10	1.26	
	Opening	1	0.90	0.30	2.00	0.54	29.34 CuM
	Window	5	1.20	0.30	1.40	2.52	

03 M

	c)	**Explain the following terms in brief** **(i) Contingencies** **(ii) Provisional Sum**	

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Ans:

1) **Contingencies** – The miscellaneous incidental expenses which cannot approximately be classified under any distinct sub head are called as contingencies. **1 M**
   Some items of work might have been omitted from the detailed estimate due to oversight or some miscellaneous items do not form under any sub head. To meet such expenses, provision of contingencies is done in detailed estimate. Normally it is 3 to 5% of estimated cost. **1 M**
2) **Provisional Sum** - Provisional sum is an amount provided in the estimate for some specialized work to be done by specialist firm. Whose details are not known at the time of preparing estimate. **1 M**
   The work like installation of A.C, Lift etc. are comes under provisional sum whose full information and details may not be known at the time of preparing estimate. The amount paid to the contractor will not necessarily be the exact amount of provisional sum. **1 M**

d) Describe the general procedure of carrying out rate analysis

Ans:

Procedure to carry out rate analysis of any item: **1/2 M x 8 (for eight steps)**

Assume quantity of given item as per its mode of measurement.

1) Calculate the quantity of various materials and the quantity of various types of labours with reference to their task work for completing the item.
2) Take lump-sum charges for tools & plants, sundries if any required.
3) Calculate Total cost of material & labours = cost of material + cost of labours + charges of tools plants, etc. if any
4) Calculate water charges as 1.5% on Total cost of materials & labours.
5) Calculate Overall cost = Total cost of material & labours + water charges
6) Calculate contractors profit as 10% on Overall cost.
7) Calculate Total cost of the item = overall cost + contractors profit.
8) Work out Rate per unit of item = Total cost of the item / assumed quantity of item.

e) Calculate the volume of earthwork for a proposed road having formation width 10 m and side slopes 2:1 using mid sectional area method. Assume formation level as 115.50 m with no longitudinal slope.

Chainage	400	420	440	460	480	500
G.L. (m)	111.50	111.60	111.85	111.45	111.20	110.90

Ans:

Given-

1) Formation width of road = B = 10 m
2) Formation level = 115.50 m
3) Side slope of both side 2 : 1 i.e. S = 2
4) No longitudinal slope.
5) Chainage interval or length of section = L = 20m

Earthwork Calculations **01**

i) Depth of earthwork = Formation level – G.L.

Sr.No.	G.L.	F.L.	Depth (F.L.-G.L.)	Remark
400	111.50	115.50	4.00	Filling
420	111.60	115.50	3.90	Filling
440	111.85	115.50	3.65	Filling
460	111.45	115.50	4.05	Filling
480	111.20	115.50	4.30	Filling

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500	110.90	115.50	4.60	Filling		

ii) By Mid sectional area method

Mean depth (dm) = (d1+d2)/2
Area of Rectangular Part = B.dm
Area of side triangles = Sdm^2
Total Area A = Bdm + Sdm^2
Volume of earthwork = Total area x Length of Section = A x L

Ch.	Depth (d) m	Mean depth (dm) m	A1= Bdm	A2= Sdm^2	Total Area (A1+A2)	Length of Section (L)	Volume= (AL)	
							Filling	Cutting
400	4.00	--	--	--	--	--	--	--
420	3.90	3.950	39.50	31.205	70.705	20	1414.10	--
440	3.65	3.775	37.75	28.501	66.251	20	1325.02	--
460	4.05	3.850	38.50	29.645	68.145	20	1362.90	--
480	4.30	4.175	41.75	34.861	76.611	20	1532.22	--
500	4.60	4.450	44.50	39.605	84.105	20	1682.10	--
						Total	**7316.34**	--

02

Volume of Earthwork = 7316.34 Cu.M **01**

5		**Attempt any TWO of following.**	**12a)**
	a)	**Figure No.2 shows c/s of a square RCC column footing. Work out the quantity of following item**	

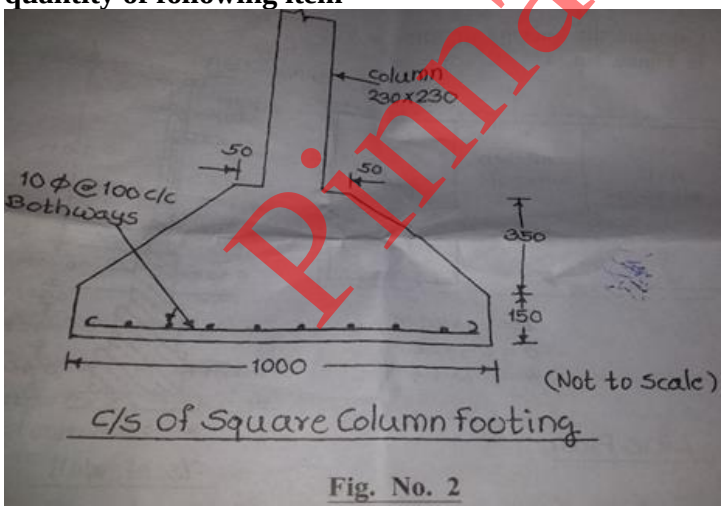

Fig. No. 2

Ans:-

Quantity of bottom square part = L x B x H
=1 x 1 x .15
= 0.15 m^3 1 M

Area of bottom square A_1 = L x B
= 1 x 1= $1m^2$

Area of top square A_2 = L x B
= 0.33 x 0.33=0.109 m^2

Mean area $A_m = (A_1 + A_2)/2$
= (1+0.109)/2

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= 0.554

Total quantity of trapezoidal portion = h/6 (A_1 + A_2 + 4A_m)

= 0.35/6 (1 + 0.109 + 4 x 0.554) 1 M

= 0.193 m^3

Total quantity of footing = volume of bottom square + volume of Trapezoidal

= 0.15+0.193

= 0.343 m^3 1 M

1. **Quantity of steel in footing**

Assume cover (all round) = 50 mm

1) Length of main straight bar

L = (*l* – cover) + 18d

= (1000 – 50 – 50) + 18 (10)

= 1080 mm **1 M**

L = 1.080 m

No of bars = $\frac{\text{Span – Clear cover}}{\text{Spacing}}$ +1

= $\frac{1000 - 100}{100}$ +1

= 9 +1

= 10 Nos. **1M**

2) Length of distribution bar

Same as main bar as footing is square footing and steel same in both direction. So total bars = 20 Nos.

Sr no	Description	Shape of bar	No	Length(M)	Total length(m)	Diam of bar mm	Wt Kg/m	Total wt in kg
1	Main Bar		20	1.080	21.6	10	0.62	13.40
							total	13.40

1M

b) Work out the quantity of plain steel for beam in following and prepare bar bending schedule

i. **Overall length of beam = 4m long**
ii. **Main Bars = Total 4 NOs of 12 mm dia out of which 2 bent up**
iii. **Size of Beam = 230mm X 300mm**
iv. **Anchor Bars = 2 NOs of 10 mm dia**
v. **Stirrups = 6 mm dia at 150 c/c**

Ans:

Assume clear cover on all sides = 25 mm.

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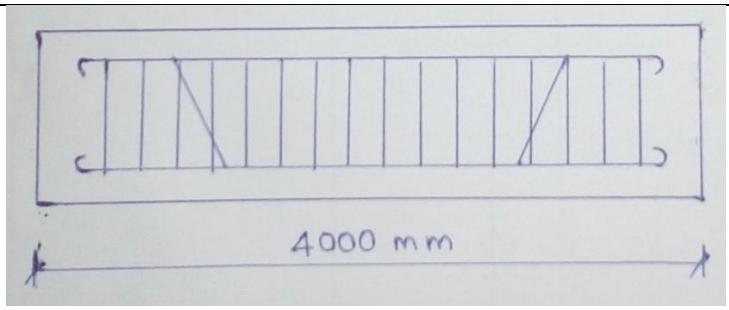
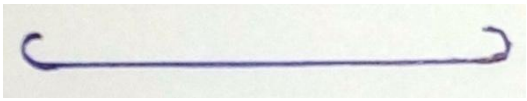


➢ Length of main bar

1. Length of bottom straight bar



$L = T_L - 2 \times \text{side cover} + 2 \times 9\phi$
$= 4000 - 2 \times 25 + 2 \times 9 \times 12$
$= 4166\text{mm}$

2. Bent up bar

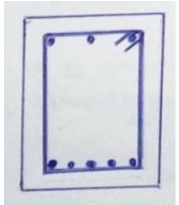
$L = T_L - 2 \times \text{side cover} + 2 \times 0.42 \times d + 2 \times 9\phi$

$= 4000 - 2 \times 25 + 2 \times 0.42 \times 250 + 2 \times 9 \times 12$
$= 4376$ mm.

➢ Length of anchor bar

$L = T_L - 2 \times \text{side cover} + 2 \times 9\phi$
$= 4000 - 2 \times 25 + 2 \times 9 \times 10$
$= 4130\text{mm} = 4.130\text{m}$.

➢ Length of stirrups



A = 230 – 2 x 25
= 180
B = 300 – 2 x 25
= 250

3 M for length calculations

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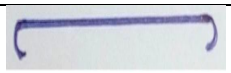
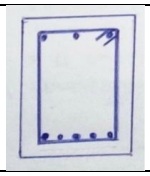
L = 2 (A + B) + 24 d
= 2 (180 + 250) + 24 x 6
= 1004 mm

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

$= \frac{4000 - 2 \times 25}{150} + 1$

= 27.33 say 28 Nos

Sr no	Description	Shape of bar	No	Length(M)	Total length(m)	Diam of bar mm	Wt Kg/m	Total wt in kg
1	Main Bar bottom bar		2	4.166	8.332	12	0.89	7.42
2	Main Bar bent up bar		2	4.376	8.752	12	0.89	7.79
3	Anchor Bar		2	4.130	8.26	10	0.62	5.12
4	Stirrups		28	1.004	28.11	6	0.22	6.18
							total	26.51

3 M for Table

C) Prepare rate analysis for 12mm plaster in CM 1:4

Ans:

Prepare rate analysis for 12mm plaster in CM 1:4

Assume Quantity (Area) of plaster = 100 m2
Wet Volume = Area x Thickness
= 100 x 0.012
= 1.20 m^3
Add 30% to fill-up the joints
= 1.20x 1.30
= 1.56 m^3

1/2 M

Material Calculation
Dry Volume = 25% more of wet volume
= 25/100 x (1.56)
= 1.95 m^3

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

Volume of Cement = $\frac{1.95}{1+4}$ x 1 = 0.390 cu.m

No. of Cement Bags = $\frac{0.390}{0.035}$ = 11.143bags = approximately = 12 bags

1/2 M

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

Volume of Sand = $\frac{1.95}{1+4}$ x 4 =1.560 cu.m

Note : 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

Sr No	Perticular		Qty	Rate	per	Amount	
A	**Material**						
1	Cement		12	280	Bag	3360	**2 M**
2	Sand		1.56	1500	Cum	2340	
					Total (A)	**5700**	
B	**Labour**						
1	Head Mason		0.5	600	Day	300	
2	Mason		8	500	Day	4000	
3	Male Mazdoor		8	300	Day	2400	
4	Female Mazdoor		8	300	Day	2400	
5	Bhisti		2	300	Day	600	
6	Scaffolding		L.S.			500	**2 M**
					Total (B)	**10200**	
		Total Cost of Material & Labour (C) = Total (A+B)				**15900**	
		Add Water Charges @ 1.5% of Total Cost of Material & Labour				**239**	
		Add Contractors Profit @ 10% of Overall Cost (E)				**1590**	
		Grand Total= Overall Cost+ Water Charges + Contractors Profit				**17729**	
		Rate per Sqm = Grant total / Assumed area =17729/100=177.29				**RS 180 per Sqm**	**1 M**

6		**Attempt any TWO of following**	**12**
	a)	**Calculate the quantities of material required for** **i. 60 Cum Brick masonry in CM (1:6)** **ii. 100 Sqm pointing in CM (1:3)**	
		Ans: **iii. 60 Cum Brick masonry in CM (1:6)** For Volume of Brick Masonry = $60m^3$ a) Dry Volume = 35% of volume of masonry = $\frac{35}{100}$ X 60 = 21 cu.m. b.Volume of Cement = $\frac{\text{Dry Volume}}{\text{Sum of Mix}}$ X Content of cement in proportion	

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Proportion

Volume of Cement = (21 x 1)/(1+6) = 3 cu. m

1 M

No. of Cement Bags = 3 /0.035= 85.71 bags

= 86 bags

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

1M

Volume of Sand = (21 x 6)/(1+6) = 18 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

Number of Bricks = 60/(0.2x0.1x0.1) =30000

1M

Assume 5% wastages = (5 x 30000/100) + 25000 = 31500Nos.

ii) **100 Sqm pointing in CM (1:3)**

Thickness of pointing is 10 mm to 20 mm

Assume 15 mm thickness

Volume of mortar = 100 X 0.015

= 1.5 m^3

Add 30% to fill-up the joints

= 1.50x 1.30

= 1.95 m^3

Material Calculation

1 M

Dry Volume = 25% more of wet volume

= 25/100 x (1.95)

= 2.44 m^3

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

Volume of Cement = $\frac{2.44}{1+4}$ x 1 = 0.488 cu.m

1 M

No. of Cement Bags = $\frac{0.488}{0.035}$ =13.94bags = approximately = 14 bags

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

Volume of Sand = $\frac{2.44}{1+4}$ x 4 =1.95 cu.m

1M

Note: - Students may assume different thickness of plastering and different value for calculation of dry volume.

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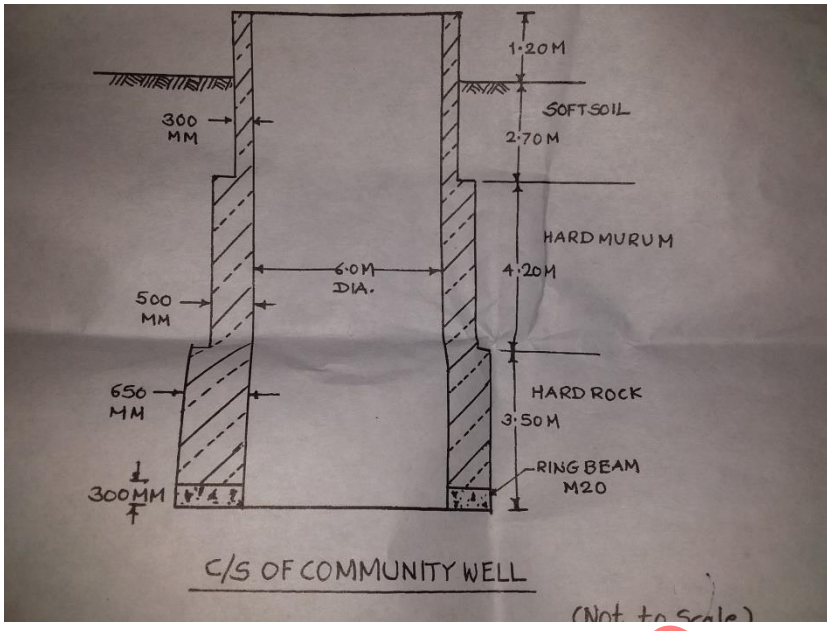
b) **Calculate the quantity of excavation in standard measurement sheet with brief description of item of work for community well shown in fig**



Ans:

Sr No	Item of work	Nos	length / width Or Area in m^2	Depth in m	Quantity In m^3	
1	**Excavation in soft Soil**					
.	Up to 1.5 m depth	1	$((\pi/4) \times 7.3^2) = 41.85$	1.5	62.775	
	Up to 2.70 m depth	1	$((\pi/4) \times 7.3^2) = 41.85$	1.2	50.22	
				Total quantity in soft soil	**112.995**	**2 M**
2	**Excavation in Hard murum**					
	Up to depth 3.0 m	1	$((\pi/4) \times 7.3^2) = 41.85$	0.3	12.555	
	Up to 4.5m depth	1	$((\pi/4) \times 7.3^2)$ 41.85.	1.5	62.775	
	Up to 6.0m depth	1	$((\pi/4) \times 7.3^2) = 41.85$	1.5	62.775	
	Up to depth 6.9 m	1	$((\pi/4) \times 7.3^2)$ 41.85.	0.9	37.665	
				Total quantity in Hard murum	**175.77**	**2 M**
3	Excavation in Hard Rock					
	Up to depth 7.5 m	1	$((\pi/4) \times 7.3^2) = 41.85$	0.6	25.11	
	Up to depth 9.0 m	1	$((\pi/4) \times 7.3^2) = 41.85$.	1.5	62.775	
	Up to depth 10.4m	1	$((\pi/4) \times 7.3^2) = 41.85$	1.4	58.59	
				Total quantity in Hard Rock	**146.475**	**2M**

C) **Calculate the quantity of UCR masonry and ring beam concrete M20 for above community well**

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Sr No	Item of work	Nos	length	width	Depth in m	Quantity In m^3	
			Or Area in m^2				
1.	**UCR Masonry**						
1	UCR masonry for thk 300 mm and 2.7 m depth						
	UCR Masonry	1	$(\pi/4) \times (6.6^2 - 6.0^2)$		3.9	23.16	**1 M**
2	UCR masonry for thk 500 mm and 4.2 m depth						
	UCR Masonry	1	$(\pi/4) \times (7.0^2 - 6.0^2)$		4.2	42.88	**1 M**
3	UCR masonry for thk 650 mm and 3.2 m depth						
	UCR Masonry	1	$(\pi/4) \times (7.3^2 - 6.0^2)$		3.2	43.43	**1 M**
					Total Quantity	**109.47**	
2.	**R.C.C. Ring beam (RCC M20)**						
	The ring beam for thk 650 mm and 300mm depth						
1	RCC ring beam	1	$(\pi/4) \times (7.3^2 - 6.0^2)$		0.3	4.07	**3 M**
					Total quantity	**4.07**	

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