

**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.
- 5) 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.

**Important notes to examiner**



<b>d)</b>	<b>Explain cubic content method of approximate estimate</b>																																																																												
	<ul style="list-style-type: none"> <li>This method is generally used for multi-storeyed buildings. It is more accurate than the other two methods viz., plinth area method and unit base method. The cost of a structure is calculated approximately as the total cubical contents (Volume of buildings) multiplied by Local Cubic Rate. The volume of building is obtained by Length x breadth x depth or height. The length and breadth are measured out to out of walls excluding the plinth off set.</li> <li>The cost of string course, cornice, corbelling etc., is neglected.</li> <li>The cost of building = volume of buildings x rate/ unit volume.</li> </ul>																																																																												
<b>B</b>	<b>Attempt any one of following :</b>							<b>08M</b>																																																																					
<b>a)</b>	<b>Draw the standard formats of measurement sheet, abstract sheet and face sheet.</b>							<b>08M</b>																																																																					
	<p><b>i) measurement sheet :</b></p> <table border="1" data-bbox="297 617 1404 863"> <thead> <tr> <th>Item number</th> <th>Description or particulars of items</th> <th>Number</th> <th>Length In m</th> <th>Breadth In m</th> <th>Height or depth In m</th> <th>Quantity</th> <th>Total quantity</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> </tr> </thead> <tbody> <tr> <td> </td> </tr> </tbody> </table> <p><b>ii) Abstract sheet :</b></p> <table border="1" data-bbox="297 976 1404 1207"> <thead> <tr> <th>Sr. number</th> <th>Quantity</th> <th>Description or particulars of items</th> <th>Unit</th> <th>Rate Rs. P.</th> <th>Unit of rate</th> <th>Amount Rs. P.</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> </tr> </thead> <tbody> <tr> <td> </td> </tr> </tbody> </table> <p><b>iii) Face sheet:</b></p> <table border="1" data-bbox="297 1318 1404 1810"> <thead> <tr> <th>Sr. No.</th> <th>Particulars</th> <th>Amount</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>Estimated cost</td> <td>Rs.....</td> </tr> <tr> <td>02</td> <td>Water supply and sanitary charges @... %</td> <td>Rs.....</td> </tr> <tr> <td>03</td> <td>Electrification charges@...%</td> <td>Rs.....</td> </tr> <tr> <td>04</td> <td>Contingencies@... (3 to 5 %)</td> <td>Rs.....</td> </tr> <tr> <td>05</td> <td>Work charge establishment @.. (1 to 2 %)</td> <td>Rs.....</td> </tr> <tr> <td> </td> <td><b>Total amount</b></td> <td> </td> </tr> <tr> <td> </td> <td><b>In words....</b></td> <td> </td> </tr> </tbody> </table>							Item number	Description or particulars of items	Number	Length In m	Breadth In m	Height or depth In m	Quantity	Total quantity	1	2	3	4	5	6	7	8									Sr. number	Quantity	Description or particulars of items	Unit	Rate Rs. P.	Unit of rate	Amount Rs. P.	1	2	3	4	5	6	7								Sr. No.	Particulars	Amount	01	Estimated cost	Rs.....	02	Water supply and sanitary charges @... %	Rs.....	03	Electrification charges@...%	Rs.....	04	Contingencies@... (3 to 5 %)	Rs.....	05	Work charge establishment @.. (1 to 2 %)	Rs.....		<b>Total amount</b>			<b>In words....</b>		<p><b>03M</b></p> <p><b>03M</b></p> <p><b>02M</b></p>
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b)	<p><b>Describe the following terms and state purpose of each</b></p> <ol style="list-style-type: none"> <li>i. <b>Contingencies</b></li> <li>ii. <b>Work charged establishment</b></li> <li>iii. <b>Centage charges</b></li> </ol>	8M
	<p><b>Contingencies:</b> It is the incidental expenses of a miscellaneous character which cannot be reasonably predicted during preparation of estimate and to met such unforeseen expenses an additional amount of 3% to 5% of the estimated cost of the works is provided in the total estimate.</p> <p><b>Work Charged Establishment:</b> During the construction of a project considerable number of skilled supervisors, work assistance, watch men etc., are employed on temporary basis. The salaries of these persons are drawn from the L.S. amount allotted towards the work charged establishment. That is, establishment which is charged directly to work. an L.S.amount of 2% to 2½ of the estimated cost is provided towards the work charged establishment.</p> <p><b>Centage Charges:</b> When an engineering department executes the work of another department of government or local bodies etc. a percentage amount 10% to 15% of the estimated cost is charged recovery of the cost of establishment, planning, designing, supervision etc. Is called as centage charges.</p>	<p>3M</p> <p>3M</p> <p>2M</p>

<b>Q.No.2</b>	<b>Attempt any two of following</b>			<b>16M</b>
<b>a)</b>	<b>Describe how you will prepare an approximate estimate for a cinema theatre of 1000 seats by using service unit method.</b>			<b>8M</b>
	<p><b>Service unit method :-</b></p> <p>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 theatre etc. so that in this problem we have to calculate or assume the cost of one seat then approximate cost of cinema theatre is calculated by multiplying the cost per service unit (i.e per seat) by the no. of service unit in the structure.</p> <p style="text-align: center;">Approximate estimate = No. of service unit x Cost per service unit</p> <p>Given: Capacity of cinema theatre = 1000 seats                  Service unit for cinema theatre= per seat                  Approximate estimate = number of seats x Cost per seat                  Assume cost of one seat = 50000 to 70000 only                  Consider cost of one seat = 70000  <math display="block">= 1000 \times 70000</math> <math display="block">= \mathbf{7,00,00,000/-}</math></p> <p><b>In words: Rs Seven crore only/-</b></p>			6M for theoretical background and 1M for formula and 1M for final answer.
<b>b)</b>	<p><b>Prepare approximate estimate of a town hall building having plinth area equal to 1500 m2.</b></p> <p><b>1) Plinth area rate Rs. 4,000 per m2</b>  <b>2) Water supply and sanitary installation- 5 % of cost of building</b>  <b>3) Electric installation – 10% of cost of building</b>  <b>4) Other services-5% of cost of building</b>  <b>5) Contingencies – 3% of. overall cost of building</b>  <b>6) Supervisioncharges-8 % of overall cost of building.</b></p>			
	<p>Given:-                  Plinth area = 1500 Sqm                  Plinth area rate = 4000 per sq.m                  Approximate estimate = Plinth area x Plinth area rate  <math display="block">= 1500 \times 4000</math> <b>Cost of building = Rs 60,00,000 /- .....A</b></p>			<b>2M</b>
	Sr no	Particulars	Calculations	Amount
	1	Water supply and sanitary installation - 5 % of cost of building	$0.05 \times 60,00,000$	3,00,000/-
	2	Water supply and sanitary installation- 5 % of cost of building	$0.05 \times 60,00,000$	3,00,000/-
	3	Electric installation – 10% of cost of building	$0.1 \times 60,00,000$	6,00,000/-
	4	Other services-5% of cost of building	$0.05 \times 60,00,000$	3,00,000/-
	<b>B</b>	<b>Total</b>		<b>Rs 15,00,000/-</b>
		<b>Overall cost of the building=A+B</b>		<b>Rs 75,00,000/-</b>
	5	Contingencies – 3% of. overall cost of building	$0.03 \times 75,00,000$	2,25,000/-
	6	Supervision charges-8 % of overall cost of building.	$0.08 \times 75,00,000$	6,00,000/-
	<b>C</b>			<b>8,25,000/-</b>
		<b>Approximate estimate of a town hall building = A+B + C</b>		<b>Rs 83,25,000/-</b>
		<b>= 60,00,000 + 15,00,000 +8,25,000</b>		
	<b>In words= Rs Eighty three lakhs twenty five thousand only.</b>			



Chainage	Depth or Height	Area of central Portion BD (m <sup>2</sup> )	Area of sides Sd2 (m <sup>2</sup> )	Total Area (Bd + Sd2) (m <sup>2</sup> )	Mean Sectional Area Am	Length L (m)	Quantity (Am x L)		
							Cutting (Cum)	Banking (Cum)	
160	0.6	7.2	0.72	7.92					
181.82	0.0	0	0	0	3.96	21.82		86.40	
200	0.5	6.0	0.5	6.5	3.25	18.18	59.08		
240	2	24	8	32	19.25	40	770		
280	3.2	38.4	20.48	58.88	45.44	40	1817.6		
320	4.1	49.2	33.62	82.82	70.85	40	2834		
360	3.8	45.6	28.88	74.48	78.65	40	3146		
<b>Total</b>							<b>8626.68</b>	<b>86.40</b>	

4M

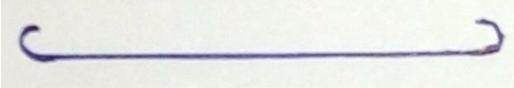
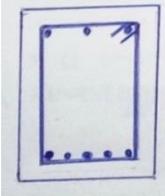
<b>Q.3</b>	<b>Attempt Any Four</b>	<b>16M</b>
<b>a)</b>	<b>State factors affecting process of rate analysis.</b>	<b>4M</b>
	<p><b><u>Factors affecting Rate Analysis:-</u></b></p> <p><b>1. Major Factors :-</b> a) Material b) Labour</p> <p><b>2. Minor Factors: -</b>a) Special Equipment b) Place of work c) Magnitude of work d) Conditions of Contract e) Profit of the contractor f) Specification g) Miscellaneous</p> <p><b><u>Major Factor:-</u></b></p> <p><b>a) Materials: -</b> The material can be calculated by knowing the specification of the items. The price of various materials depends upon market conditions. The cost of material is taken as delivered at site inclusive of transport, local taxes, and other charges. For tools and plants and miscellaneous petty item which cannot be accounted in details lump sum provision is made. It is also necessary to include a certain percentage of waste of all materials to cover breakage, losses, cutting waste etc.</p> <p><b>b) Labour: -</b> The labour force will be necessary to arrange the materials in proper way so that the items can be completed. The amount of labour force required to carry out a unit of a particular item is decided from past experience or in case of complicated items it is decided by carrying out a sample of that item. The labour force required depends upon the efficiency of labourer hence this force will vary from place to place and also there prices. By knowing the amount of labour force and wages of laborer the cost of labour can be calculated</p> <p><b><u>Minor factors:-</u></b></p> <p><b>a) Special equipments: -</b> different types of tools and plants are necessary for execution of work. A good estimator will decide whether purchasing is more economical or hiring the tools and plants is advisable.</p> <p><b>b) Place of work:-</b> if the site is in remote areas, transportation charges increases similarly labour charges also varies i.e. if site conditions are difficult, cost will be more.</p> <p><b>c) Magnitude of work: -</b> greater the magnitude of work lesser will be the cost.</p> <p><b>d) Conditions of Contract:-</b> if the condition of contract is very stiff the rates are high</p> <p><b>e) Profit of the contractor: -</b> Normally 10% of actual cost of work is considered as contractor profit.</p> <p><b>f) Specification: -</b> it shows the proportion of material, the method of construction and execution of work. If superior quality material issued rate will be higher.</p> <p><b>g) Miscellaneous: -</b> time of completion, climatic condition, also affects the rate of item.</p> <p><b>(Note:- Students May explain any other Factors, Examiner should give proportionate Marks.)</b></p>	<p><b>1M</b></p> <p><b>2M</b></p> <p><b>1M</b></p>

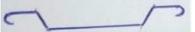
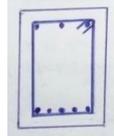
<b>b)</b>	<b>Enlist the data required for detail estimate and write Necessity of each.</b>	<b>4M</b>
	<p>i) <b>Drawing:</b> The drawing is the basis from which quantities of various items for a work are calculated.</p> <p>ii) <b>Specification :</b></p> <p>a) General specification: In general specification the nature and class of work and the names of material to be used are described. It gives a general idea for the project.</p> <p>b) Detailed specification: Detailed specification gives detailed description of every item to be executed, with the qualities, quantities, proportion of materials, workmanship, the method of preparation and execution.</p> <p>iii) <b>Rates:</b> The rates of various materials used in the construction and the wages of different categories of labour should be available for preparing estimate.</p> <p>a. The location of work and its distance from the source of materials and the cost of transport should be known.</p> <p>b. These rates may be obtained from P.W.D. schedule of rates book or the rates may be worked out the “Analysis of Rate” method.</p> <p>iv) <b>Modes of measurement:</b> Measurement for different items of work is different. These consider as per guideline of IS1200.</p>	<p><b>1M</b></p> <p><b>1M</b></p> <p><b>1M</b></p> <p><b>1M</b></p>
<b>c)</b>	<p><b>Give the Hire charges for Following Machinery/Equipment</b></p> <ol style="list-style-type: none"> <li>1. Concrete Mixer:- 2600 Per Day</li> <li>2. Truck : - 2000 Per Day</li> <li>3. Vibrator: - 8500 Per Day</li> <li>4. Rammer : - 700 To 800 Per Day (Depends upon types of rammer)</li> </ol> <p>(Note:- Rates may differ place to place hence examiner should give proportionate marks)</p>	<b>1M each</b>
<b>d)</b>	<b>Describe D.S.R. State Its Uses.</b>	<b>4M</b>
	<ul style="list-style-type: none"> <li>➤ A booklet containing rates of various engineering items for the preparation of detailed estimates such as buildings, roads, bridges, canal etc, called as schedule of rates.</li> <li>➤ It also gives the rate of materials, daily wages of labour, carriage expenditure.</li> <li>➤ It is also given with table for quantities of various material required in construction.</li> <li>➤ Schedule of rates vary with region</li> <li>➤ Schedule of rates increases every year by certain percentage of previous year rates.</li> <li>➤ Schedule rates periodically revised</li> </ul>	<b>4M</b>

<b>e)</b>	<p><b>Calculate the quantities of following items of work for a circular community well as shown in Figure No.3</b>  <b>Excavation in soft Murum</b>  <b>RCC Ring Beam</b></p>	<b>4M</b>																																																																																	
	<p><b>Calculate the quantities of following items of work for a circular community well as show in figure.</b></p> <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width:5%;">SR. No.</th> <th style="width:25%;">Description</th> <th style="width:5%;">No.</th> <th style="width:10%;">L</th> <th style="width:10%;">B</th> <th style="width:5%;">H</th> <th style="width:5%;">Unit</th> <th style="width:5%;">Qty</th> <th style="width:10%;">Total Qty</th> </tr> </thead> <tbody> <tr> <td align="center"><b>1</b></td> <td align="center"><b>Excavation in soft Murum</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td align="center">i)</td> <td>a) Excavation upto 1.5m in soft murum</td> <td align="center">--</td> <td align="center"><math>\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2</math></td> <td></td> <td align="center">1.5</td> <td align="center">M<sup>3</sup></td> <td align="center">30.64</td> <td></td> </tr> <tr> <td></td> <td>b) Excavation from 1.5m to 3.0m in soft murum</td> <td align="center">--</td> <td align="center"><math>\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2</math></td> <td></td> <td align="center">1.5</td> <td align="center">M<sup>3</sup></td> <td align="center">30.64</td> <td></td> </tr> <tr> <td></td> <td>c) Excavation from 3.0m to 4.5m in soft murum</td> <td align="center">--</td> <td align="center"><math>\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2</math></td> <td></td> <td align="center">1.5</td> <td align="center">M<sup>3</sup></td> <td align="center">30.64</td> <td></td> </tr> <tr> <td></td> <td>d) Excavation from 4.5m to 6.0 m in soft murum</td> <td align="center">--</td> <td align="center"><math>\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2</math></td> <td></td> <td align="center">1.5</td> <td align="center">M<sup>3</sup></td> <td align="center">30.64</td> <td></td> </tr> <tr> <td></td> <td>e) Excavation from 6.0 m to 7.5 m in soft murum</td> <td align="center">--</td> <td align="center"><math>\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2</math></td> <td></td> <td align="center">1.5</td> <td align="center">M<sup>3</sup></td> <td align="center">30.64</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td align="center"><b>Total</b></td> <td></td> <td align="center"><b>153.20 m<sup>3</sup></b></td> </tr> <tr> <td align="center">2</td> <td>R.C.C. Ring Beam M20</td> <td></td> <td align="center"><math>\frac{\pi}{4}D^2 - d^2 =</math> <math>(\frac{\pi}{4} \times 5.1^2) -</math> <math>(\frac{\pi}{4} \times 4.5^2)</math></td> <td></td> <td align="center">0.3</td> <td align="center">M<sup>3</sup></td> <td align="center">--</td> <td align="center"><b>1.357</b></td> </tr> </tbody> </table>	SR. No.	Description	No.	L	B	H	Unit	Qty	Total Qty	<b>1</b>	<b>Excavation in soft Murum</b>								i)	a) Excavation upto 1.5m in soft murum	--	$\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2$		1.5	M <sup>3</sup>	30.64			b) Excavation from 1.5m to 3.0m in soft murum	--	$\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2$		1.5	M <sup>3</sup>	30.64			c) Excavation from 3.0m to 4.5m in soft murum	--	$\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2$		1.5	M <sup>3</sup>	30.64			d) Excavation from 4.5m to 6.0 m in soft murum	--	$\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2$		1.5	M <sup>3</sup>	30.64			e) Excavation from 6.0 m to 7.5 m in soft murum	--	$\frac{\pi}{4}d^2 = \frac{\pi}{4} \times 5.1^2$		1.5	M <sup>3</sup>	30.64								<b>Total</b>		<b>153.20 m<sup>3</sup></b>	2	R.C.C. Ring Beam M20		$\frac{\pi}{4}D^2 - d^2 =$ $(\frac{\pi}{4} \times 5.1^2) -$ $(\frac{\pi}{4} \times 4.5^2)$		0.3	M <sup>3</sup>	--	<b>1.357</b>	<b>2M</b> <b>2M</b>
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<b>f)</b>	<p><b>State the rules for deduction of plaster as per IS1200.</b></p>	<b>4M</b>																																																																																	
	<p><b>Rules for deduction for openings as per IS-1200 for plastering :</b>  Deduction in plastering are made in the following manner :</p> <ul style="list-style-type: none"> <li>i) No deduction is made for ends of beams, posts, rafters, purlins etc.</li> <li>ii) No deduction is made for opening upto 0.5 sq. m. and no addition is made for jambs, soffits, and sills of these openings.</li> <li>iii) For opening more than 0.5 sq. m. and upto 3 sq. m. deduction is made for one face only. No addition for jambs, soffits, and sills of these openings.</li> <li>iv) For opening above 3 sq. m. deduction is made for both faces of openings and the jambs, soffits, and sills of shall be added.</li> </ul>	<b>1M</b> <b>each</b>																																																																																	

<p><b>Q No.4</b></p>	<p><b>Workout quantities of any three items of work for figure no.</b></p> <ul style="list-style-type: none"> <li>i. Earthwork in excavation</li> <li>ii. U.C.R. masonry in C.M. 1 : 6 in foundation and plinth</li> <li>iii. Brickwork in C.M. 1 : 5 in superstructure, Thk. - 30 cm</li> <li>iv. R.C.C. work in roof slab (M20 concrete).</li> </ul>			<p><b>12M</b></p>												
	<table border="1"> <thead> <tr> <th>Length of Wall</th> <th>Length</th> <th>Number of walls</th> </tr> </thead> <tbody> <tr> <td>Length of Long Wall (L1)</td> <td>8.1m</td> <td>02</td> </tr> <tr> <td>Length of Long Wall (L2)</td> <td>4.3m</td> <td>01</td> </tr> <tr> <td>Length of Short Wall (S1)</td> <td>3.3m</td> <td>05</td> </tr> </tbody> </table>			Length of Wall	Length	Number of walls	Length of Long Wall (L1)	8.1m	02	Length of Long Wall (L2)	4.3m	01	Length of Short Wall (S1)	3.3m	05	<p><b>1M</b></p>
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	<div style="border: 1px solid black; padding: 10px; width: fit-content;"> </div>			<p><b>1M</b></p>												

Item No.	Description or Particular of work	No	Length (m)	Breadth (m)	Depth (m)	Quantity (m <sup>3</sup> )	Total Quantity (m <sup>3</sup> )	
i)	<b>Excavation in foundation</b>							
	LW1 = 8.1 + 0.9 = 9.0	2	9.0	0.9	0.95	15.39		
	LW2 = 4.3 + 0.9 = 5.2m	1	5.2	0.9	0.95	4.446		
	SW1 = 3.3-0.9 = 2.4m	5	2.4	0.9	0.95	10.26		
						<b>Total</b>	<b>30.096</b>	<b>2M</b>
ii)	a) U.C.R Masonry in Foundation (0.6m wide)							
	LW1 = 8.1 + 0.6 = 8.7m	2	8.7	0.6	0.5	5.22		
	LW2 = 4.3 + 0.6 = 4.9m	1	4.9	0.6	0.5	1.47		
	SW1 = 3.3-0.6 = 2.7m	5	2.7	0.6	0.5	4.05		
						<b>Total</b>	<b>10.74</b>	<b>1M</b>
	b) U.C.R Masonry in Foundation (0.4m wide)							
	LW1 = 8.1 +0.4= 8.5m	2	8.5	0.4	0.75	5.1		
	LW2 = 4.3 + 0.4 = 4.7m	1	4.7	0.4	0.75	1.41		
	SW1 = 3.3-0.4 = 2.9m	5	2.9	0.4	0.75	4.35		
						<b>Total</b>	<b>10.86</b>	<b>1M</b>
						<b>UCR Masonry grand Total</b>		<b>21.6</b>
iii)	BrickWork in Super Structure							
	LW1 = 8.1 +0.3= 8.4m	2	8.4	0.3	3	15.12		
	LW2 = 4.3 + 0.3 = 4.6m	1	4.6	0.3	3	4.14		
	SW1 = 3.3-0.3 = 3.0m	5	3.0	0.3	3	13.5		
						<b>Total</b>	<b>32.76</b>	<b>1M</b>
	<b>Deductions</b>							
	1. Doors (D)	1	1.2	0.3	2.1	0.756		
	2. Doors (D1)	2	1.0	0.3	2.1	1.26		
	3. Windows (W)	8	1.2	0.3	1.5	4.32		
						Total	<b>6.336</b>	<b>1M</b>
	<b>Lintel (Size 0.15m x 0.3m)</b>							
	1. Doors (D)	1	1.5	0.3	0.15	0.0675		
	2. Doors (D1)	2	1.3	0.3	0.15	0.117		
	3. Windows	8	1.5	0.3	0.15	0.54		
						Total	<b>0.7245</b>	<b>1M</b>
						<b>Total Deduction= 6.336 + 0.7245 = 7.0605</b>		
						<b>Total Brickwork = 32.76 – 7.0605 = 25.6995m<sup>3</sup></b>		<b>1M</b>
iv)	R.C.C Roof Slab							
	Slab 1		7.1	8.6	0.12	7.3272		
	Slab 2 ( deduction)		3.3	3.8	0.12	1.5048		
							<b>5.8224 m<sup>3</sup></b>	<b>2M</b>

B)	Attempt any one of the following :	06M
a)	Workout quantity of 6mm \ 10mm and 16mm Q reinforcement for a rectangular beam of size 230 x 500 mm. The beam is reinforced with 2 No's - 10 mm $\phi$ at top, 2 No's 16 mm $\phi$ at Bottom, 2 No's- 16mm $\phi$ bent up, 6 mm Q two legged stirrups are provided at 150mm/c throughout the length. Length of beam is 4.5 m.	06M
<p>Assume Clear cover on all side as 25mm.</p> <p>i) <b>Length main Bar(Straight bar)</b></p>  $L = T_L - 2 \times \text{side cover} + 2 \times 9\phi$ $= 4500 - 2 \times 25 + 2 \times 9 \times 16$ $= 4738 \text{ mm.} = 4.738\text{m}$ <p>ii) <b>Length of Main Bar ( Bent up bar)</b></p>  $L = T_L - 2 \times \text{side cover} + 2 \times 0.42 \times d_1 + 2 \times 9\phi$ $= 4500 - 2 \times 25 + 2 \times 0.42 \times 450 + 2 \times 9 \times 16$ $= 5116 \text{ mm.} = 5.116\text{m.}$ <p>iii) <b>Length of anchor Bar</b></p>  $L = T_L - 2 \times \text{side cover} + 2 \times 9\phi$ $= 4500 - 2 \times 25 + 2 \times 9 \times 10$ $= 4630 \text{ mm.} = 4.630\text{m.}$ <p>iv) <b>Length of Stirrups</b></p>  $A = 230 - 2 \times 25$ $= 180$ $B = 500 - 2 \times 25$ $= 450$ $L = 2 (A + B) + 24 d$ $= 2 (180 + 450) + 24 \times 6$ $= 1404 \text{ mm.} = 1.404\text{m}$ <p>v) <b>Number of stirrups</b> = <math>\frac{T_L - 2 \times \text{Clear cover}}{\text{Spacing}} + 1</math></p> $= \frac{4500 - 2 \times 25}{150} + 1$ $= 30.667 \text{ say } 31 \text{ Nos}$		3 M for calculation of length

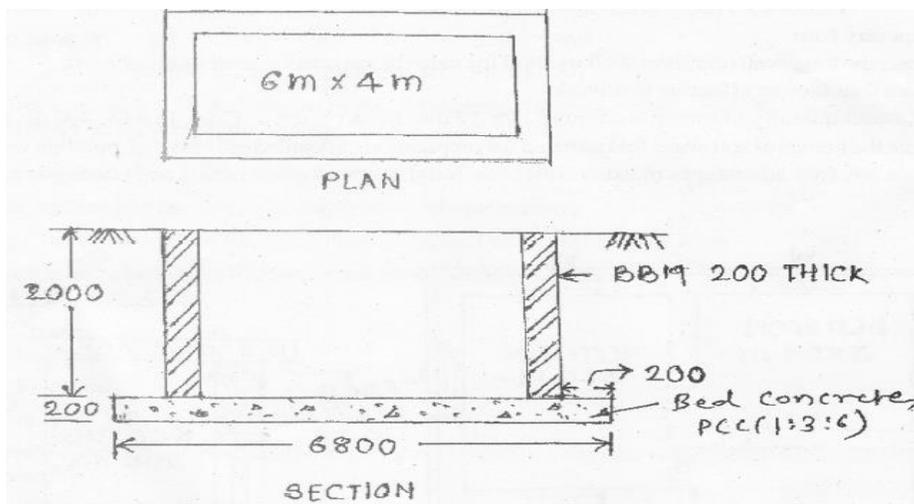
Bar Bending Schedule									3 M for calculati on of BBS	
Sr. No.	Description	Shape of Bar	No.	L (m)	Total length (m)	Dia. Of bar (mm)	Wt. kg/m (d <sup>2</sup> /162)	Total wt. in kg		
1	Bottom straight bar 16 mm $\phi$		2	4.73 8	9.476	16	$\frac{16^2}{162}$ 1.580	14.97		
2	Bottom bent-up bar 16 mm $\phi$		2	5.11 6	10.23 2	16	$\frac{16^2}{162}$ 1.580	16.17		
3	Top anchor bar 10 mm $\phi$		2	4.63 0	9.26	10	$\frac{10^2}{162}$ 0.62	5.74		
4	Length of Stirrups 6 mm $\phi$ @ 150 c/c		31	1.40 4	43.52 4	6	$\frac{6^2}{162}$ 0.222	9.58		
								<b>46.46 Kg</b>		
<b>Total quantity of steel per dia of bar:</b>										
<b>6mm dia = 9.58</b>										
<b>10 mm dia = 5.74</b>										
<b>16 mm dia = 31.14</b>										
b)	<b>Work Out The Quantity of Cement, Sand, Bricks required for 40m<sup>3</sup> brick masonry in cement mortar 1:6.</b>								06M	
<p>Wet volume of concrete = 40 m<sup>3</sup></p> <p>Dry volume considering (Frog Filling, wastage etc.) = 35% of volume of brick masonry</p> $= \frac{35}{100} \times 40$ $= 14 \text{ m}^3$ <p>Volume of cement = <math>\frac{\text{Dry volume}}{\text{Sum of proportion}} \times \text{Content of cement in proportion}</math></p> $\text{Volume of cement} = \frac{14}{1+6} \times 1$ $\text{Volume of cement} = 2 \text{ m}^3$ <p>Number of cement bags = <math>\frac{\text{Volume of cement}}{\text{Volume of one cement bag}}</math></p> $\text{Number of cement bags} = \frac{8.685}{0.0347} = 57.63 \text{ say } 58 \text{ bags}$ <p>Volume of Sand = <math>\frac{\text{Dry volume}}{\text{Sum of proportion}} \times \text{Content of sand in proportion}</math></p> $\text{Volume of Sand} = \frac{14}{1+6} \times 6$ <p><b>Volume of Sand = 12 m<sup>3</sup></b></p> <p><b>Number of Bricks</b></p> <p><b>Size of One Brick with Joint = 20cm x 20cm x 10cm = 0.2m x 0.2m x 0.1m</b></p> $\text{Volume of Bricks} = \frac{\text{Total Volume}}{\text{Size of one Brick with mortar}} = \frac{40}{0.2 \times 0.1 \times 0.1} = 20,000 \text{ No.}$ <p>Assume 5% Wastage = (20000 x (5/100)) = 1000 No.</p> <p>Total Number of Bricks = 20000 + 1000 = 21000. No.</p>									1 M	
									1 M	
									1 M	
									1 M	
									2M	

<b>Q.5</b>	<b>Attempt any <u>TWO</u> of the following</b>						<b>16 M</b>																																																																																																					
<b>a)</b>	<b>Prepare rate analysis for U.C.R masonry in C.M 1:5 in a foundation and plinth</b>						<b>8 M</b>																																																																																																					
<p>A) Calculation of materials                  Assume, volume of masonry 10 m<sup>3</sup></p> <p>a) Dry volume of cement mortar = 42 % of volume of masonry                  = (42/100) x 10 = 4.2 cu.m <span style="float:right">½ M</span></p> <p>b) Volume of cement = {4.2/(1+5)} x 1 = 0.7 cu.m                  Number of bags of cement = 0.7/0.035 = 20 bags <span style="float:right">½ M</span></p> <p>c) Volume of sand = {4.2/(1+5)} x 5 = 3.5 cu.m <span style="float:right">½ M</span></p> <p>d) Volume of stone = 1.25 x volume of masonry                  = 1.25 x 10 = 12.5 cu.m <span style="float:right">½ M</span></p> <p>e) Number of through stone = 2 Nos / cu.m                  Number of stone required = 2 x 10 = 20 Nos <span style="float:right">½ M</span></p> <p>B)</p>																																																																																																												
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Particulars</th> <th rowspan="2">Quantity</th> <th colspan="2">Rate</th> <th rowspan="2">Per Unit</th> <th colspan="2">Amount</th> </tr> <tr> <th>Rs.</th> <th>Ps.</th> <th>Rs.</th> <th>Ps.</th> </tr> </thead> <tbody> <tr> <td colspan="7"><b>1. Materials:</b></td> </tr> <tr> <td>Cement</td> <td>20 Bags</td> <td>300</td> <td>00</td> <td>Bag</td> <td>6000</td> <td>00</td> </tr> <tr> <td>Sand</td> <td>3.5 m<sup>3</sup></td> <td>800</td> <td>00</td> <td>Cu.m</td> <td>2800</td> <td>00</td> </tr> <tr> <td>Stone</td> <td>12.5 m<sup>3</sup></td> <td>700</td> <td>00</td> <td>Cu.m</td> <td>8750</td> <td>00</td> </tr> <tr> <td>Through stone</td> <td>20 Nos.</td> <td>38</td> <td>00</td> <td>Nos.</td> <td>760</td> <td>00</td> </tr> <tr> <td colspan="7"><b>2. Labours:</b></td> </tr> <tr> <td>Head Mason</td> <td>½ Nos.</td> <td>325</td> <td>00</td> <td>Day</td> <td>162</td> <td>50</td> </tr> <tr> <td>Mason</td> <td>13 Nos.</td> <td>314</td> <td>00</td> <td>Day</td> <td>4082</td> <td>00</td> </tr> <tr> <td>Male Mazdoor</td> <td>10 Nos.</td> <td>273</td> <td>00</td> <td>Day</td> <td>2730</td> <td>00</td> </tr> <tr> <td>Female Mazdoor</td> <td>08 Nos.</td> <td>269</td> <td>00</td> <td>Day</td> <td>2152</td> <td>00</td> </tr> <tr> <td>Bhisti</td> <td>1½ Nos.</td> <td>273</td> <td>00</td> <td>Day</td> <td>409</td> <td>50</td> </tr> <tr> <td>Sundries, T &amp; P etc</td> <td>L.S</td> <td>L.S</td> <td>L.S</td> <td>---</td> <td>200</td> <td>00</td> </tr> <tr> <td colspan="4"></td> <td><b>Total</b></td> <td><b>28046</b></td> <td><b>00</b></td> </tr> </tbody> </table>							Particulars	Quantity	Rate		Per Unit	Amount		Rs.	Ps.	Rs.	Ps.	<b>1. Materials:</b>							Cement	20 Bags	300	00	Bag	6000	00	Sand	3.5 m <sup>3</sup>	800	00	Cu.m	2800	00	Stone	12.5 m <sup>3</sup>	700	00	Cu.m	8750	00	Through stone	20 Nos.	38	00	Nos.	760	00	<b>2. Labours:</b>							Head Mason	½ Nos.	325	00	Day	162	50	Mason	13 Nos.	314	00	Day	4082	00	Male Mazdoor	10 Nos.	273	00	Day	2730	00	Female Mazdoor	08 Nos.	269	00	Day	2152	00	Bhisti	1½ Nos.	273	00	Day	409	50	Sundries, T & P etc	L.S	L.S	L.S	---	200	00					<b>Total</b>	<b>28046</b>	<b>00</b>
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<p>C) Add water charges @ 1 % of total = 280.46 <span style="float:right">½ M</span></p> <p>D) Add contractor's profit @ 10 % of total = 2804.80 <span style="float:right">½ M</span></p> <p align="center">Grant total = 31131.06 <span style="float:right">½ M</span></p> <p>Rate per cu.m = Grant total / Volume of masonry = Rs 3113.11/-</p>																																																																																																												



c) Find quantity of brickwork, bed concrete and excavation for underground water tank. Shown in figure no.2.

08M



Sr. No	Description of items and details of work	No.	Length (m)	Width (m)	Depth (m)	Qty	Explanatory notes
1	<b>Earth work in Excavation</b> water tank up to 2.2 m depth	1	6.8	4.8	2.2	71.80 cu.m	Width= $4+0.2+0.2+0.2+0.2$ $= 4.8$ Ht.= $2 + 0.2$ $=2.2$
2	<b>Cement concrete for bed</b> 1:3:6- floor and foundation	1	6.8	4.8	0.2	6.52 cu.m	
3	<b>Brickwork</b>						
	Long wall	2	6.4	0.2	2	5.12	Length of long wall = c/c dist of long wall + width of item $= 6.2 + 0.2 = 6.4$ m
	Short wall	2	4	0.2	2	3.2	Length of short wall =c/c dist of short wall – width of item
					Total	8.32 cu.m	

2 M

2 M

2 M

2 M



<b>d)</b>	<b>State the names of software that are used for preparation of detailed estimates of building works.</b>	<b>4 M</b>
	<b>List of software's are as follows:</b> 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 9) Plan Swift Software 10) EXTRAXION Estimating Software etc.	<b>½ For each Any Eight</b>
<b>e)</b>	<b>State any four advantages of using software have /programmes for estimating and costing.</b>	<b>4 M</b>
	Following are the advantages: 1) Fort of accurate quantity computation. 2) Calculates quantities from building plans. 3) Generation of measurement sheet in LBD format. 4) Cost break up for material, labour and machine. 5) Project planning and Gantt chart. 6) Interface with MS project.	<b>1 Mark for each Any Four</b>