



**Important Instructions to examiners:**

- 1) The Answer should be examined by key words 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 errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills.)
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by the candidate and those in the 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 some cases, the assumed constant values may vary and there may be some difference in the candidate's Answer and the model answer.
- 6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.1	a)	<b>Attempt any <u>THREE</u> of the following :</b>		<b>12</b>
	(i)	<b>State any four method used in PWD for execution of work. Explain any one in brief.</b>		
	Ans.	The following are the various methods for executing a work by P.W.D. i. Rate list method ii. Piece work method iii. Day's work method iv. Employing labour on daily wages	$\frac{1}{2}$ each	
		<b>i. Rate list method:</b> 1. This method is suitable for petty work when the cost is small. Hence various contracting firms are not interested in carrying out work and advertisement in newspaper is not justified for work of small magnitude. 2. For such petty work list of petty workers are kept in the office of executive engineer. 3. Cost of any individual work to be executed does not exceed Rs.3000/- 4. The petty workers will quote rate and lowest offer is accepted.	2	4
		<b>OR</b>		
		<b>ii. Piece work method:</b> 1. This method is suitable for maintenance and repair work. 2. Piece work is the agreement which involves the payment for work done at agreed rate without reference to total quantity of work to be done or time of completion. 3. Agreement contains only description of item to be executed. 4. Form shall be invited from piece worker. The agreement is made on A1 form for percentage basis and A2 form for item rate basis. 5. The piece worker has to arrange all material and labour required for carrying out work.		



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Q.1	a)	<b>OR</b>		
	(i)	<b>iii. Day's work method:</b> 1. There are certain works of special nature which can not be measured hence their valuation is made on basis of actual material and labour used. For e.g. decorative plaster work 2. In such cases day work method is adopted for valuation of above items on basis of actual material used and number and class of labour employed and tools and plants required for work. 3. In this method contractor has to maintain day to day account of material consumed, the labour, types of labour, the hours for which each labour is employed is filled in day work sheet. 4. Contractor is paid on the basis of net cost of various material required and wages paid to the labour plus 20- 25 % as his profit		
		<b>OR</b>		
		<b>iv. Employing labour on daily wages:</b> 1. In this method department purchase material directly from supplier and engage labour on daily wages on muster as and when required. 2. The material is supplied by department or can be purchased directly from market. 3. The attendance of total number of labour employed is maintained in muster roll form No.21 by Junior engineer and it is checked by assistant engineer. The payment is made weekly, fortnightly or monthly as per requirement. 4. When muster roll is closed for payment it is necessary to measure the work during that period and enter it in measurement book.		
	(ii)	<b>State any four requirements of valid contract.</b>		
	Ans.	1. <b>Contract in writing:</b> Contract should be in writing and should be signed by both the parties i.e. owner and contractor 2. <b>Subject matter:</b> The subject matter of agreement must be legal and definite. It should be easy to understand not too complex to understand and execute. 3. <b>Can be enforced in court of law:</b> All terms, conditions words should be according to law. 4. <b>Parties must be competent:</b> The parties signing the contract should be competent enough to carry out work. 5. <b>Free consent of parties:</b> Both parties must give their free consent to do the work as per agreement contract. 6. <b>Attested by witness:</b> Contract should be attested by responsible person or officer.	1 each (any four)	4



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.1	(iii)	<p><b>List any four types of contract. Explain percentage rate contract.</b></p>		
	Ans.	<p><b>Following are different types of contract:</b></p> <ol style="list-style-type: none"><li>1. Lump sum contract.</li><li>2. Item rate contract.</li><li>3. Percentage rate contract.<ol style="list-style-type: none"><li>a. Cost plus percentage rate contract.</li><li>b. Cost plus fixed fee contract.</li><li>c. Cost plus variable fee contract.</li><li>d. Cost plus variable percentage.</li></ol></li><li>4. Labour contract.</li><li>5. Demolition contract.</li><li>6. Fee contract.</li><li>7. Target contract.</li><li>8. Negotiated contract.</li><li>9. Material supply contract.</li></ol> <p><b>Percentage rate Contract:</b></p> <p>In this method bill of quantities consist of description of item as per sanctioned estimate with their quantities, rates, unit and amount. Contractor is asked to quote only percentage above or below the rates shown in schedule.</p> <p><b>Advantages:</b></p> <ol style="list-style-type: none"><li>1. Suitable for private work</li><li>2. It allows extra items.</li><li>3. Due to assurance of profit better quality of work is assured.</li><li>4. Scrutiny of tender is simple.</li><li>5. Overwriting and erasing of rates can be eliminated.</li><li>6. Comparative statement can easily be prepared.</li><li>7. No Scope for contractor to submit unbalanced tender.</li></ol> <p><b>Disadvantages:</b></p> <ol style="list-style-type: none"><li>1. Final cost of work is not known till completion of work.</li><li>2. Two or more contractor can quote same percentage this increases trouble during allotment of tender.</li><li>3. Uncertain and unworkable rates can be quoted by contractor.</li><li>4. Tenderers can easily form ring.</li></ol>	<p>1/2 each (any four)</p> <p>2</p>	<p>4</p>



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.1	(iv) Ans.	<b>List out any eight points to be included while drafting tender notice.</b> Following points should be included while drafting a tender notice: 1. Name of the authority inviting tender 2. Name of work and its location 3. Estimated cost 4. Time limit of completion 5. Earnest money required along with tender 6. The availability of data and forms 7. The last date, place and time of receipt of tender 8. The right to reject the tender.	$\frac{1}{2}$ each	4
	(v) Ans.	<b>Define</b> <b>1. Earnest Money Deposit</b> <b>2. Security Money Deposit</b> <b>3. NMR</b> <b>4. Cash Book</b> <b>1. Earnest Money Deposit:</b> It is the initial deposit paid with the tender in order to show the earnest desire of the contractor to take up the work if awarded. An amount equal to 1% to 2% of the estimated cost is taken as EMD. <b>2. Security Money Deposit:</b> It is the amount of money deposited as a security of work by the contractor for certain period of time. Usually the % of security deposit is 10%. <b>3. NMR:</b> The muster roll which is maintained to keep the record of works being done by a labour employed on each day, is called as Nominal Muster Roll. <b>4. Cash Book:</b> The form in which all cash transactions taking place day to day are strictly entered in order of occurrence is called as cash book.	1 each	4



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Q.1	b)	<b>Attempt any <u>ONE</u> of the following:</b>		<b>6</b>																												
	(i)	<b>Explain Piece work method used in PWD.</b>																														
	Ans.	<p><b>Piece Work Method :</b></p> <p>This method is suitable for maintenance and repair work Piece work is the agreement which involves the payment for work done at agreed rate without reference to total quantity of work to be done or time of completion. Agreement contains only description of item to be executed.</p> <p>The tender notice is displayed on notice board of the office of executive engineer without mentioning the quantities of work to be done.</p> <p>Item rate quoted either in A<sub>1</sub> and A<sub>2</sub> form.</p> <p>Form shall be invited from piece worker. The agreement is made on A<sub>1</sub> form for percentage basis and A<sub>2</sub> form for item rate basis.</p> <p>The piece worker has to arrange for all material and labour required for carrying out work.</p> <p><b>Advantages :</b></p> <ol style="list-style-type: none"> <li>1. Small works can be effectively executed.</li> <li>2. Rapid completion of work.</li> </ol> <p><b>Disadvantages :</b></p> <ol style="list-style-type: none"> <li>1. No penalty clause.</li> <li>2. Piecework is not valid contract and hence can be terminated at any time.</li> <li>3. Lack of co-ordination.</li> </ol>	4																													
	(ii)	<b>Draw standard form of</b>																														
	Ans.	<ol style="list-style-type: none"> <li>1) Measurement Book</li> <li>2) Nominal muster roll</li> </ol> <p>1) Measurement Book</p> <p><b>Form 23, Measurement Book (M.B)</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Particulars</th> <th colspan="4">Details of Actual measurement</th> <th rowspan="2">Contents of area</th> </tr> <tr> <th>No.</th> <th>L</th> <th>B</th> <th>D</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Particulars	Details of Actual measurement				Contents of area	No.	L	B	D																			1	6
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Q.1	(ii)	<p><b>2) Nominal muster roll-</b></p> <p><b>FORM – 21 : MUSTER ROLL</b></p> <p>Cash Book Voucher No. ....</p> <p>Date .....</p> <p>Name of work .....</p> <p>.....</p> <p><b>Part I – Nominal Roll</b></p> <table border="1"> <thead> <tr> <th>Designation Description</th> <th>No. (Sr. No.)</th> <th>Name grouped according to classes</th> <th>Father's Name</th> <th>Dates Month</th> <th>Total</th> <th>Rate Rs.P</th> <th>Amount Rs.P.</th> <th>Dated initial of paying officer</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4">Daily Total .....</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4">Initial of person marking daily attendance .....</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4">Initial of Inspecting Officer .....</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="8">Passed for Rs. .... (Rupees .....) Signature .....</td> <td></td> </tr> <tr> <td colspan="8">..... Rank .....</td> <td></td> </tr> <tr> <td colspan="8">Grand total of this muster roll .....</td> <td></td> </tr> <tr> <td colspan="8">Deduct – Payment not made as per details transferred to Register of arrears .....</td> <td></td> </tr> <tr> <td colspan="8">Total amount paid in words Rupees.....</td> <td></td> </tr> <tr> <td colspan="8">Date ..... Signature .....</td> <td></td> </tr> <tr> <td colspan="8">..... Rank .....</td> <td></td> </tr> <tr> <td colspan="8">.....</td> <td></td> </tr> </tbody> </table>	Designation Description	No. (Sr. No.)	Name grouped according to classes	Father's Name	Dates Month	Total	Rate Rs.P	Amount Rs.P.	Dated initial of paying officer										Daily Total .....									Initial of person marking daily attendance .....									Initial of Inspecting Officer .....									Passed for Rs. .... (Rupees .....) Signature .....									..... Rank .....									Grand total of this muster roll .....									Deduct – Payment not made as per details transferred to Register of arrears .....									Total amount paid in words Rupees.....									Date ..... Signature .....									..... Rank .....									.....									3	6
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Q.2		<b>Attempt any <u>FOUR</u> of the following:</b>		<b>16</b>
	a) Ans.	<b>State any four functions of Executive Engineer of PWD.</b> <b>Function of Executive engineer (EE):</b> (1) Inspect sub divisional office once in a year. (2) Execution of work under him. (3) Ensures all tools plants and machinery are properly maintained. (4) Invite tender for work valued within his power. (5) Maintenance of accounts. (6) He is responsible for preparation of project design, estimate etc. (7) Keep close watch on expenditure.	<b>1 each (any four)</b>	<b>4</b>
	b) Ans.	<b>Explain in brief Technical Sanction and Administrative Approval.</b> <b>Technical Sanction:</b> Technical sanction means the sanction of the detailed estimate, design, rates and cost of work. It is sanctioned by competent authority. The work is taken for the execution only after the technical sanction. If the estimated amount exceed 10% of administratively approved amount technical sanction is granted only after obtaining revised administrative approval for work technical sanction once given remains valid for 5 years. <b>Administrative Approval:</b> For any work, it is necessary to take formal acceptance with respect to cost and work is called as administrative approval. For this the department sends a proposal to government for taking up the work. After considering all aspects like feasibility of project, financial aspect, government accepts proposal is called administrative approval.	<b>2  2</b>	<b>4</b>
	c) Ans.	<b>Define contract. State its objects.</b> <b>Contract:</b> Contract is an undertaking by person or firm to do work under certain terms and condition. <b>Objects of Contract:</b> 1. To execute the work by experienced persons. 2. To execute work with most competitive rate. 3. To do work as per specification. 4. To use latest machineries and techniques. 5. To have free hand for a supervisor to check the work done by contractor without interference.	<b>1  1 each (any three)</b>	<b>4</b>



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2	d) Ans.	<p><b>Explain Lumpsum Contract.</b></p> <p>In lump sum contract the complete work as per plan and specification is carried out by contractor for certain fixed amount as per agreement. The owner provides required information and contractor charges certain amount. This contract is suitable when the number of items are limited or when it is possible to work out exact quantities or work to be executed. The detailed specification of all items of work, plans and detail drawings, security deposit, penalty, progress and other condition of contract are included in agreement.</p> <p>Through it is lump sum contract contractor will be paid at regular interval of 2-3 months as per progress of work on the basis of certificate issued by engineer incharge. A schedule of rate is included in agreement for making payment of extra items.</p> <p><b>Advantages of lumpsum contract:</b></p> <ol style="list-style-type: none"><li>1. Total cost of project is known before completion of work.</li><li>2. Progress of work is fast.</li><li>3. Owner need not require to appoint staff to maintain accounts.</li><li>4. Contractor can derive more profit by proper planning.</li><li>5. Detailed measurement of work is not required except in case of addition and alteration.</li></ol> <p><b>Disadvantages of lumpsum contract:</b></p> <ol style="list-style-type: none"><li>1. This method is suitable for small work.</li><li>2. For extra items contractor may demand higher rates.</li><li>3. Extra item can be cause of dispute between owner and contractor.</li><li>4. Quality of work is not assured.</li><li>5. Contractor may quote higher rate and thus higher tendering is possible.</li></ol>	2	
	e) Ans.	<p><b>List any eight forms used in PWD. Explain any one.</b></p> <p><b>The various forms used in PWD :</b></p> <ol style="list-style-type: none"><li>1. Form 24 : First and final bill.</li><li>2. Form 25 : White – Running Account Bill A.</li><li>3. Form 26 : White – Running Account Bill B.</li><li>4. Form 26 : Yellow – Final Bill B.</li><li>5. Form 27 : White – Running Account Bill C.</li><li>6. Form 27 : Yellow – Final Bill C.</li><li>7. Form 27 A : Running Account Bill D.</li><li>8. Form 27 B : Final Bill.</li><li>9. Measurement Book – Form No. 23.</li><li>10. Nominal Muster Roll – Form No. 21.</li><li>11. Imprest Cash – Form No. 2.</li><li>12. Cash Book – Form No. 7.</li></ol>	3	4





Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2	e)	<p><b>1. Form 24 : First and Final Bill :</b> For a single payment, form 24 is used for making payment to the contractor both for works and supplies.</p> <p style="text-align: center;"><b>Or</b></p> <p><b>2. Form 25 : White-Running Account Bill A :</b> For advance payment without any measurement, this form is used for the works only but not for supply.</p> <p style="text-align: center;"><b>Or</b></p> <p><b>3. Form 26 : White-Running Account Bill B :</b> This type of form is used so as to secure the advance payment for works only and it can also be used for running payment partly for secured advance, partly for measured works and partly for to advance.</p> <p style="text-align: center;"><b>Or</b></p> <p><b>4. Form 26 : Yellow – Final Bill B :</b> In case if the recovery of secured advance payment is done already, then form 26-Yellow is used for payment of final bill for adjustment. If the advance is already recovered then in such case final bill is prepared on final bill C (i.e. Form 27 Yellow).</p> <p style="text-align: center;"><b>Or</b></p> <p><b>5. Form 27 : White – Running Account Bill C :</b> This type of form is used for the payment of measured works or supplies. Note that if there is an advance outstanding against the contractor, then this type of form is not used.</p> <p style="text-align: center;"><b>Or</b></p> <p><b>6. Form 27 : Yellow – Final Bill C :</b> When there is no advance outstanding against the contractor and intermediate payment is to be made, then in such case, this type of form is used.</p> <p style="text-align: center;"><b>Or</b></p> <p><b>7. Form 27 A : Running Account Bill D :</b> When the account payment is to be made to the contractors on lump-sum basis or lump-sum contract, then in such case, this type of form is used.</p> <p style="text-align: center;"><b>Or</b></p> <p><b>8. Form 27 B : Final Bill :</b> This type of form is used for making the final payment to the contractors on lump-sum basis. Hence above mentioned forms are the standard forms of bills used for making the account payment to the contractors or supplies in various cases like secured advanced payment, partly payment, lump-sum contract etc.</p>	1	4



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Q.2	f)	<b>Define interim payment and state purpose of interim payment.</b>		
	<b>Ans.</b>	<p><b>Interim Payment :</b></p> <p>A partial payment given to the contractor monthly for works in progress or supply in progress under the terms of contract is called as interim payment.</p> <p>Note that interim payment is not be considered as final acceptance of the work upto that level. Powers are given to the engineer to hold the interim payment under special circumstances.</p> <p>The interim payment are necessary due to following reasons:</p> <ol style="list-style-type: none"><li>1. In case of large project, the contractor has to invest the large amount for a longer duration and this is not suitable or possible to the contractor. Progress of project work may affect due to lack of funds with the contractor. In such case, the interim payment is made to the contractor so as to continue the progress of project without any break.</li><li>2. The interim payments also indicate the approximate value of work done by contractor.</li><li>3. If the bills are paid to the contractor at interval, there will be the check over the progress of the project work. Hence the progress of the work must be in proportion to the duration of the project.</li></ol>	<p><b>1</b></p> <p><b>1 each</b></p>	<p><b>4</b></p>





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Q.3	b)	<p><b>Purpose of schedule B:</b> Schedule 'B' consist of description of each item, approximate estimate quantity, rate per unit, the amount of each item and total amount of all the items. A contractor has to insert his rates on schedule 'B' only.</p>	1	4														
	c)	<p><b>Explain any four situations when contract is terminated.</b> The contract can be terminated by competent authority the contract may be terminated under following conditions.</p> <ol style="list-style-type: none"> <li>1. If contractor does not fulfill terms and conditions of contract.</li> <li>2. If contractor does not maintain progress of work.</li> <li>3. If contractor sublets his contract.</li> <li>4. Contractor fails to complete work within stipulated period.</li> <li>5. Bankruptcy of contractor.</li> <li>6. Mutual agreement between the parties to terminate the contract.</li> </ol>	1 each (any four)	4														
	d)	<p><b>Differentiate between item rate contract and percentage rate contract.</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Item rate contract</th> <th>Percentage rate contract</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>In this contract, the contractor agrees to work as per the rates quoted by him for each item.</td> <td>In this contract, the contractor agrees to carry out the work at a certain percentage below or above the estimated cost.</td> </tr> <tr> <td>2</td> <td>This is useful when the quality of work is required and also quantities of work to be executed are not known previously.</td> <td>This is useful for the work of all nature with no item-wise rates.</td> </tr> <tr> <td>3</td> <td>Suitable for most of public works executed by government departments.</td> <td>Suitable for all type of government as well as private.</td> </tr> <tr> <td>4</td> <td>It is difficult to prepare comparative statement.</td> <td>It is easy to prepare comparative statement.</td> </tr> </tbody> </table>	Sr. No.	Item rate contract	Percentage rate contract	1	In this contract, the contractor agrees to work as per the rates quoted by him for each item.	In this contract, the contractor agrees to carry out the work at a certain percentage below or above the estimated cost.	2	This is useful when the quality of work is required and also quantities of work to be executed are not known previously.	This is useful for the work of all nature with no item-wise rates.	3	Suitable for most of public works executed by government departments.	Suitable for all type of government as well as private.	4	It is difficult to prepare comparative statement.	It is easy to prepare comparative statement.	1 each
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Q.3	e)	<p><b>Explain BOT projects with respect to objectives, advantages and disadvantages.</b></p>		
	<b>Ans.</b>	<p><b>B.O.T.</b> B.O.T. is a form of project where government grants permission to private firm to construct and administrate certain public infrastructure by financing and authorizing them to pay off loans reclaim investment by allowing them to collect tools, fees, rent as stated in contract and after concession period is over, ownership is transferred back to government.</p> <p><b>Objects of B.O.T.</b></p> <ol style="list-style-type: none"><li>1. To encourage private investment.</li><li>2. To promote foreign investment, techniques and technology in country.</li></ol> <p><b>Advantages of B.O.T.</b></p> <ol style="list-style-type: none"><li>1. Use of private sector financing to provide new source of capital.</li><li>2. Accelerate the development of project.</li><li>3. Use of latest techniques and machineries for fast completion of projects.</li></ol> <p><b>Disadvantages of B.O.T.</b></p> <ol style="list-style-type: none"><li>1. Not suitable for Small works.</li><li>2. Transaction cost is high.</li><li>3. The success of BOT project depends upon successful raising of necessary finance.</li></ol>	<p>1</p> <p>1</p> <p>½ each (any two)</p> <p>½ each (any two)</p>	<p>4</p>



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.4	a) (i) Ans.	<p><b>Attempt any <u>THREE</u> of the following:</b></p> <p><b>List different types of advances granted to contractor. Explain any one in brief.</b></p> <p>Following are the various types of advances which are granted to contractor by site-in charge :</p> <ol style="list-style-type: none"><li>1. Secured advance</li><li>2. Petty advance</li><li>3. Mobilization advance</li><li>4. On account payment</li></ol> <p><b>Secured Advance:</b> An advance payment made to the contractor on the basis of the security of materials brought by the contractor to the site of work under construction is called as secured advance. Authority to make the secured advance is in the hand of Divisional Engineer upto the amount not exceeding 75% of the value of the materials brought to the site by contractor. Amount of secured advance is adjusted in the next running account bill within proportion to that of actual consumption of the materials.</p> <p style="text-align: center;"><b>OR</b></p> <p><b>On Account Payment:</b> The payment made on running account to the contractor for the works done by him or supplies by him which is measured and recorded in measurement book (M.B) is called as 'on account payment'. This type of payment is made when only a part of the complete work or supply have been done and the work or supply is in progress. 10% amount is kept as deposit, out of which 5% amount is to be refunded at the end of the maintenance period. Note that percentage of amount may vary or change.</p> <p style="text-align: center;"><b>OR</b></p> <p><b>Petty Advance:</b> A small amount given in advance to the engineer in charge in case of emergency needs is called as "Petty Advance". The engineer in charge can utilize the petty advance for purchasing the material in small quantity and which is not more costly. In such case, there is no need of any quotation and approval by the competent authority.</p> <p style="text-align: center;"><b>OR</b></p> <p><b>Mobilization Advance:</b> Mobilization advance is the amount of money given to the contractor for establishment purpose. Establishment charges consist of the following work to be done on site under construction.</p> <ol style="list-style-type: none"><li>i. Approach roads</li><li>ii. Site office</li><li>iii. Go down for storage of building material</li><li>iv. Water tank</li><li>v. Electric connection and</li><li>vi. Other facilities which ensure the safety on projects and smooth working.</li></ol>	<p style="text-align: center;"><math>\frac{1}{2}</math> <b>each</b> <b>(any four)</b></p> <p style="text-align: center;"><b>2</b></p>	<p style="text-align: center;"><b>12</b></p> <p style="text-align: center;"><b>4</b></p>



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.4	(ii) Ans.	<p><b>Explain 'Defect liability period' and liquidated damage.</b></p> <p><b>Defect Liability Period :</b> Defect liability period is period in which contractor is supposed to remedy all defect due to faulty material, bad workmanship this period is generally adopted as 12 months after completion of work. Any defect noticed within one year shall be rectified by contractor and if he fails to do so then department / owner will get it rectified and its cost is recovered from security deposit of contractor and if he refuses to pay the cost.</p> <p><b>Liquidated Damage:</b> Liquidated damage is an amount of compensation payable to owner by contractor due to delay in construction of work it has no relation with actual damage. The amount of compensation ranges from Rs. 50 to Rs. 400 per day of delay for excess period required for completion of work than specified in contract liquidated damages are recovered under following situation :</p> <ol style="list-style-type: none"><li>1. Delay in giving possession of land.</li><li>2. Time limit is not mentioned in contract.</li><li>3. Delay due to extra items of work.</li></ol>	2  2	4
	(iii) Ans.	<p><b>State points to be considered while drafting specifications.</b></p> <p>Following are the various important points to be observed in framing the specifications :</p> <ol style="list-style-type: none"><li>1. The main intention or object of specification is to present a clear picture of facts to be adopted in the construction work. Hence clear facts of the quality of material and workmanship mentioned in the specification should be observed.</li><li>2. Specification depends upon the site conditions, hence it is to be observed the nature of work and purpose for which the work is carried out.</li><li>3. Well-known or familiar abbreviations in building industry are to be used without giving information.</li><li>4. Proper and suitable words with required meaning should only be used. Unfamiliar words should not be used in specification.</li><li>5. Prepare the specification by observing the rules of grammar.</li><li>6. The information about quality of the material and procedure of workmanship to be adopted should be complete and accurate.</li><li>7. Avoid cross-references.</li><li>8. The specification should state looking to view that what the contractor shall or shall not do and not what the contractor should or should not do.</li></ol>	1 each (any four)	4



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.4	(iii)	9. The subject matter mentioned in the specification should relate to the information required when the contract is given to the contractor. 10. Unfair specifications are not desirable, meaning that throwing all the possible risks on the shoulders of contractors is unfair and hence such specification should not be mentioned. 11. The sentences of the specification should be simple and short so as to avoid the risk of legal difficulties and allegations. 12. Specifications of various items should be framed by keeping the practical limitations of materials and workmanship in mind.		
	(iv)	<b>Define 'Depreciation'. List different methods of calculating depreciation.</b>		
	Ans.	<b>Depreciation:</b> The loss in the value of the property caused by its use life, wear, tear and decay is called as 'depreciation'. Following are the various methods used to calculate the depreciation 1. Straight line method. 2. Constant percentage method. 3. Sinking fund method. 4. Quantity survey method.	1  1 <b>each (any three)</b>	4





Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.4	b)	<b>Attempt any <u>ONE</u> of the following:</b>		<b>6</b>
	(i)	<b>Explain demolition contract in detail.</b>		
	Ans.	This type of contract includes the demolition and the removal of structure and its component parts and disposal of demolished material. This is the simplest type of contract in which the owner invites tender for demolition of an existing structure so that the particular land can be developed in any manner. It is different from construction contract due to following reasons: i. The contract is given to contractor who quotes higher amount, and contractor has to pay full amount before demolishing the existing structure. ii. The contract must clearly state the contractor is responsible for making necessary arrangements for cutting off existing service connections of water supply drainage and electricity iii. The contractor should be asked	<b>3</b>	
	(ii)	<b>State six precautions to be taken while making entries in measurement book.</b>		
	Ans.	<b>Following precautions to be taken while making entries in Measurement Book:</b> 1. Entries are made by J.E. and certified by S.D.O or A.E. 2. All entries are recorded in ink directly in M.B. 3. No entry is allowed to be erased. 4. If any correction is required, it must be initialed by the officer who made the measurement. 5. Measurements are taken in the presence of contractor, and his signature is taken in M.B. 6. Entries should be recorded continuously and no blank pages left or turn off. Any pages left blank should be cancelled by diagonal lines and signed by authority. 7. The M.B. contains name of work, name of contractor, date of measurement, location, date of work order, and number of measurements.	<b>1 each</b> <b>1 each (any six)</b>	<b>6</b>



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks												
Q.5	a)	<p>Attempt any <b>TWO</b> of the following:</p> <p><b>Draft tender notice for Hospital Building costing Rs. 50 Lakhs covering all important points.</b></p> <p><b>Ans.</b></p> <p style="text-align: center;"><b><u>Tender Notice</u></b></p> <p>Sealed item rate tenders in form B-2 are invited by executive engineer from experienced and appropriate class of contractors registered with state-central government. PWD for the work mentioned below :</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Sr. No.</th> <th>Name of Work</th> <th>Estimated Cost</th> <th>Earnest Money</th> <th>Security Deposit</th> <th>Time Limit</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Construction of hospital building</td> <td>50 Lakhs</td> <td>50,000</td> <td>2,50,000</td> <td>18 months including rainy season.</td> </tr> </tbody> </table> <p>1. Cost of blank tender form is 1000 Rs./ each (non refundable.) (Rs. 1200/- if required by post)</p> <p>2. Period of issue of blank tender _____ to _____ between (11am to 4 pm) except Sunday and holiday.</p> <p>3. The Tender form with complete sets of blank forms of contract can be obtained from the office of the Executive Engineer ____</p> <p>4. Last date for receipt of tender is ____ upto 4pm.</p> <p>5. Tender will be opened on the same day at 6pm in presence of contractor who may like to attend..</p> <p>6 The authorities reserve right to reject any or all tenders without assigning any reason.</p> <p>Date :</p> <p style="text-align: right;">Sd/- Executive Engineer xxx</p>	Sr. No.	Name of Work	Estimated Cost	Earnest Money	Security Deposit	Time Limit	1.	Construction of hospital building	50 Lakhs	50,000	2,50,000	18 months including rainy season.	<p>1</p> <p>3</p> <p>2</p> <p>1</p> <p>1</p>	<p>16</p> <p>8</p>
Sr. No.	Name of Work	Estimated Cost	Earnest Money	Security Deposit	Time Limit											
1.	Construction of hospital building	50 Lakhs	50,000	2,50,000	18 months including rainy season.											



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.5	b)	<p>A person purchases plot measuring 600 sq.m. @ 900 per/m<sup>2</sup>. He construct building having 200m<sup>2</sup> built up area, cost of construction being Rs. 700/m<sup>2</sup>. He desires to have net return 6% on building cost and net return of 5% on land cost, assuming outgoing 22% of gross income. Suggest suitable rent for property.</p>		
	Ans.	<p><b>Given :</b></p> <p>Cost of land = <math>600 \times 900 = 540000</math></p> <p>Cost of building = <math>200 \times 700 = 140000</math></p> <p><b>Step 1 : To find net rent :</b></p> <p>Net return,</p> $6\% \text{ on cost of building} = \frac{6}{100} \times 140000$ $= 8400/-$ $5\% \text{ on cost of land} = \frac{5}{100} \times 540000$ $= 27000/-$ <p>Gross rent = Net rent + out going</p> <p><math>\therefore</math> Net rent = Net return/annum</p> <p>Out going = 0.22 GR</p> <p>Net rent = <math>8400 + 27000</math></p> $= 35400/-$ <p><b>Step 2 : To find gross rent :</b></p> <p>Gross rent = <math>35400 + 0.22 \text{ GR}</math></p> $0.78 \text{ GR} = 35400$ $\text{GR} = 45384.61/\text{year}$ <p><b>Step 3 : To find gross rent per month :</b></p> <p><math>\therefore</math> Gross rent per month = <math>45384.61/12</math></p> $= 3782.05$ $= 3782/-$	1 1 1 1 1 1 1 1	8





Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	a) Ans.	<p>Attempt any <b>FOUR</b> of the following:</p> <p><b>Draft detailed specification for PLL foundation bed in cement concrete 1:2:4.</b></p> <p>Specification of cement concrete for PCC work includes the following items:</p> <p><b>(i) Materials:</b></p> <p><b>(a) Course aggregate:</b></p> <ul style="list-style-type: none"><li>• Coarse aggregate shall be from hard broken stone of compact basalt or granite or similar stone and shall be free from dust, dirt, oil and other foreign matters.</li><li>• Size of stone shall be 20 mm and down and all sizes of stones shall be retained in a 5 mm square mesh and well graded, shall not have voids more than 42%.</li><li>• Size of stone aggregate depends upon the thickness of concrete and nature of work. For example, 20 mm size of stone aggregates are being used for building work and road work. 40 to 60 mm size of coarse aggregate are being used for mass concreting work.</li></ul> <p><b>(b) Fire aggregate:</b></p> <ul style="list-style-type: none"><li>• Fine aggregate shall have coarse sand consisting of hard, sharp and angular grains.</li><li>• These aggregates shall pass through sieve of 5 mm square mesh.</li><li>• Sand shall be as per the standard specification.</li><li>• Sand shall be clean and free from dust, dirt, oil and other organic matter.</li><li>• Sea sand shall not be used.</li><li>• Crushed stone sand can also be used if specified.</li></ul> <p><b>(c) Cement:</b></p> <p>Cement shall be fresh, not old and as per the standard I.S. specification and shall have required compressive strength and fineness.</p> <p><b>(d) Water:</b></p> <p>Water shall be clean water, free from any impurities and free from alkaline and acid matters; water shall be suitable for drinking purpose.</p>		16



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	a)	<p><b>(ii) Proportion:</b></p> <ol style="list-style-type: none"><li>1. The proportion of concrete shall be 1:2:4 of cement, sand and coarse aggregate by volume unless otherwise specified.</li><li>2. For 7 days, the minimum compressive strength of cement concrete (1:2:4) shall be <math>14 \text{ N/mm}^2</math>.</li><li>3. One bag of cement consist of 50 kg should be considered as cu.m. No need to measure the cement by box or Formica, but sand and coarse aggregate shall be measured by volume with boxes or Formica. Box size may be 35 cm × 35 cm × 28 cm or 30 cm × 30cm × 38 cm equivalent to the content of one bag of cement.</li><li>4. All ingredients shall be dry. Bulking of sand allowance shall be made for wet sand.</li><li>5. For large work, mixing of ingredients shall be machine mixing and for small work, mixing shall be done by hand mixing by batches may be permitted.</li></ol> <p><b>Machine Mixing:</b></p> <ol style="list-style-type: none"><li>1. Cement, sand and coarse aggregate shall be taken into the machine mixer in required proportion.</li><li>2. For concrete of proportion 1:2:4 consist of one bag of cement, two boxes of sand and four boxes of coarse aggregate shall be taken into mixer.</li><li>3. The machine shall then be operated to mix material dry &amp; then water shall be added gradually with required quantity 25 to 30 liters of water per bag of cement to obtain the desired water-cement ratio.</li><li>4. The mixing should have homogeneous mass or plastic mix of uniform colour so as to obtain thorough mixing 1.5 to 2 minutes rotation shall be given to the drum mixer.</li><li>5. Mixed concrete shall be discharge on a masonry platform or on a flat iron sheet.</li></ol> <p><b>Hand Mixing:</b></p> <ol style="list-style-type: none"><li>1. Hand mixing is allowed for small work only. Mixing of ingredients shall be done on masonry platform or flat iron sheet.</li><li>2. For concrete of 1:2:4/1:4:8 proportion, one bag of cement, first two boxes of sand shall be mixed dry thoroughly making the material turning up and down by spade or phawarha and then this homogeneous dry mix shall be placed over a spreaded stack of 4 boxes of coarse aggregate &amp; the complete mixed dry turn up and down with phawarha or spade at least three times so as to</li></ol>		



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	a)	<p>obtain uniform mix. Then water shall be added slowly and gradually and then turning the mix up and down at least three times by spade till to obtain a plastic mix of the required workability and water – cement ratio.</p> <p>3. Water quantity shall be of 25 to 30 liters per bag of cement.</p> <p><b>(iii) Slump test:</b></p> <ul style="list-style-type: none"><li>• Regular slump test shall be carried out so as to check the workability of concrete mix and to control the addition of water.</li><li>• For building work, a slump of 75 mm to 100 mm may be permitted and for road work, 30 mm to 40 mm may be allowed.</li></ul> <p><b>(iv) Form work:</b></p> <ul style="list-style-type: none"><li>• Form work and centering shall be used as per the standard specifications'</li><li>• Internal surface of formwork shall be applied by oil so as to avoid sticking of concrete during removal of the formwork.</li><li>• The base of formwork shall be watered before laying the concrete on it.</li><li>• Forms at the bottom surface in case of beam and slab shall not be removed before 14 days in general and sides of form shall be removed after 3 days.</li><li>• Form work shall be removed slowly and with care and not to disturb and damage the concrete.</li></ul> <p><b>(v) Laying of concrete:</b></p> <ul style="list-style-type: none"><li>• Concrete shall be laid gently in layers not exceeding 150 mm and compacted with rods &amp; tamping with wooden tampers or with mechanical vibrating machine until a dense concrete is obtained.</li><li>• Immersion type vibrators or needle vibrators shall be used for thick concrete or mass concrete. Surface vibrators or form vibrators shall be used for thin concrete. There shall not be over vibration.</li><li>• Concrete shall be laid continuously. If laying of concrete is suspended for rest or on next day the end of concrete shall be slope with an angle of 30° and its surface shall be made rough for proper joining.</li><li>• If the concreting work is resumed, the previous sloped portion shall be made rough, clean, watered and a grout of neat cement shall be applied and fresh concrete shall be laid in successive layer in such way that the upper layer shall be laid before the lower layer is set.</li></ul>	4	4



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	a)	<p><b>(vi) Curing:</b></p> <ul style="list-style-type: none"><li>When concrete is on the point of hardening, after and about two hours laying, then it shall be kept wet by covering with wet gummy bags for 24 hours and then cured by flooding with water. Making mud wall 75 mm high or by covering with wet sand continuously for 15 days.</li><li>In case of flat concrete work like slabs, the ponding method of curing shall be used.</li></ul> <p><b>Measurement:</b></p> <p>The measurement shall be taken as per the drawing or as per instruction of the engineer.</p>		
	b)	<p><b>Explain in brief legal aspect of specification.</b></p>		
	Ans.	<p>i. Specification of various items becomes the important documents as per as legal aspect like contract and agreements are concerned. Hence the drawing and specifications are two important contract documents considered as a legal documents.</p> <p>ii. The tender documents and agreements towards legal aspect are incomplete and invalid without specifications.</p> <p>iii. Specifications have more legal strength and hence most of the contract state that in case of discrepancy between the drawings and specifications, the specification act as a legal proof.</p> <p>iv. In case of disputes between the owner and the contractor, specifications act as a useful legal documents to solve the problem in between two party.</p>	1 each	4
	c)	<p><b>Enlist types of specifications and explain any one in brief.</b></p>		
	Ans.	<p>Following are the various types of specifications :</p> <p>a. Brief specification</p> <p>b. Detailed specification</p> <p>c. Standard specification</p> <p>d. Manufacturers specification</p> <p><b>a. Brief specification :</b></p> <p>i. The general specification used for estimating the project are the brief specifications.</p> <p>ii. General information for the quantities of materials, nature and class of work is short and not with the lengthy detailed specification. Note that brief specification do not form the part of the contract document.</p> <p>iii. Though the information is short and not lengthy but the general information should be known and understand.</p>	1/2 each	
		<p><b>OR</b></p>	2	4





Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	c)	<p><b>2. Detailed specification :</b></p> <ul style="list-style-type: none"><li>• The specification in which detailed information of the various quantities of materials, procedure of workmanship to be adopted, nature and class of work is mentioned.</li><li>• Hence detailed specification form a part of contract document.</li><li>• Detailed specification for a particular item specify the following information :<ol style="list-style-type: none"><li>i. Qualities of material</li><li>ii. Quantities of material and their proportions</li><li>iii. Method of doing work or procedure of work.</li><li>iv. Test required on the constructional material or on the finished items.</li><li>v. Type of equipments and machinery used.</li><li>vi. Special tools and plants used.</li><li>vii. Method of operations of special tools and plants.</li></ol></li></ul> <p>In short, without the detailed specification for a particular item, the tender documents and contract are incomplete and considered as invalid.</p> <p style="text-align: center;"><b>OR</b></p> <p><b>3. Standard specification :</b></p> <ul style="list-style-type: none"><li>• Detailed specifications for various works are drawn up by an engineering department and these specifications are printed and used as a standard specification. Hence most of the items in works are made to standardized specifications.</li><li>• Standard specification play a vital role that it work as guide and also refer in the specification part of a tender documents and thus avoids writing lengthy specification.</li><li>• Note that whenever the standard specifications are accepted for a particular work, then it should be observed carefully and suitable modifications or necessary corrections are made accordingly.</li><li>• Standard specifications must be periodically revised so as to include some changes in techniques.</li><li>• Specifications of items such as stone work, brickwork, plastering, pointing, excavation, earthwork concreting etc. becomes common in writing particulars of such items and hence it is not required to write such common specification again and again.</li><li>• Standard specifications are mostly referred because it saves the time and there is no possibility of doing mistakes.</li></ul> <p style="text-align: center;"><b>OR</b></p>		



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	c)	<p><b>4. Manufacturers specifications :</b></p> <ul style="list-style-type: none"><li>• This type of specifications in which the properties of products such as strength, thickness, depth, elasticity, chemical composition etc. are mentioned.</li><li>• Specifications of the products of the manufacturer like steel, mild steel, tor steel, plain steel, cement, paints, valves etc. are included under head of manufacturer's specification.</li></ul>		
	d)	<p><b>Define value of property. State factors affecting value.</b></p>		
	Ans.	<p>The corresponding exchange of one commodity to any other commodity is termed as value. In case of civil engineering value of the property is expressed in terms of money. Value of the property means its worth or utility.</p> <p>The value of the property depend upon, the following various factors:</p> <ol style="list-style-type: none"><li>1. Structure of the property</li><li>2. Life of the property</li><li>3. Location of the property</li><li>4. Maintenance of the property</li><li>5. Legal control of the property</li><li>6. Demand/supply ratio</li><li>7. Purpose for which valuation is done for the property.</li><li>8. Inflation of property</li><li>9. Returns from the property.</li><li>10. Facilities and amenities available (such as water supply line, drainage line) ; electric supply; market, etc.</li></ol>	1	
	e)	<p><b>Explain various types of outgoing.</b></p>		
	Ans.	<p><b>1. Municipal taxes:</b></p> <ol style="list-style-type: none"><li>a. The taxes which are paid to the local authority for services like water supply; sanitation etc.</li><li>b. Such taxes are calculated at certain percentage of rateable value of the property.</li></ol> <p><b>2. Government taxes:</b></p> <p>The taxes which are paid to the government land tax, education taxes are to be paid to the government authority.</p> <p><b>3. Annual repairs and maintenance:</b></p> <p>The amount spent on the repairs and maintenance depends upon</p> <ol style="list-style-type: none"><li>a) Age of building</li><li>b) Condition of the building</li><li>c) Use of the building</li><li>d) Climatic conditions or weathering effects to which</li></ol>	$\frac{1}{2}$ each (any six)	4



Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	e)	<p>building is subjected to.</p> <p>e) Number of tenants occupying the building. 1% to 1.5% of the total cost of construction is considered for annual repairs and maintenance.</p> <p><b>4. Insurance:</b></p> <p>a) Insurance is the premium paid by the owner of the property. b) It depends upon sum assured.</p> <p><b>5. Management and collection:</b></p> <p>1. Management and collection are the charges which consists of the expenses on watchman, liftman, sweeper, rent collector etc. 2. These charges are generally taken 5 to 10% of the gross rent.</p> <p><b>6. Sinking fund:</b></p> <p>Fund created by regular periodic payments which accumulate at the compound interest is a sinking fund. Amount of sinking fund is used at the end of utility period of the structure.</p>	<b>1 each (any four)</b>	<b>4</b>