

Important Instruction to Examiners:-

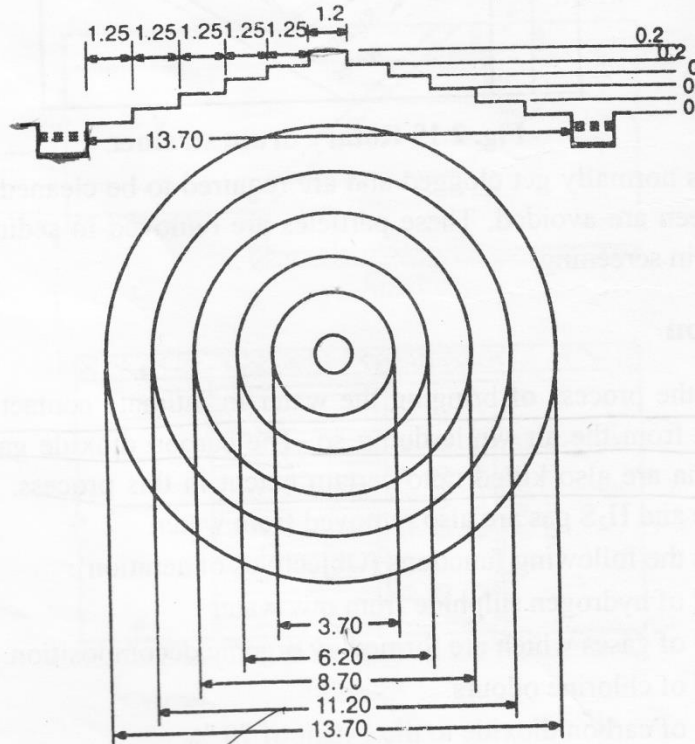
- 1) The answers should be examined by key words & not as word to word as given in the model answers scheme.**
- 2) The model answers & answers written by the candidate may vary but the examiner may try to access the understanding level of the candidate.**
- 3) The language errors such as grammatical, 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

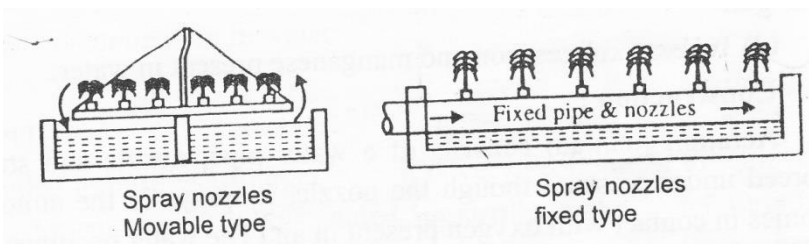
Q.NO	SOLUTION	MARKS
Q1. A)	Attempt ANY SIX of following: (06x02)	12
a	State four factors affecting rate of demand of water.	04M
	<ol style="list-style-type: none"> 1. Size of the city. 2. Climatic condition 3. Habit of people. 4. Cost of water 5. Industrial and commercial activity. 6. Quality of water supplies 7. System of supply 8. Development of sewage facilities. 9. Policy of metering. 	½ M each Any 8
b	List different types of intake and explain any one.	04M
	<ol style="list-style-type: none"> 1. Canal intake 2. Reservoir intake 3. Lake intake 4. River intake <p>a) Canal intake: A canal intake consists of a pipe placed in a brick masonry chamber constructed partly in the canal bank. On one side of the chamber, an opening is provided with coarse screen for the entrance of water. The end of the pipe inside the chamber is provided with a bell mouth fitted with a hemisphere fine screen. The outlet pipe carries the water to the other side of the canal bank, from where it is taken to treatment plants.</p> <p style="text-align: center;">OR</p> <p>b) Reservoir intake: Reservoir intake which is mostly used to draw water from earthen dam reservoir. It consist of a intake tower constructed on the slope of the dam, screens are provided to intake pipes and are controlled by sluice valve is provided to control water flow. Water level in reservoir changes from time to time intake pipes are provided at different levels.</p> <p style="text-align: center;">OR</p> <p>c) Lake intake: For obtaining water from lakes, mostly submersible intakes are used. These intakes are constructed in the bed of lake, which consists of a pipe and bell opening, protected by timber or concrete crib. Water flows from the opening and is collected in sump well and then pumped to the treatment plant.</p> <p style="text-align: center;">OR</p> <p>d) River intake: It is circular masonry tower well of 4 to 7 m diameters. It is constructed along the river bank at place from where water can be drawn in required quantity. The various river intakes are wet intake, dry intake and movable intake.</p>	½ M each FOR TYPES 2M FOR Any One
c	What is the principal behind sedimentation with coagulation? State any two types of coagulants.	04M
	When the certain chemicals are added to water, an insoluble, gelatinous, flocculent precipitation is formed. This gelatinous precipitate, during its formation and descent through water absorb and entangle very fine suspended matters and colloidal impurities. The gelatinous precipitate therefore has the property of removing fine and colloidal particles quickly and completely than by plain sedimentation. When matter contains such fine clay particles and colloidal, it becomes necessary to apply such process which can easily remove these from water. Such impurities can be removed by sedimentation with coagulation	02M

Q .NO	SOLUTION	MARKS
c)	<p>Types of coagulants:</p> <ol style="list-style-type: none"> 1. Aluminiumsulphate 2. Ferrous sulphate in combination with lime. 3. Ferric sulphate or ferric chloride 4. Chlorinated copperas 5. Polyelectrodes. 	½ M each
d	<p>Define filtration and state any four objects of filtration.</p>	04M
	<p>The process of passing the water through beds of sand or other granular materials is known as filtration.</p> <p>Objects of filtration:</p> <ol style="list-style-type: none"> 1. To remove colloidal and suspended matter remaining after sedimentation. 2. To remove bacterial load. 3. To remove colour, odour, iron and maganese. 4. To make water sparkling. 	01M 03M for any THREE
B)	<p>Attempt any ONE of the following.</p>	06M
a	<p>What is need for analysis of water? Enlist various tests for potable water.</p>	06M
	<p>The ground water is free from organic impurities and requires no treatment. But it should be usually chlorinated before using. Water obtained from shallow wells should be properly treated.</p> <p>The examination of water is done in the water works laboratory, it is necessary to examine the quality of water.</p> <p>The main advantages are:</p> <ol style="list-style-type: none"> i) To remove pathogenic bacteria. ii) To outline the purification process. iii) To make the water safe for domestic and industrial use. iv) To remove dissolved impurities mineral salts. <p>Various tests for potable water:</p> <ol style="list-style-type: none"> i) Physical test: colour, Taste and odour, Temperature, Turbidity. ii) Chemical test: Total solids, Hardness, Chlorides, Dissolved oxygen, PH value, Fluorides, Alkalinity. iii) Biological test: E-coli, MPN. 	04M 02M
b	<p>How can aeration improve water quality? Explain method of aeration with sketch.</p>	06M
	<p>Aeration is the process of bringing the water in intimate contact with air, the water absorbs oxygen from the air while doing so. The carbon dioxide gas is removed up to 70% and bacteria are also killed up to certain extent in this process. Up to certain extent iron, manganese and H₂S gas are also removed from water.</p> <p>Method of Aeration:</p> <p>1. Cascades: They consist of concrete steps over water comes down in thin sheet. Weir may be provided at the edge of each step. Thin sheet of water which comes down over steps comes in contact with the atmosphere.</p>	02M 04M For Any One Method

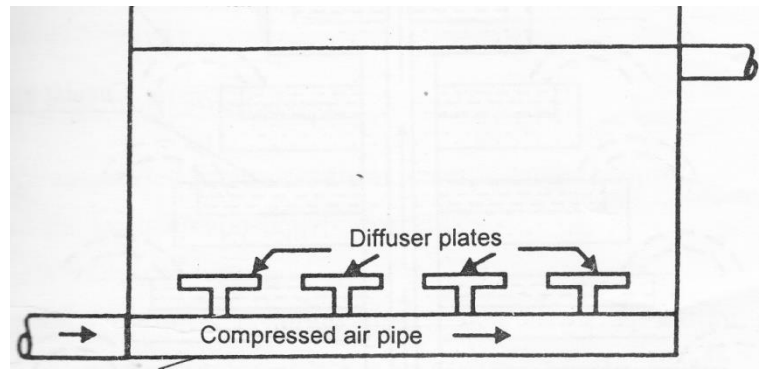
Q .NO	SOLUTION	MARKS
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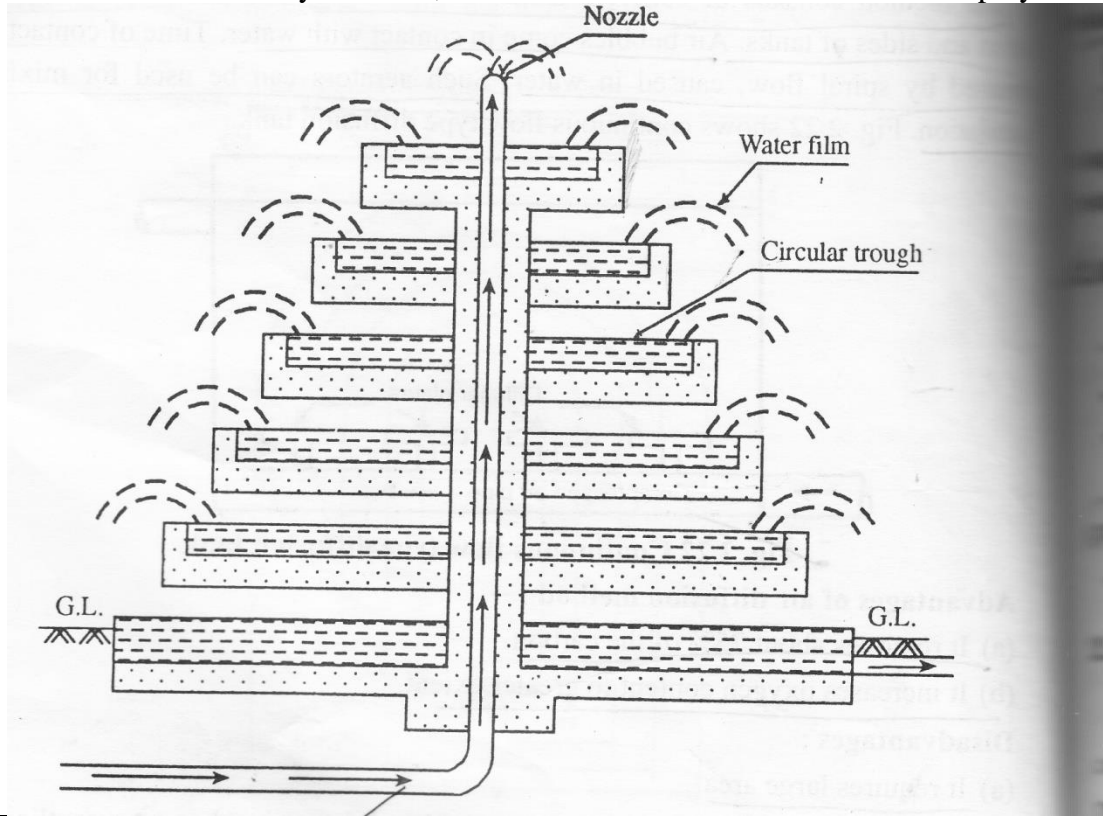
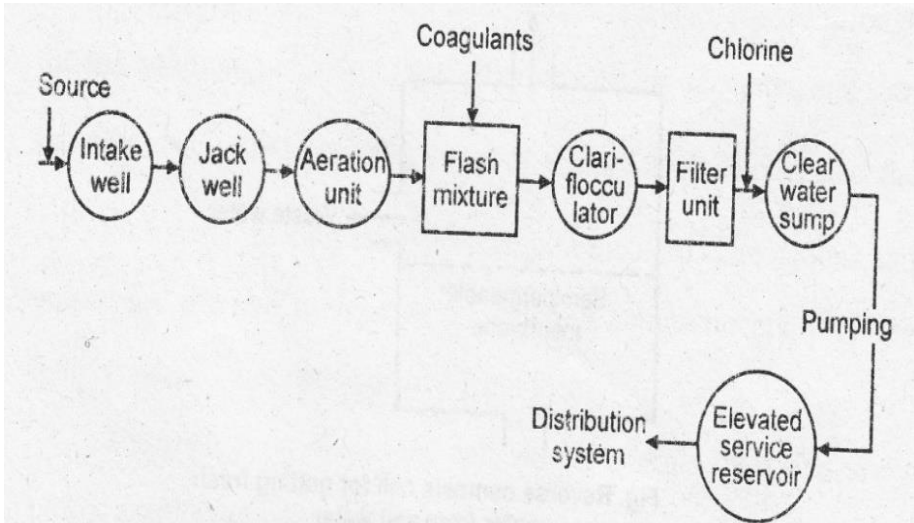


2. Spray nozzle: In this method , water is sprinkled in air or atmosphere through special nozzle which breaks the water into droplets thus permitting the escape of dissolved gases. Carbon dioxide gas is thus considerably removed in this method.

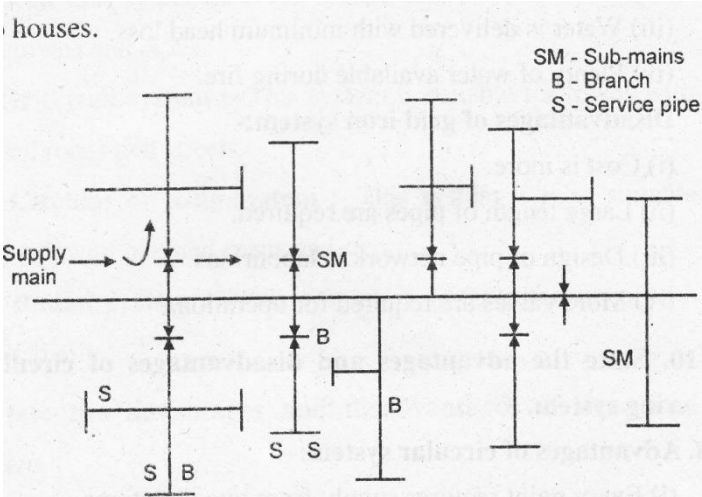
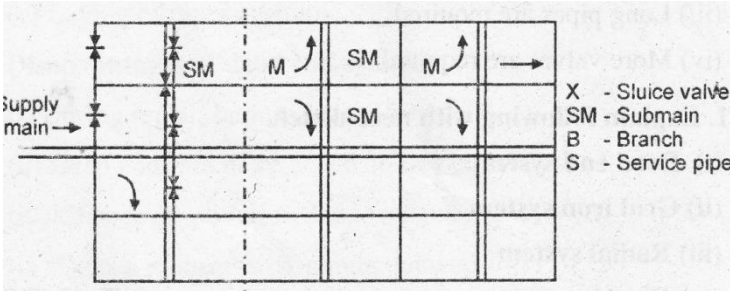
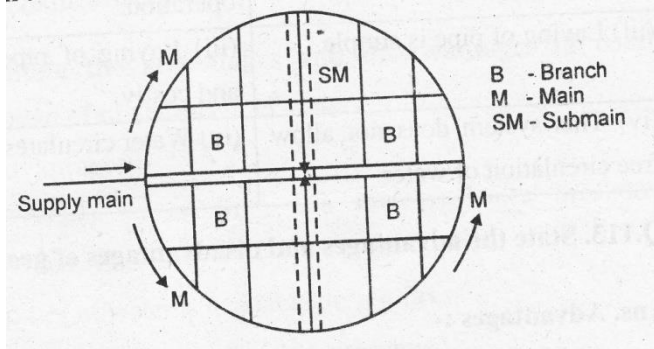


3. By air diffusion: In this method, compressed air is bubbled through the water, so as to thoroughly mix it with water. Perforated pipes are, installed at the bottom of the settling tanks, and the compressed air is blown through them. The compressed air is thus bubbled up from the bottom of the tank. During its upward movement through the water body, it gets thoroughly mixed up with the water contained in the tank, therefore completing the aeration process.

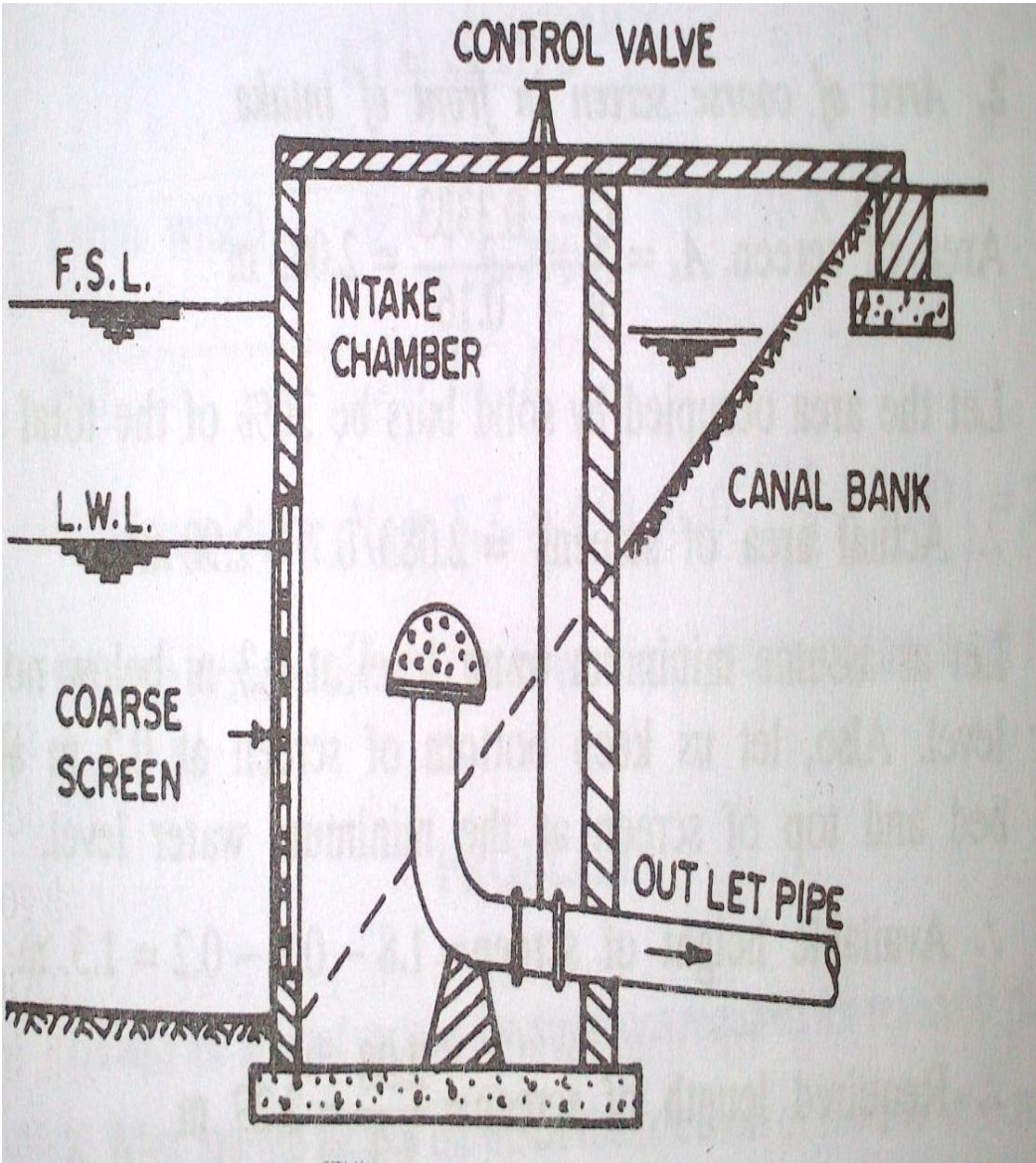


Q .NO	SOLUTION	MARKS
	<p>4. Tricking bed filter: In this method, the water is allowed to trickle down the beds of coke, supported over the perforated bottomed trays, and arranged vertically in series. Generally three beds are used, the depth of each being about 0.6m with clear distance of about 0.45 m in between. The water is applied from the top through perforated distribution pipes and allows to trickle down. During this downward motion, the water gets mixed up with air and aeration takes place. This method gives better results than what can be obtained by cascades, but is less effectiveness than the method of spray nozzles.</p> 	
2	Attempt any four of the following.	16
a	Draw layout of water supply project. Label the parts and state the work carried out by each part.	04M
		02M

Q.NO	SOLUTION	MARKS
<p>a) Conti.</p>	<ol style="list-style-type: none"> 1. Intake well: The main function of intake well is to collect the water from surface source and convey it to treatment. 2. Jack well: The jack well is situated on the bank of source and the main function is to receive the water from intake well and discharge to the treatment plant. 3. Aeration unit: It is the physical process which works on the principle of gas exchange. By increasing the water area in contact with the atmospheric air either by spray or by keeping the surface of liquid constantly agitated so as to reduce the thickness of liquid and enable it to come in contact with atmospheric air. 4. Flash mixer: The main function of flash mixer is the solution of coagulants is mixed thoroughly in water by means of fan operated by electric motor. 5. Clariflocculator: This helps in forming a big size floc and increases the efficiency of sedimentation. 6. Filter unit: To filter the water. 7. Elevated service reservoir: To supply the water under gravity. They also supply water during emergency. 	<p>½ M For any Four</p>
<p>b)</p>	<p>Draw a labeled sketch of continuous flow type sedimentation tank.</p>	<p>04M</p>
		<p>04M</p>
<p>c)</p>	<p>Explain in brief the working process of rapid sand filter.</p>	<p>04M</p>
	<ul style="list-style-type: none"> • The water from sedimentation tank enters the filter unit through inlet pipe and is uniformly distributed on the whole sand bed. • Water passes through filter media and collected by under drainage system in filtered water well. • The outlet chamber in this filter is also equipped with filter rate controller. As bed get clogged the loss of head increases, and the rate controller adjusts it to a limit. • When the rate of filtration becomes very low and the filter bed requires back washing. 	<p>04M</p>
<p>d)</p>	<p>What are the different layouts for water distribution system? Explain any one with neat sketch.</p>	<p>04M</p>
	<ol style="list-style-type: none"> i) Dead end system ii) Grid iron system iii) Circular system iv) Radial system. 	<p>½ m for each</p>

Q.NO	SOLUTION	MARKS
<p>Q.2 d)</p>	<p>i) Dead end system: In this system one main start from service reservoir along the main road. Sub main are connected to the main in both directions along other roads which meet the main road. This system is suitable for irregular developed towns and cities.</p>  <p>houses.</p> <p>SM - Sub-mains B - Branch S - Service pipe</p> <p>ii) Grid iron system: This is improvement over dead end system. All the dead ends are interconnected to each other and water circulates freely. Main line is laid along main roads and streets from these sub main and branches are taken out and are interconnected. This system removes all disadvantages of dead end system.</p>  <p>Supply main</p> <p>X - Sluice valve SM - Submain B - Branch S - Service pipe</p> <p>iii) Circular system: In this system each locality is divided into circular or square blocks and the water mains are laid around all the four sides of round or circle. The sub mains and branches are taken off from the boundary mains and are connected. Thus every point receives its supply from two directions.</p>  <p>B - Branch M - Main SM - Submain</p>	<p>02 Marks for Explanation and fig. Write ANY ONE</p>

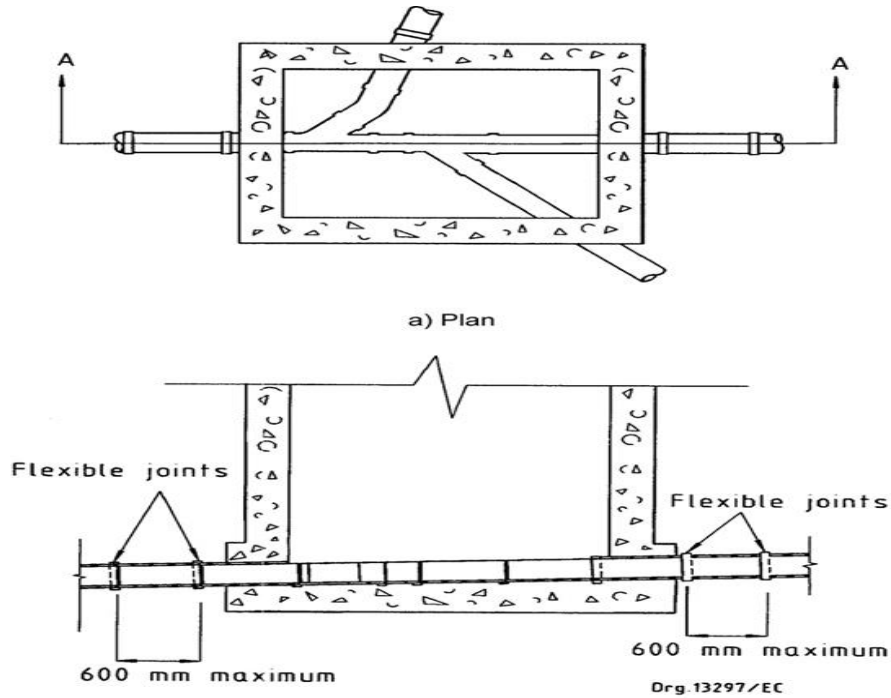
Q.NO	SOLUTION	MARKS
Q.2 d)	<p>i) Radial System: This is reverse of ring system and water flows towards outer periphery from one point. The entire city is divided into various zones and one reservoir is provided for each zone, which is placed in the centre of zone. The water lines are laid radially from it.</p> <div style="text-align: center;"> </div>	
e)	<p>Draw p trap and s trap showing water seal.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>S-trap</p> </div> <div style="text-align: center;"> <p>P-trap</p> </div> </div>	<p>04M</p> <p style="margin-top: 20px;">02M For Each Diagram</p>
d)	<p>Draw line diagram of sanitary plumbing and sewage collection residential building.</p> <div style="text-align: center;"> </div>	<p>04M</p>

Q .NO	SOLUTION	MARKS
Q 03.	Attempt ANY FOUR of following: (04 x 04= 16)	16
a)	What is recycling of domestic waste?	04M
	<p>Recycling of domestic waste: It's the process of recycling the domestic waste by adopting various techniques for minimizing the quantity of waste in landfill site. Many of the items used in the home can be recycled. The benefits of recycling include a cleaner environment, the safe disposal of hazardous materials.</p> <p>The items most commonly recycled are: Glass bottles and jars, Paper (newspapers, magazines, telephone books, office paper, junk mail, comics and light cardboard), Laminated or waxed papers like paper cups, Plastic bottles, Plastic bottle tops, metal and Aluminium lids, Batteries, etc. Recycling helps to create hygienic environment in the society and thus reduces the load on treatment and disposal units.</p>	04M
b)	Draw a labeled sketch of canal intake structure.	04M
	 <p style="text-align: center;">Fig. Canal Intake</p>	04M

Q .NO	SOLUTION	MARKS
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c) Describe inspection chamber with neat sketch. 04

Sketch:



2M

2M

Inspection chamber

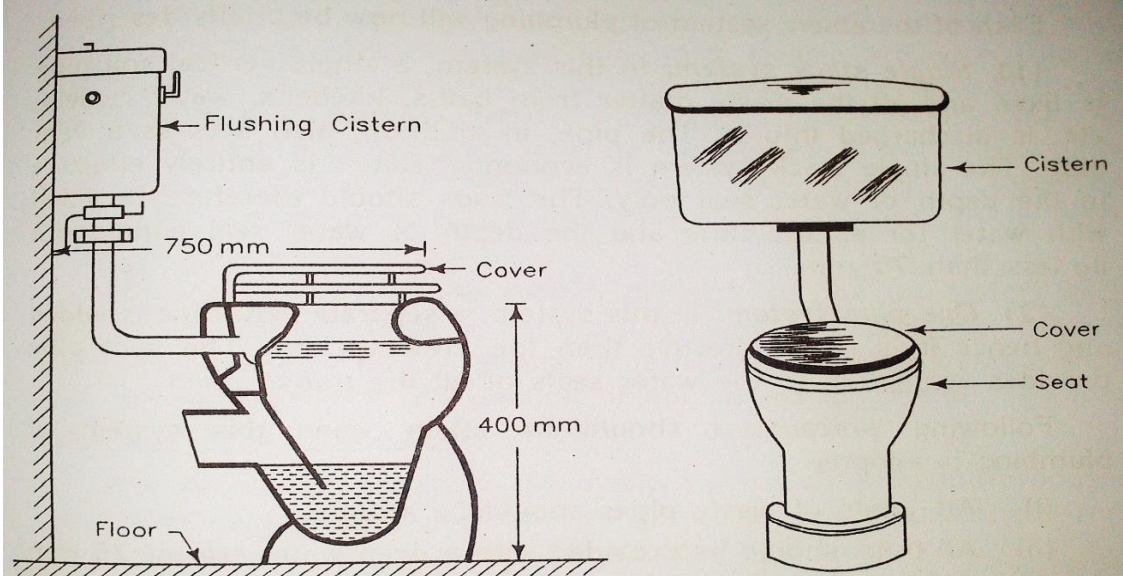
The purpose of inspection chamber is to provide a means of access for inspecting the drain or sewer and to allow cleaning. Inspection chambers may be constructed from Class B bricks, precast concrete sections, in-situ concrete, and glass fiber plastic. All pipes in an inspection chamber should be discharging in the direction of flow. Benching in a chamber should rise vertically on either sides of channel up to the crown of pipe, and slope upwards towards the chamber wall at a gradient of 1:6.

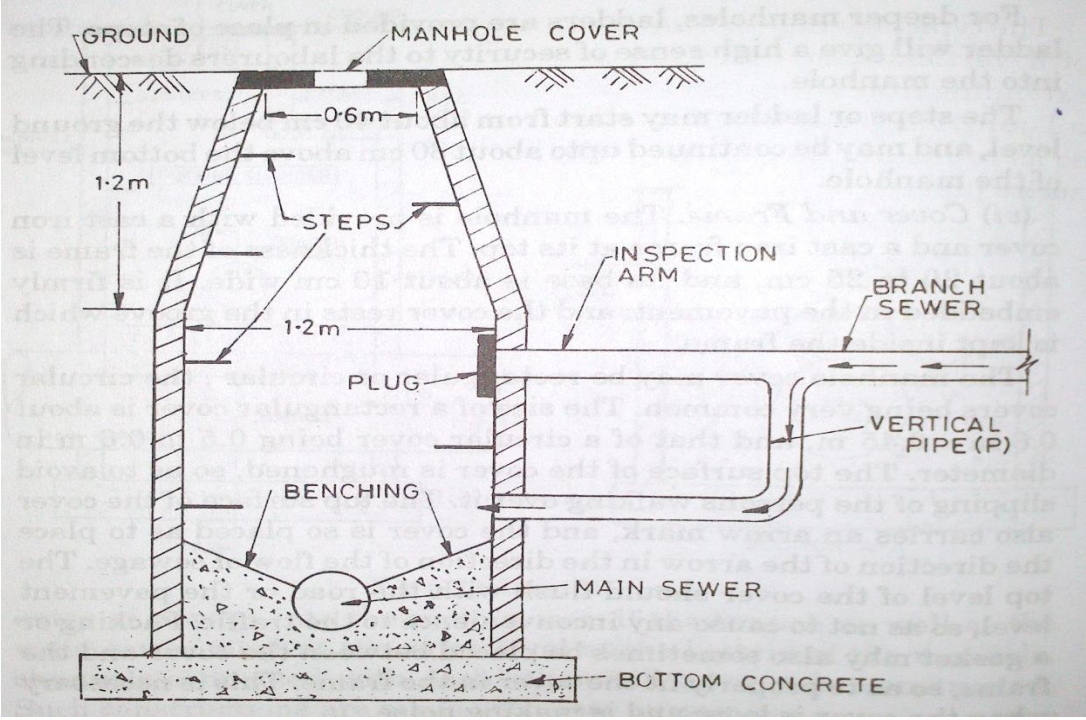
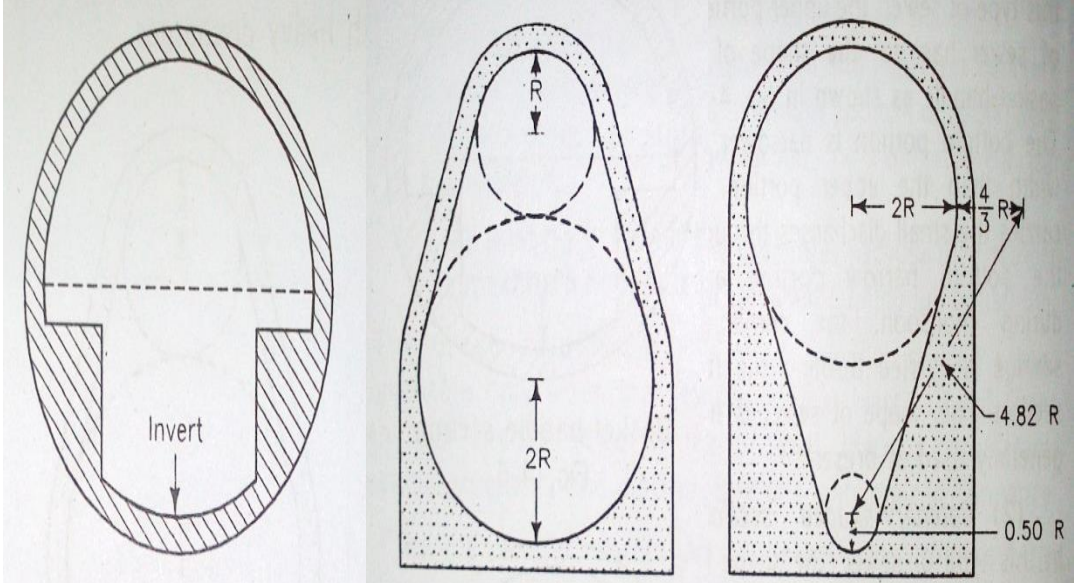
d) Compare on four points between rapid sand filter and slow sand filter. 04

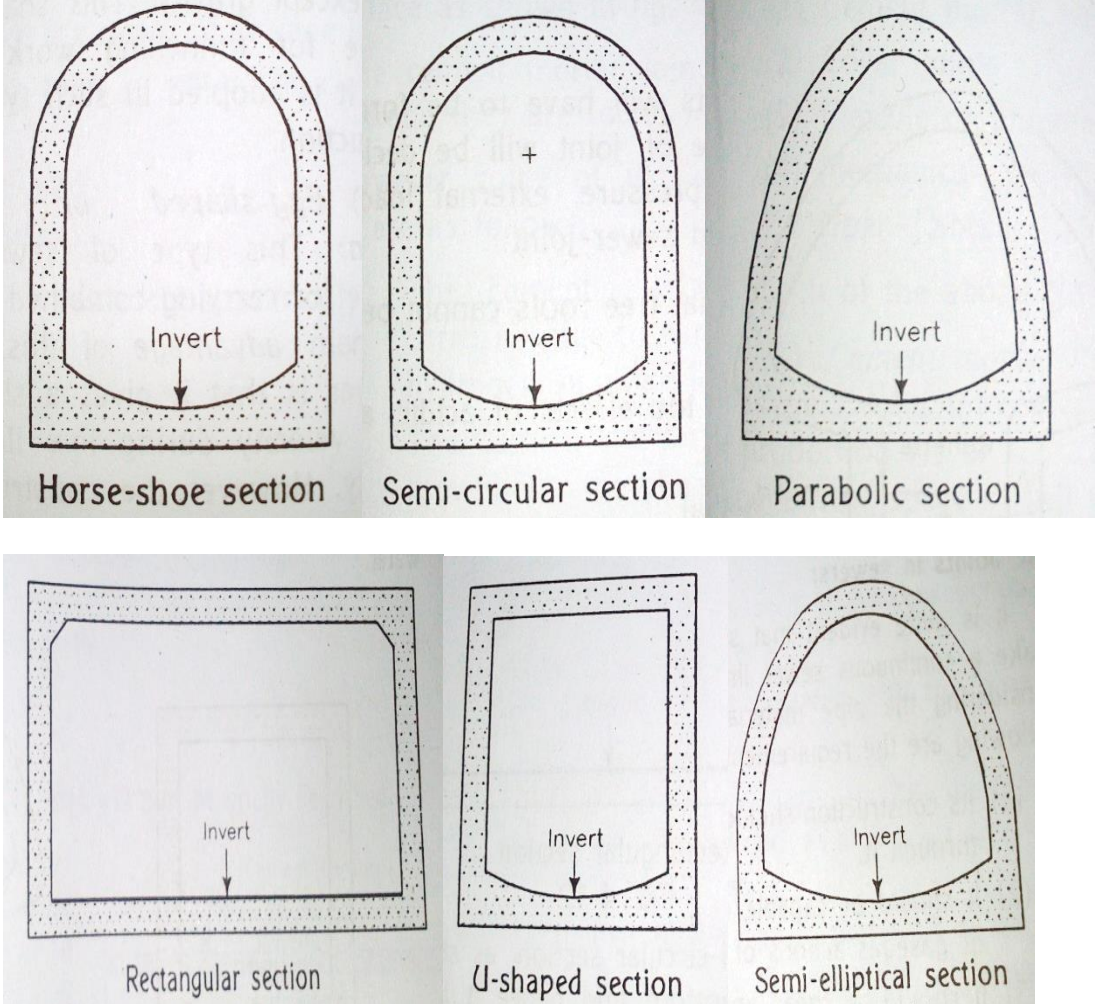
Comparison between rapid sand filter and slow sand filter:

Comparison Points	Slow Sand filter	Rapid Sand Filter
1. Coagulation	Not required	Essential
2. Compactness	Requires large area for its installation.	Requires small area for its installation.
3. Construction	Simple	Complicated as separate under drainage system is required to be design.
4. Cost of operation	Low	High
5. Period of cleaning	1-3 Months	2-3 days
6. Method of clearing	Long and laborious method	Due to back washing short and speedy method.
7. Skilled supervision	Not essential	Essential
8. Suitability	For small towns and villages.	For big cities where land cost is high and variation in water demand.
9. Base material	Varies from 3-65mm in size with 300-750 mm depth.	Varies from 3-40mm in size with 600-900 mm depth.
10. Loss of head	150-750mm	3m -3.50m
11. Rate of filtration	100-200lit/hr/m ²	3000-6000lit/hr/m ²

1 Each for Any 4 Points of comparison.

Q.NO	SOLUTION	MARKS
e)	State types of sewers. Describe ANY ONE.	04
	<p><u>Types of sewers:</u></p> <ol style="list-style-type: none"> 1. Main sewer or Trunk sewer. 2. Branch sewer. 3. Lateral sewer. 4. Outfall sewer. 5. Intercepting sewer. 6. Separate sewer. 7. Combined sewer. 8. Storm sewer. <p><u>Intercepting sewer:</u> A sewer which receives dry weather flow from a number of transverse sewers of outlets and quantities and conducts such waters to a point for treatment and disposal is called intercepting sewer. It is usually a large sewer which flows parallel to a natural drainage channel into which a number of main or outfall sewers discharge.</p>	<p style="text-align: center;">2M</p> <p style="text-align: center;">2M</p>
Q.04 A)	Attempt ANY THREE of the following: (03x04=12)	12M
a)	State importance of building sanitation.	04M
	<p><u>Importance of building sanitation:</u> The arrangement provided in the building, for collection and conveying wastewater through drain pipes, by gravity to join either public sewer or a domestic septic tank is called as building sanitation. It is important due following reasons:</p> <ol style="list-style-type: none"> 1. To maintain healthy condition in the building. 2. To dispose off the waste water as early and quickly as possible. 3. To avoid the entry of foul gases form sewer or septic tank. 4. To facilitate quick removal of foul matter (e.g. Human excreta). 5. To collect and remove waste matters systematically. 	4M
b)	Draw neat sketch of European type water closet and explain in brief its working.	04M
	<p><u>Neat sketch of European type water closet:</u></p>  <p style="text-align: center;">European type water closet</p> <p style="text-align: center;">Perspective view of European type water closet</p>	<p style="text-align: center;">02M</p> <p style="text-align: center;">02M</p>

Q.NO	SOLUTION	MARKS
	<p>Working: The above figure shows the details of typical European type water closet. It is usually made of porcelain. The pan has a flushing rim to spread the flush water. A cover is provided at its top. The excreta fall directly into the trap and with a good flush of water, pan remains in clean position.</p>	
c)	<p>Sketch drop manhole showing its construction details.</p>	04M
	 <p style="text-align: center;">Figure Drop manhole</p>	04M
d)	<p>Draw ANY FOUR sections of sewer. State advantage of egg-shaped sewer.</p>	04M
	<p>Sections of sewer:</p>  <p style="text-align: center;">Basket-handle section Inverted egg-shaped section New egg-shaped section</p>	<p>½ Each for Any 4 Sections</p>

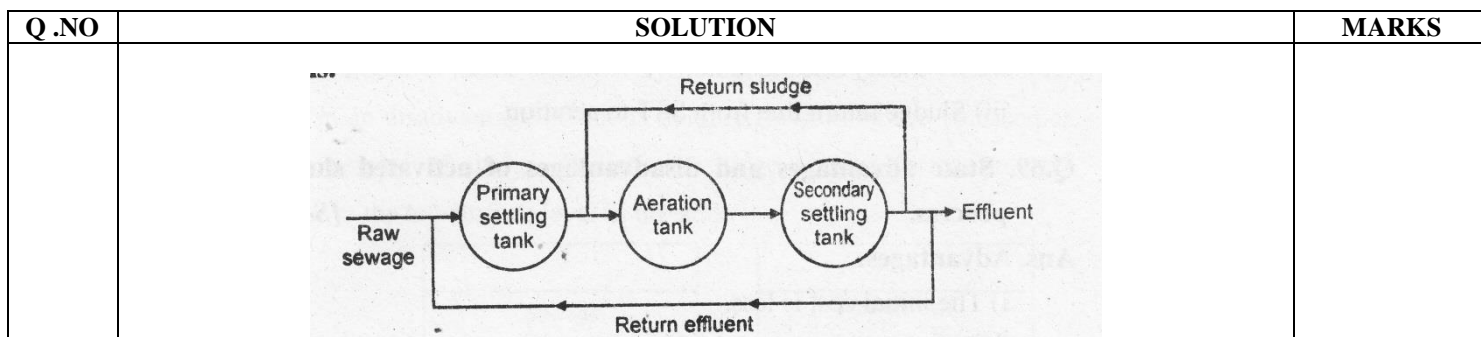
Q.NO	SOLUTION	MARKS																												
	 <p>Horse-shoe section Semi-circular section Parabolic section</p> <p>Rectangular section U-shaped section Semi-elliptical section</p> <p>Advantage of egg-shaped sewer:</p> <ol style="list-style-type: none"> 1. Egg-shaped sewer is suitable for carrying combined flow. 2. It gives slightly higher velocity than a circular sewer of same capacity. 3. It is suitable for great fluctuation of discharge. 	<p>1 Each Any 2</p>																												
B)	<p>Attempt ANY ONE of following: (03 x 02 =06)</p>	06M																												
a)	<p>The population of city from census record, for last four decades is given in the following table. Calculate population at the end of year 2041 by incremental increase method.</p> <table border="1" data-bbox="203 1522 893 1596"> <thead> <tr> <th>Year</th> <th>1981</th> <th>1991</th> <th>2001</th> <th>2011</th> </tr> </thead> <tbody> <tr> <td>Population</td> <td>1,00,000</td> <td>1,09,000</td> <td>1,16,000</td> <td>1,28,200</td> </tr> </tbody> </table>	Year	1981	1991	2001	2011	Population	1,00,000	1,09,000	1,16,000	1,28,200	06M																		
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	<p>Incremental increase method:</p> <table border="1" data-bbox="251 1627 1299 1942"> <thead> <tr> <th>Year</th> <th>Population</th> <th>Increment/decade</th> <th>Incremental increase</th> </tr> </thead> <tbody> <tr> <td>1981</td> <td>1,00,000</td> <td>-</td> <td>-</td> </tr> <tr> <td>1991</td> <td>1,09,000</td> <td>9,000</td> <td>-</td> </tr> <tr> <td>2001</td> <td>1,16,000</td> <td>7,000</td> <td>-2,000</td> </tr> <tr> <td>2011</td> <td>1,28,200</td> <td>12,200</td> <td>+5,200</td> </tr> <tr> <td></td> <td>Total</td> <td>28,200</td> <td>+3,200</td> </tr> <tr> <td></td> <td>Average</td> <td>$\frac{28200}{03} = 9400$</td> <td>$\frac{3200}{02} = 1600$</td> </tr> </tbody> </table>	Year	Population	Increment/decade	Incremental increase	1981	1,00,000	-	-	1991	1,09,000	9,000	-	2001	1,16,000	7,000	-2,000	2011	1,28,200	12,200	+5,200		Total	28,200	+3,200		Average	$\frac{28200}{03} = 9400$	$\frac{3200}{02} = 1600$	<p>02M 01M</p>
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Q.NO	SOLUTION	MARKS																		
	$P_n = P + nI + \frac{n(n+1)}{2}r$ <p>Where, P = Population in 2011 =1,28,200 n = number of decades = (2041-2011)/10 =03 I = Average increase per decade = 28200/03 = 9400 r = Average incremental increase = 3200/02 = 1600</p> $\therefore P_{2041} = 128200 + 3 \times 9400 + \frac{3(3+1)}{2} \times 1600$ $\therefore P_{2041} = 1,66,000$ <p>Therefore the population at the end of year 2041 will be 1,66,000.</p>	<p align="center">1</p> <p align="center">½</p> <p align="center">½</p> <p align="center">1</p>																		
b)	<p>Differentiate between one pipe and two pipe system of plumbing.</p>	<p align="center">06M</p>																		
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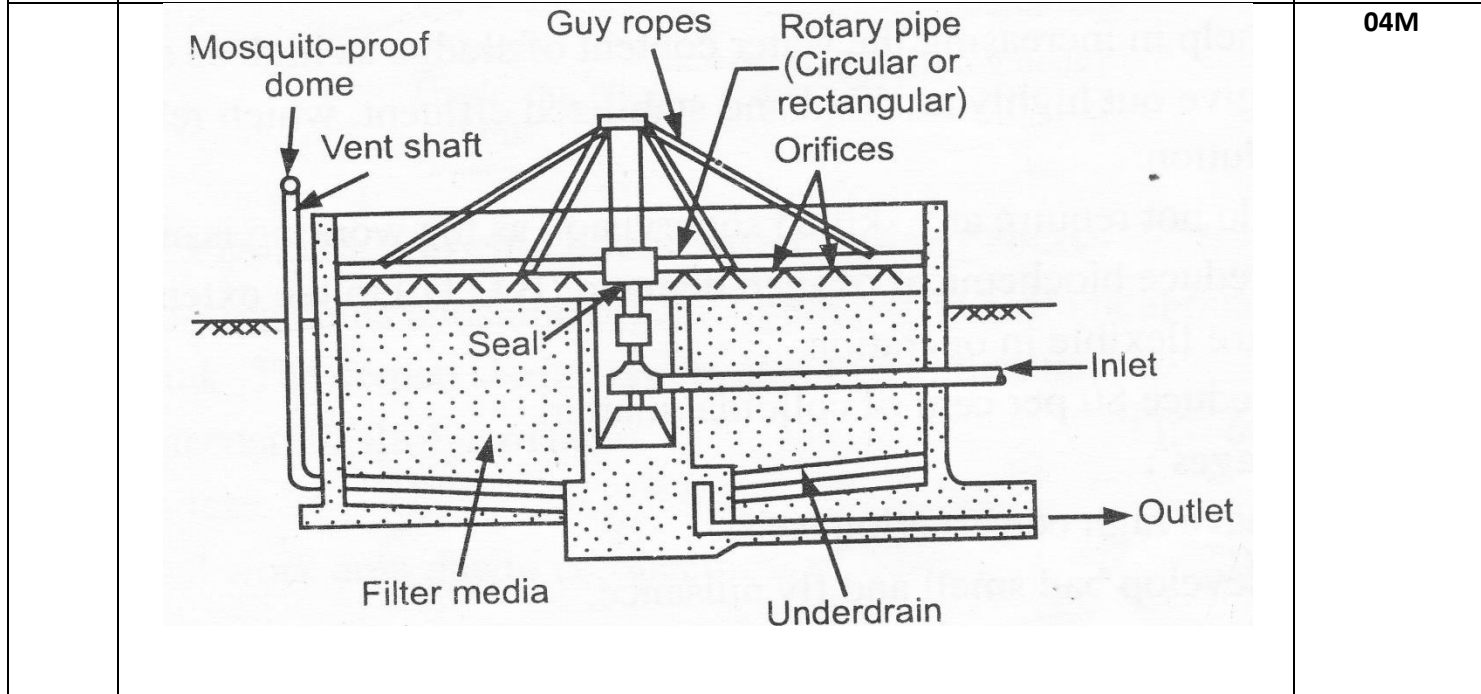
Q .NO	SOLUTION	MARK S																												
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(a)	List any four sanitary pipe fitting and mention purpose of each.	04																												
	<p>a) List of sanitary pipe fitting and purpose of each.</p> <p>i) Water closet, Indian and European type-: it is sanitary fitting is used to receive human excreta directly and is connected to soil pipe by means of trap.</p> <p>ii) Flushing cistern -: it is used for flushing water closet and urinal after its use.</p> <p>iii) Wash hand basin-:A wash basin is vessel use for washing hand, face or bushing etc in standing position</p> <p>iv) Sink-: These are rectangular shallow vessels suitable for kitchen or laboratory for washing purpose.</p> <p>v) Urinals-: A urinal is a toilet-like plumbing fixture for urination only.</p> <p>vi) Traps-: the device is used to stop the escape of foul gases inside or outside the house.</p>	<p>½ for each Types and ½ for its purpose</p> <p><u>WRITE ANY FOUR</u></p>																												
(b)	Define COD. State its significance.	04M																												
	<p>Define COD-: it is defined as the amount of oxygen required to oxidize matter by strong oxidizing agent under acidic conditions.</p> <p>Significance-:</p> <p>i) To measure the content of organic matter, biodegradable as well as no bio-degradable matter COD test is carried out.</p> <p>ii) The COD test can be carried out to measure organic matter present in industrial waste having toxic compound likely to interfere with the biological life.</p>	<p>02M</p> <p>02M</p>																												
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Q .NO	SOLUTION	MARKS
(d)	Explain working of septic tank with sketch.	04M
Ans	<p>i) Septic tank sketch.</p> <p>ii) working of septic tank</p> <p>A septic tank is closed water tight chamber where combined sedimentation and digestion of sewage are carried out under anaerobic activity. The sewage and sludge are detained for some period when suspended solids are settled down which are treated by anaerobic digestion and results in reduction of volume and release of CH₄, CO₂, H₂S gases. The foul gases are escaped through vent pipe and the offensive effluent is disposed off into the ground through soak pit. The digested sludge is periodically removed once in year or twice. the septic tank is useful for individual houses, hostel and small groups of population</p>	02 M
(e)	Enlist benefits of rain water harvesting.	04M
Ans	<ol style="list-style-type: none"> 1. Diminishing flooding, erosion and the flow to storm water drain by reducing peak storm water runoff. 2. Reducing water bills and demand on your community's drinking water supply by using rainwater for flushing toilets, washing clothes, watering the garden and washing cars 3. Improving plant growth by using rainwater for irrigation because stored rainwater is free from pollutants as well as salts, minerals, and other natural and man-made contaminants 4. Making use of a valuable resource that is free. 5. It provides water when there is a drought, can help mitigate flooding of low-lying areas, and reduces demand on wells which may enable ground water levels to be sustained. 6. Rainwater harvesting systems are environmentally sound. 7. Pipes from house to water tanks hidden underground. 8. Simple designs and concepts. 9. Reduces the capital needed for expensive dam building, and eliminates the need for new sewerage treatment works. 10. Reduces sewerage outfall 11. Stored water is available during future water outages. 12. Adequate water available for irrigation. 13. Storm water from roofs to street is almost eliminated. 	½ marks each WRITE ANY EIGHT

Q.NO	SOLUTION	MARKS
(f)	Draw a general layout and flow diagram for sewage treatment plant.	04M
		04M
Q. 6	Attempt any Four of the following	16M
(a)	Explain purpose of grit chamber. State its location.	04M
	<p>i) purpose of grit chamber</p> <ul style="list-style-type: none"> • Protect moving mechanical equipment from abrasion and accompanying abnormal wear. • Reduce formation of heavy deposits in pipelines, channels and conduits. • Reduce the frequency of digester. • To remove grit from the sewage. • To minimizes the load of subsequent treatment. <p>ii)grit chamber location</p> <p>Grit chambers are usually located ahead of pumps or comminuting devices, and if mechanically cleaned, should be preceded by coarse bar rack screens</p>	01M Each Write any TWO
(b)	Explain activated sludge process.	04M
	<ul style="list-style-type: none"> • Raw sewage from a primary settling tank(D.T.1 to 1.5 hrs) enter into an aeration tank • The raw sewage is mixed with 20% to 30% of activated sludge (return sludge) in aeration tank, the mixture is known as mixture liquor. • The mixture liquor is aerated and agitated in the tank for about 4 to 8hrs.the micro-organism oxidize organic matter in the presence of abundant quantity of oxygen. • Sewage is allowed to settle in secondary settling tank. This settled sludge has undergone aeration and has active microorganism, so some portion of this active sludge is re-circulated into the aeration tank for seeding the raw sewage. Excess quantity of sludge is treated and disposed off. • The effluent from SST is disposed off. A portion of effluent is mixed in raw sewage before sending it to PST. 	04M



(c)	Draw a labeled sketch of trickling filters.	04M
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(d)	Describe the procedure of testing of sewers after construction is complete.	04M
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	<p>i) Water Test</p> <ul style="list-style-type: none"> ❖ This test is carried out for sewer lines between two manholes. ❖ Plugging is done by rubber plug at its lower end. ❖ Rubber plug is connected with air blown. ❖ The upper end of sewer is plugged with a connection to the funnel. ❖ The sewer is filled with water and to maintain the required head, water level in the funnel is kept 2 m above the upper end. ❖ This head varies with the material of sewer. ❖ In case of cast iron sewer, the head should be at 9m. ❖ The acceptable loss or head loss should not exceed 2 litres/cm of length of the sewer. ❖ To perform this test sufficient amount of water should be available. <p>ii) Air Test</p> <ul style="list-style-type: none"> ❖ When sufficient amount of water is not available, then air test is to be carried out. ❖ Air is pumped into the pipeline, usually via a hand-pump with a control valve, until the reading on the manometer is around 125-150mm. ❖ The set-up is then left for 5-10 minutes to allow for temperature stabilisation within the pipe before the pressure is reduced to exactly 100mm on the manometer scale. 	<p>02M</p> <p>02M</p>
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	<ul style="list-style-type: none"> ❖ The manometer is then monitored for a period of 5 minutes; the level of water in the manometer should not fall below the 75mm mark during this period. ❖ This is deemed to be a 'pass' and the pipeline is declared satisfactory and can be backfilled. ❖ However, if the level in the manometer does fall below the 75mm mark, then the equipment should be checked and cleaned and the pipeline examined for leaks or defects. ❖ If any problems are identified, they should be rectified before re-testing. 																			
(e)	Enlist any four types of valves used in conveyance of water. State their Location and one function of each.	04M																		
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