TED (IS): 6012 (A) (11)

Scheme of valuation

Part A

1. 1. When pumping is done, water is drawn from the surrounding water table from all directions. The water table which was originally horizontal al round the well, is now depressed into the shape of the surface of an inverted cone which is known as cone of depression.

2. It is the pipe connecting the storage tank to the various sanitary fixtures, taps etc. for the purpose of distribution of water inside the building.

3. It includes all types of semi-solid and solid waste, food products such as vegetables, Peelings of fruits, waste meat etc.

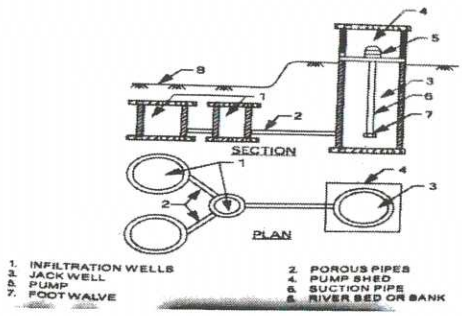
4. Rectangular, Semi -circular, U- shaped, V- shaped

5. It is an enlarged channel through which sewage is passed through to remove grit.

(5x2=10)

Part B

11. **1**.These are vertical shallow well constructed in series along the banks of rives. The wells are connected by porous pipes.



The wells are constructed either by masonry, concrete or RCC rings. Supply can be augmented by either providing more number of wells or by laying radial porous pipes with open joints. Covered at top with RCC slabs. Manholes are provided for inspection. Wells

are connected by porous pipes to a sump well called jack well. Water is connected finally in the jack well and pumped. Treated if necessary and distributed. **(3+3=6)**

2. Water tightness, Durability, Strength, Adhesiveness, Workability, Availability of materials, Flexibility, Economy. **(Any six)**

3. 1. To assess the quality of raw water and the concentration of various impurities.

2. To decide the line of treatment, which mainly depends on the type and concentration of impurities.

3. To facilitate the controlling of daily operations in the treatment plant.

4. To check whether the treated water is satisfying the required standards for domestic use and industrial use. **(4x1.5=6)**

4.Cascade aerators: Water is made to fall in the form of thin sheet, over a series of steps. During fall, water mixes thoroughly with atmospheric air and gets aerated.

Spray nozzles: Water is sprayed under pressure through special nozzles and increasing the contact area of water with air and thus effecting aeration.

Multiple pan aerators: Water is made to trickle through successive perforated pans arranged one below the other and thus aerated.

Diffusion aerators: It consists of bubbling the water from bottom through compressed air by using porous plates. Water contained in the tank is thus aerated. **(4x1.5=6)**

5. 1. Construction and maintenance should be easy and cheap

2. Even during dry weather flow, self-cleansing velocity should be developed to avoid deposition of any solids if present.

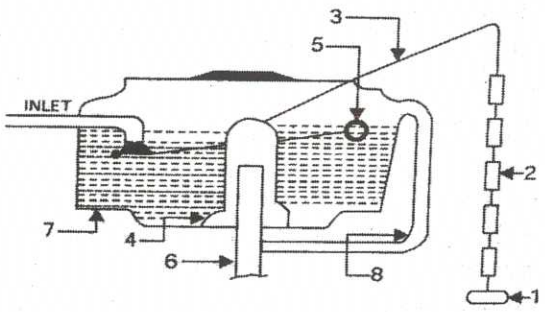
3. Drain should have sufficient free board even during maximum discharge so as to a avoid over flowing. 4. Inner surface should be smooth.

5. Drain should be such that it can be easily cleaned. 6. It should be structurally safe and stable. 7. It should be non-corrosive and with stand erosion due to flow. **(Any six)**

6. This is based on "suspended growth process" in which an adequate biological mass (aerobic bacteria) in suspension with in the tank, is maintained by either natural or mechanical mixing. This is an improved method of secondary treatment of the effluent from primary sedimentation tank. The sludge of the sewage which is previously agitated under aerobic condition containing full of aerobic bacteria is called activated sludge.

In the activated sludge process the primary effluent is mixed with activated sludge and then aerated so as to oxidize the organic matter and convert it into settleable flocs. These flocs can be removed in the secondary sedimentation tanks. **(6)**

7. The arrangement made to flush out the water closet or urinals is called flushing cistern.



1. HANDLE 2. FLUSHING CHAIN 3. LEVER
4. BELL 5. FLOAT 6. FLUSH PIPE
7. CASING 8. OVER FLOW PIPE

Made of cast iron with a capacity of 5 to 15liters of water. A bell connected to flushing chain through a liver. When the chain is pulled, the bell is lifted up and the water in the tank rushes through the flushing pipe by symphonic action. The float valve now allows water from the inlet into the cistern is made ready for next flushing. **(3=3=6)**

PART C

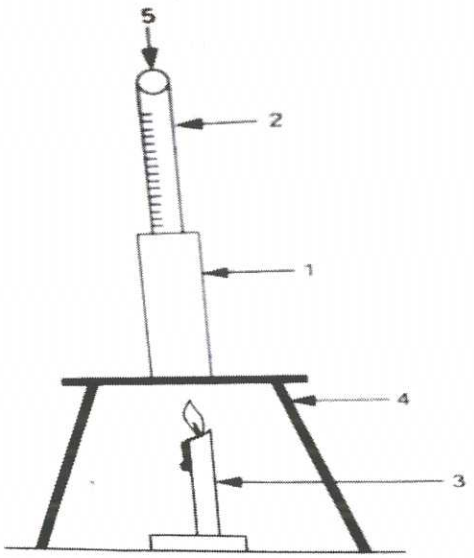
III **(a)** 1. Social and economic status of consumers, 2. Climatic conditions

3. Industries and commerce 4. Quality of water 5. Systems of supply

6. Pressure in distribution system 7. Policy of metering 8. Cost of water

9. Systems of sewage collection 10. Size of the city **(Any 8)**

(b) Jackson turbidimeter:



1. METAL CONTAINER
2. CALIBRATED GLASS TUBE
3. STANDARD CANDLE
4. STAND
5. EYE POSITION

It is used to measure turbidity directly in the range 2 to 1000 mg/l or more. It consists of a metal container supporting a calibrated glass tube is placed. A standard candle is placed below the metal tube. Water is added gradually to the glass tube until the image of candle flame ceases to appear when seen from top of the glass tube. The reading corresponding to the depth of water in glass tube directly gives the value of turbidity of the sample.

(4+3=7)

5

IV **(a)** The various demands are

1. **Domestic demand:** This includes water furnished for houses for the purposes of Drinking, bathing, cooking and other needs. According to Indian standard specifications the recommended value is 135 lpd. This amounts to about 50% of total consumption.

2. Industrial and commercial demand: This comprises of water required by various Industries, offices and hospitals etc. of the town and depends on the nature and number of of industrial establishments. 20 to 25% of the total consumption is made in the design.

3. Public use: This includes water used for public utility purposes such as watering for public Parks, jails etc. This may take about 10% of the total consumption.

4. Losses and wastes: This is the water "unaccounted for" and is due to bad plumbing, leakage in mains, damaged meters, unauthorized connections and other wastes. Losses can be reduced by careful maintenance. This loss can be taken as about 15% of the total consumption.

5. Fire demand: It is desirable that provision for the firefighting should form part of the water supplies, as the chances for fire outbreak in thickly populated localities and industrial areas are more.

(Any 4x2= 8)

(b) 1.Direct Pumping Test:

The test involves pumping water from the well at such rate as to maintain constant draw down. First, water level is lowered down by heavy rate pumping till maximum working head is reached. The rate of pumping is then slowly adjusted so that water level in the well remains constant for a considerable period. Now the actual yield of well is equal to the rate of pumping. The test requires a variable pump, whose rate of of pumping can either be lowered or raised.

2. Recuperation test: In this test, water is first lowered down to a safe level by pumping. Then pumping is stopped and the water level is allowed to recuperate to its original level. The rise of water level and its corresponding time interval is noted. Knowing cross-sectional area of the well and time taken to reach different levels the yield of the well at different drawdowns can be calculated by the use of formula.

$K = 2.303\ A/T\ \text{Log}_{10}\ h1/h2$, $Q = K.H$

Where Q = Yield of well in m^3/hr

K = Specific yield of well in m^3/hr

A = Cross sectional area of well in m^2

T = Time in hrs required by the well to recuperate from h1 to h2

h1= Initial draw down in m. When pumping is stopped.

h2= Final draw down in m. after recuperation time interval.

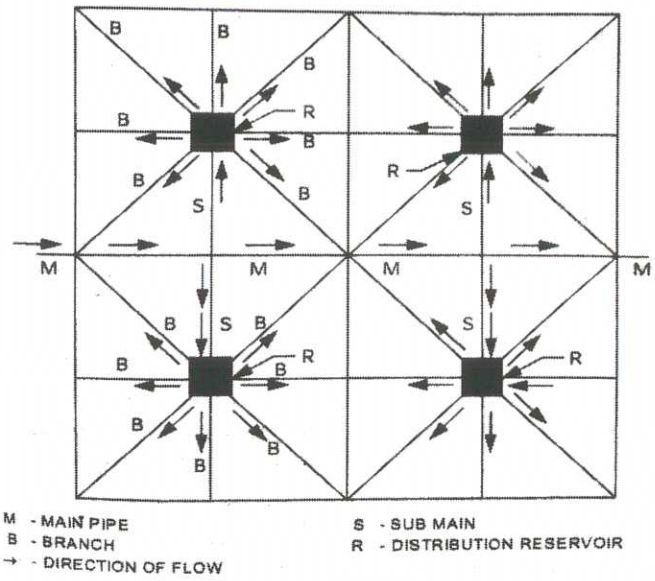
H= Any value of draw down at which yield is to be calculated. **(3 +4=7)**

V **(a) Requirements of a good coagulant:**

1. It should react quickly in water to form flocs
2. It should be cheap
3. It should be easy to handle and store
4. Quality should not deteriorate with time.
5. It should give positively charged ions to attract negatively charged colloids
6. It should react in the long range of pH
7. It should mix easily in water
8. It should not render water unpotable and harmful

(b) Radial System:

In this system water flows radially from one point to the outer periphery. The entire city is divided into number of zones and distribution reservoir is placed in the centre of each zone.



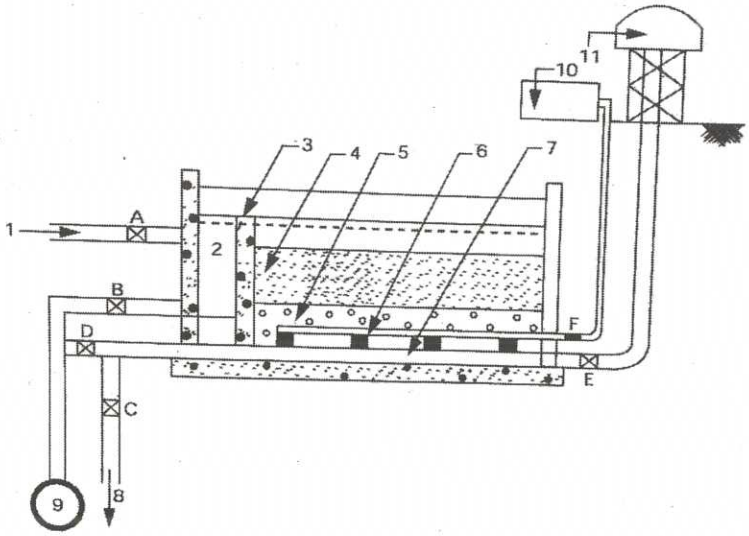
Advantages:

1. Advantageously used for "Direct indirect" system.
2. Ensures high pressures and efficient water distribution
3. Design calculations are easy

Disadvantages:

1. Suitable for towns only with radial layout of roads and cannot be adopted for other patterns.
2. Number of elevated reservoirs are more.
3. Overall cost is more.

VI **(a) Working of a Rapid Sand Filter**: The effluent from sedimentation with coagulation unit is applied to the filter. Through valve A. Valves B,D and E are closed and then water is allowed to percolate through sand bed. Water is filtered by the action of different mechanisms of filtration. The filtered water collected in the under drainage system is taken to the clear water reservoir through manifold drain pipe by opening the valve C.



1. INLET
2. INLET CHANNEL
3. OVER FLOW WEIR
4. SAND MEDIUM
5. GRAVEL BED
6. LATERAL DRAINS
7. MANIFOLD DRAIN PIPE
8. TO CLEAR WATER RESERVOIR
9. WASH WATER DRAIN
10. AIR COMPRESSER UNIT
11. OVER HEAD TANK TO SUPPLY WASH WATER A, B, C, D, E AND F ARE VALVES

(4+4=8)

(b) Methods of Disinfection:

Boiling, Chlorination, Use of Chloramines, Ozonization, Treatment with ultra violet rays Treatment with excess lime, Treatment with Iodine and Bromine, Treatment with Pottasium Permanganate, Disinfection with silver. **(Any Seven)**

VII (a) Disadvantages of conservancy system:

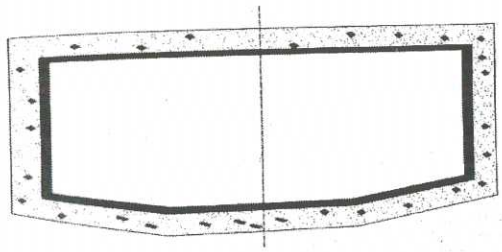
1. The night soil gives bad smell in the conservancy latrines which is a nuisance to public
2. House fly nuisance and possibility of transmission of diseases like typhoid
3. Un hygenic and social injustice involved in the manual removal of human excreta
4. Insanitation and unaesthetic aspect involved in the transportation of night soil through streets by trucks and carts.
5. Risk of epidemics due to improper and care less disposal of night soil.
6. Risk of ground water pollution due to percolation
7. Insanitation due to carriage of sullage through open drains.
8. Require much land for the disposal of night soil
9. The system completely fails during strikes by workers
10. The latrines are to be located away from the buildings. such location is very inconvenient to the inhabitants. **(Any eight)**

(b) Rectangular Sewers:

Merits: 1. Easy to construct 2. Can be used for storage also 3. Economical

Demerits: 1. Hydraulic mean depth is low for small discharges

2. Cannot effectively take the load of over burden when width is large.



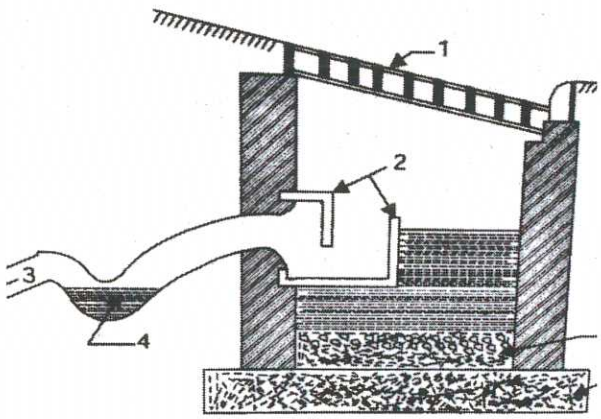
(6+2=8)

VIII (a) Physical Characteristics of a sewage:

1. Colour: The sewage has grey or light brown colour. The stale or septic sewage has black or dark brown colour.
2. Odour: Fresh sewage has soapy or oily smell but the stale sewage has offensive odour due to liberation of Hydrogen sulphide.
3. Temperature: Temperature of sewage is slightly higher than that of water supplied.
4. Turbidity: Sewage is normally turbid. **(4x2=8)**

(b) Catch Basins:

It is similar to the horizontal inlet with an extra provision of a basin to allow settlement of grit sand and debris. Thus it prevents these matters to enter into the sewer. The outlet pipe is usually trapped to prevent escape of foul gas from the sewers.



GRATING 2. BAFFLES
TO SEWER 4. TRAP
GRIT, SAND DEPOSIT 6. CONCRETE BED

IX **(a) Advantages of oxidation ponds:**

1. Quite suitable for tropical contries
2. Efficiency of the plant is quite high
3. Simple in operation
4. Initial and maintenance costs are found to be low.
5. They are flexible and do not get upset due to fluctuations in organic loading
6. Algae can be harvested and used as chicken feed.

Disadvantages:

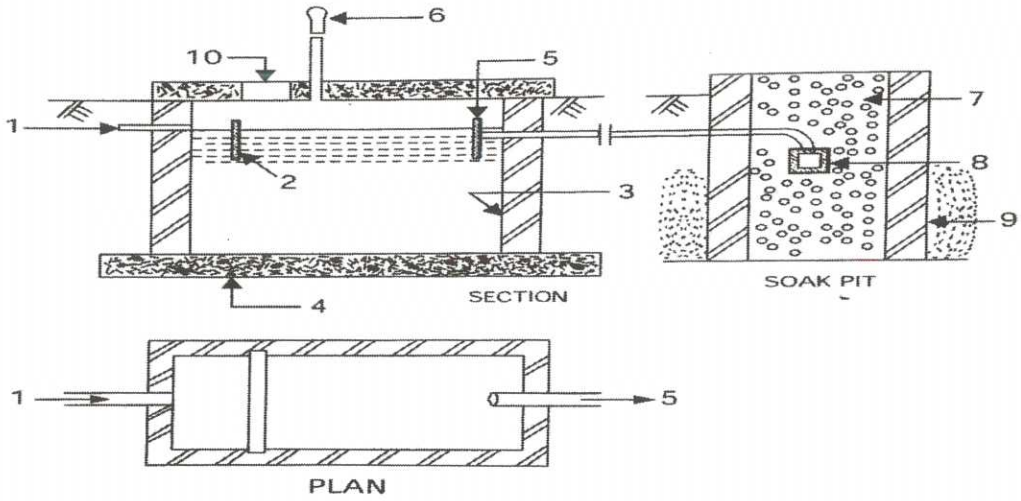
1. Large area of land is required.
2. Mosquito breading may takes place
3. The pond may liberate bad odour when normal working gets upset. **(8)**

(b) Natural source of air pollution:

1. Electrical storms producing oxides of Nitrogen
2. Volcanic disturbances contributing hydrogen fluride etc
3. Volcanoes releasing Sulphur dioxide, hydrogen sulphide etc
4. Wind blowing, causing the spread of dust particles, bacteria etc
5. Aerosols of natural origin by volcanic action, smoke of forest fires
6. Radioactivity of the atmosphere due to radio activity minerals in the earths crust
7. Natural chemical reactions, bio chemical reactions releasing carbon dioxide into Atmosphere. **(7)**

X **(a)) Construction and operation of a Septic tank:**

Septic tank is a single chambered masonry or concrete rectangular tank with a water tight concrete floor at bottom. Inside of the tank is plastered with a water tight plastering.It consist of a inlet and out let pipe of Tee-section with inlet and out let baffles so as to avoid scum to enter in to pipes. Top of the tank is closed and provided with a man hole. Also provided with a vent pipe to escape the gas produced in the tank to atmosphere. Minimum width of tank is 1m. The sewage from urinals and water closets is allowed into tank and detained for 12 to 24hrs during which period the faecal matter is sedimented in the tank. Sedimented excreta is further digested under anaerobic conditions in about 30 to 50 days. The digested sludgestored at the bottom of the tank and then removed through man hole.



1. INLET PIPE
2. BAFFLE WALL
3. INSIDE PLASTERING
4. CONCRETE FOUNDATION
5. OUTLET PIPE WITH TEE
6. VENTILATING PIPE
7. BRICK BATS
8. BRICKS CHAMBER WITH DRY JOINTS
9. SAND CASING
10. MANHOLE

(5+3=8)

(b) 1. Spreading on soil 2. Lagooning 3. Dumping 4. Heat drying

5. Sanitary land fill 6. Drying on drying beds 7. Incineration

8. Ocean disposal

(7)