MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

(Autonomous)
(ISO/IEC-27001-2005 Certified)

WINTER-12 EXAMINATION

Subject Code: 12221 Model Answer Page No: 01/

Q.1.A) Attempt any three **(12)**

a) i) Four laws Related to Environmental pollution (1/2x4=2)

- The Air (prevention and control of pollution) Act,1981
- The Environmental (protection) Act,1986
- The (prevention & control of pollution)Act,1974
- The water (prevention & control of pollution) less Act 1977
- The National Environmental Applellate Authority Act 1997

ii) Two components of Acid Rain (1x2=2)

- Gases- main gases responsible for acid rain are So4& Nox
- Water

b) Environmental Pollution- The undesirable changes in the surroundings that have effects on plants, animals & human beings (02)

Type (1/2x4)

- Air Pollution
- Soil Pollution
- Water Pollution
- Noise Pollution
- Radiation Pollution
- Solid waste Pollution

c) i)Types of demand of water **(1/2x4)**

- Domestic demand
- Public demand
- Industrial, Commercial, Institutional demand
- Fire demand
- Losses & waste

ii) Factors affecting water demand (1/2x4= 02)

- Cost of water
- Habits of people
- Climate conditions
- Size of city
- Quality of water
- Metering system
- Supply & distribution pressure
- Industries & commerce
- System of supply
- System of sanitation

d) Intake Structure- The structure which is constructed across the surface of water so as to permit the withdrawal of water from the sources . **(02)**

Types (1/2x4=2)

- Intake canal
- Reservoir or Lake intake
- River Intake
- Portable Intake

Q.1. B) a) Desirable Limits **(1/2x12=6)**

i) Color – 50 (units of platinum cobalt scale) ii)Turbidity – 2.5 JTU Scale

iii) Total Solids - 500 mg/lit iv) Hardness- 200mg/lit (as CaCo3)

v) Chlorides – 200mg/lit (as Cl3) vi) Iron -0.1mg/lit (as Fe)

vii) pH- 7.0 to 8.5 viii) Dissolved Oxygen -3mg/lit

ix) Fluoride- 1mg/lit x) Sulphate – 200mg/lit xi) Nitrate – 45mg/lit (as No3)

xii) Pathogenic bacteria-Nil

b) (02)

Year	Population	Increase in population	Incremental increase
1981	100000	-	-
1991	109000	9000	-
2001	116600	7600	-1400
2011	128200	11600	4000
	Total	20200	2600

Average per decade (d) = 20200/4= 5050 (01)

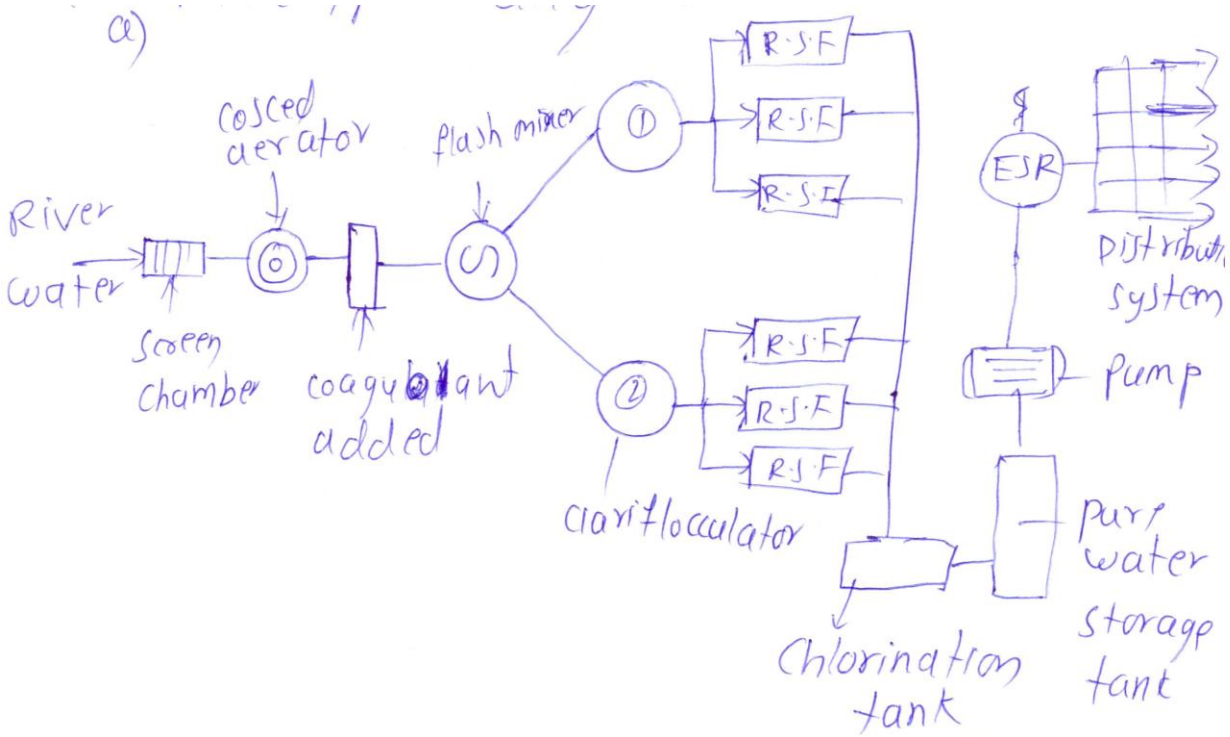
Average incremental increase= (t) = 2600/3=866.67 (01)

P2041= p+nd+ {n (n+1) t/2} (01)

128200+3{5050} +3{3+1} x866.67= 140550 persons (01)

Q.N.2. Attempt any four **(16)**

a)



b) Co-agulation- process of mixing certain chemicals to water to neutralize the electrical charges & to form an insoluble gelatinous flocculants precipitates for absorbing & entraining suspended & colloidal particles of impurities is called as coagulation (02)

Principle of coagulation

- Floc formation- when coagulants are added to water ,& insoluble gelatinous precipitate is formed , called as floc. Floc has got property of arresting the suspended impurities in water during downward travel towards the bottom of tank. (01)
- Electric charge- The floc positively charged & attracts negatively charged clay particles& thus they cause the removal.lof such particle from water (01)

c) Rapid sand filter

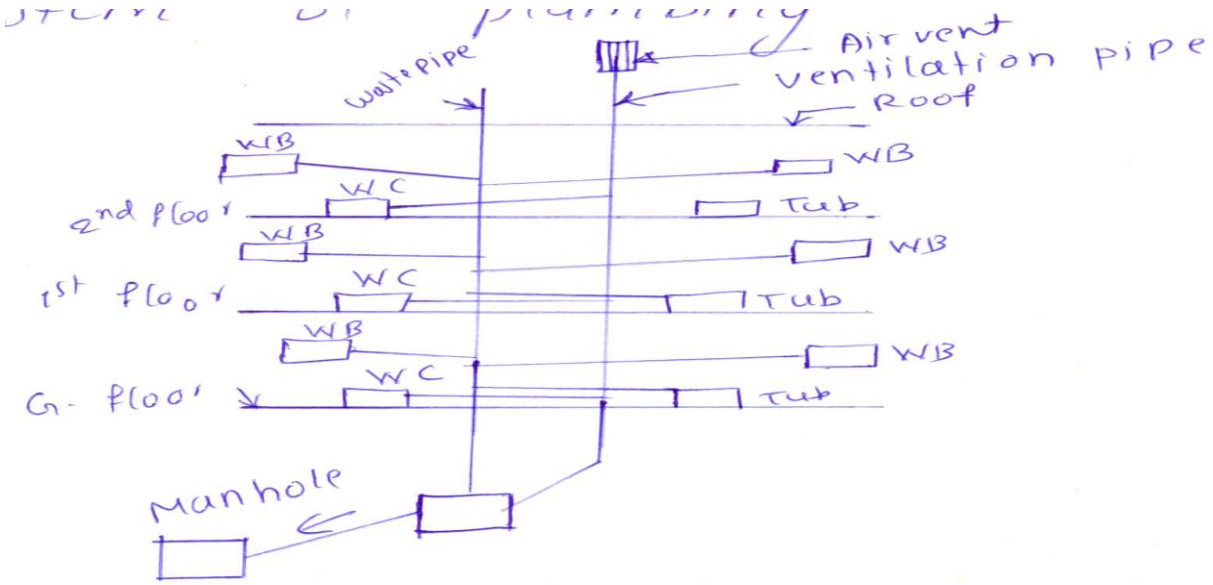
i) Size- 3 to 40mm & depth of base material -60 to 90cm (01)

ii) Effective size- 0.35 to 0.6mm Uniformity coefficient- 1.2 to 1.7 (01)

iii) Rate of filtration- 3000 to 6000litre/hour / m^2 (01)

iv) Loss of head- 30cm initial to 3mfinal (01)

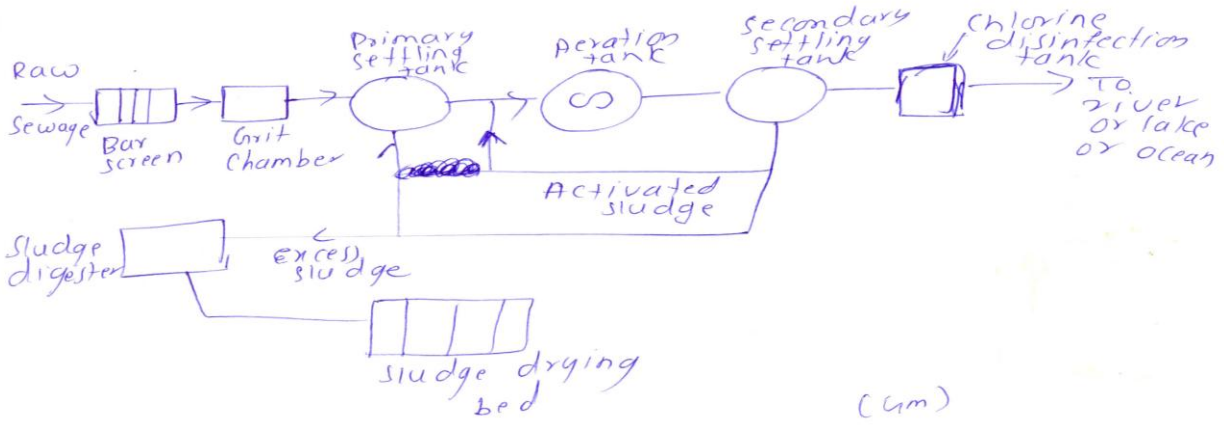
d) One pipe system of plumbing



e) **i) Sewage**-it includes sullage ,discharge from latrines, urinals,stables industrial wastes & also the ground surface & storm water that may be admitted into sewer (02)

ii) Sullage-The waste water from sink & bathroom is known as sullage (02)

f) General layout plan of municipal sewage treatment plant



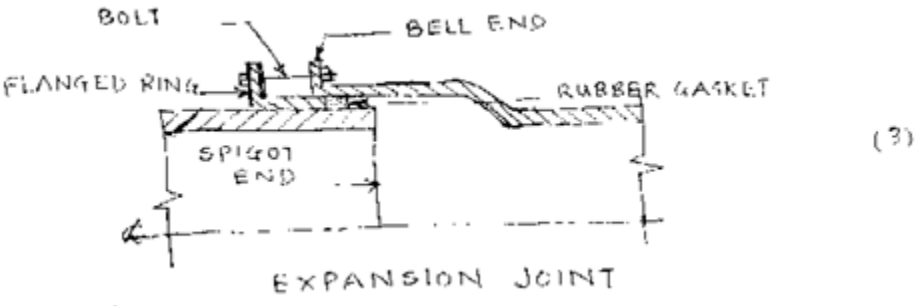
Q.N.3 a) Forms of chlorination (02)

- Plain chlorination
- Pre chlorination
- Post chlorination
- Double chlorination
- Breakpoint chlorination
- De chlorination

Residual Chlorine- The dosage of chlorine applied to water such that 0.1 to 0.2 ppm chlorine appears in water at the points if its entry into the distribution system (01)

Significance- It is used to disinfect water, when it is flowing through the distribution system to take care of contamination in the invent of leakages. (01)

b) Expansion joints- it is used when pipes are subjected to severe changes in temperature leading expansion & contraction of pipes. (01)



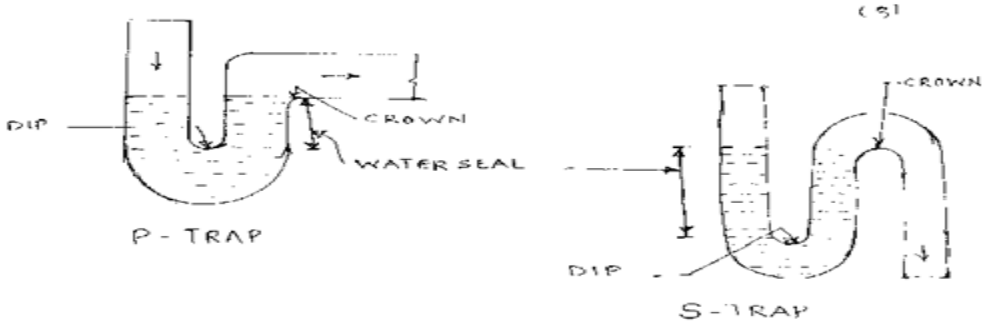
c) Dead end system-Advantages (02)

- It is possible to accurately workout discharge & pressure at any point on the distribution system. Design calculation calculations are easy.
- Less number of cut off valves are required

Disadvantages (02)

- During repairs large portion of area is affected causing great incontinence
- Too many dead ends & no free circulation of water causing stagnation

d) Trap-A depress or bent sanitary fittings which always remains full of water (01)



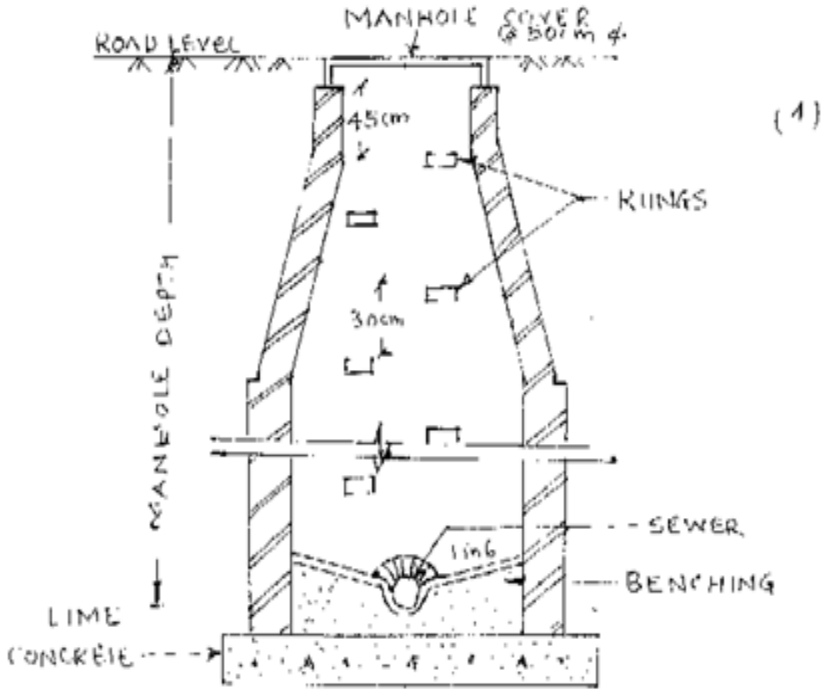
e) Merit (02)

- Easy to clean as it is large in size
- Maintenance cost are reasonable
- Storm water reduces the strength of sewage by dilution

Demerits (02)

- Load on settlement plant increases
- Sewer are large in diameters
- Storm water is unnecessarily polluted

f) Man hole showing component parts



Q.N.4.A) Attempt any three **(12)**

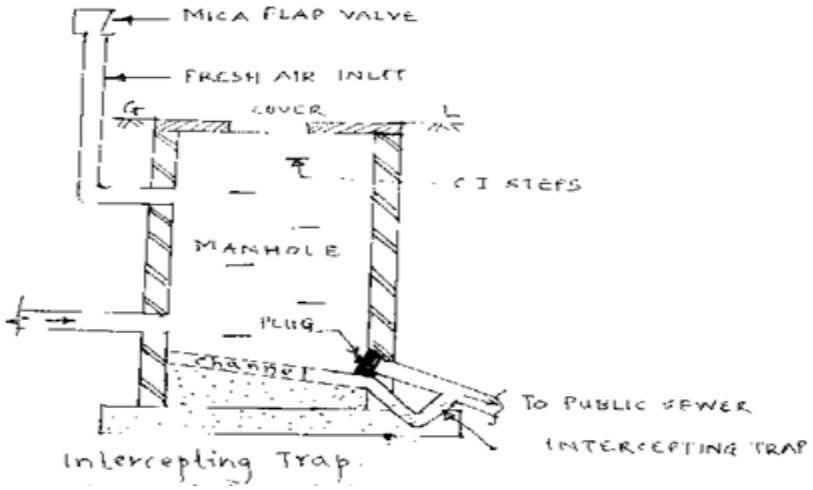
a) i) BOD- the amount of oxygen required by microbes to carry out the biological decomposition of dissolved solids or organic matter in sewage under aerobic conditions at standard temperature. (02)

ii) COD-the amount of oxygen required to oxidised the organic matter by strong oxidizing agent under acid conditions. (02)

b) Steps involved in laying of sewers:

- Boring or trial holes are dug along proposed sewer line to a certain nature of ground.
- Positions of man holes are located on ground. Sewer lines are usually laid between two man holes.
- Centre line pegs of sewer lines are driven at every 7.5 m to 15 m as per convenience.
- Centre line of sewer line should be properly maintained either by offset line method or sight rail method. (Explain any one method).
- Modified invert levels are marked.
- Excavation of trench is started. (Providing timbering of sides if necessary.)
- Sewers are laid; boning rod is used to check invert levels.
- Back filling of trenches is done after checking sewers for water tightness. (8 x /2 =04)

c) Intercepting Trap



(02)

Location: Last man hole of house drainage system (01)

Function: Prevent entry of sewer gases from public sewer line in to house drains. (01)

d) Global Warming: Green house effect i.e. heating effect of gases like CO_2, CH_4 (methane), Nitrogen Oxides (NOx) called greenhouse gases in atmosphere increases the terrestrial and atmospheric temperatures all over the globe is called as global warming.

Main cause of rise in temperature of atmosphere is green house effect apart from other factors like pollution, exhaust gases, steady deforestation, unusual human activity, industrialization etc.

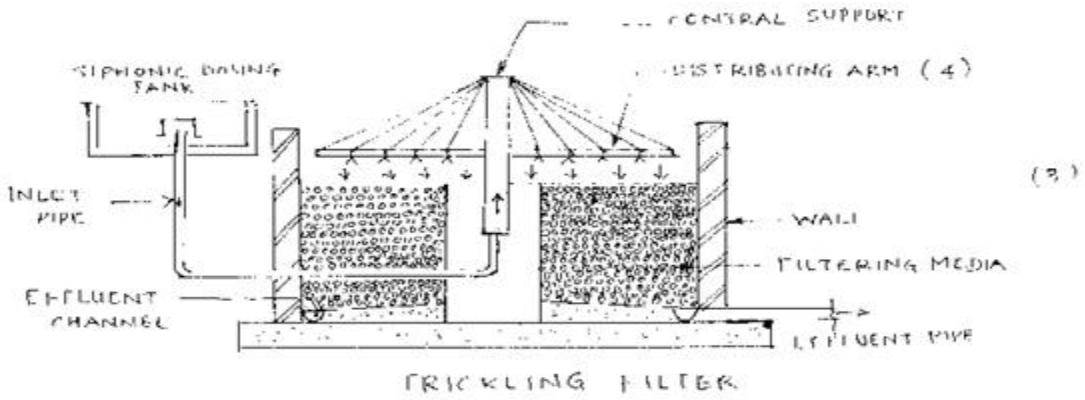
Effects: Rise in sea level- changes in sea level are sensitive indicator. During 20^{th} century sea level rose by @0cm. It is caused due to melting of polar ice caps and thermal expansion of water. (02)

Climate Change: Rainfall pattern is changing brings in prolonged drought and frequent floods, drying of surface water bodies, fall in ground water table, crop pattern change, growth of micro-organisms and spread of diseases etc. (01)

Remedial Measures: Reduction in CO_2 emission, energy conservation, industrial processes need to be upgraded, forest cover to be increased. (01)

Q.4. B) Attempt any one **(06)**

a) Trickling filter:

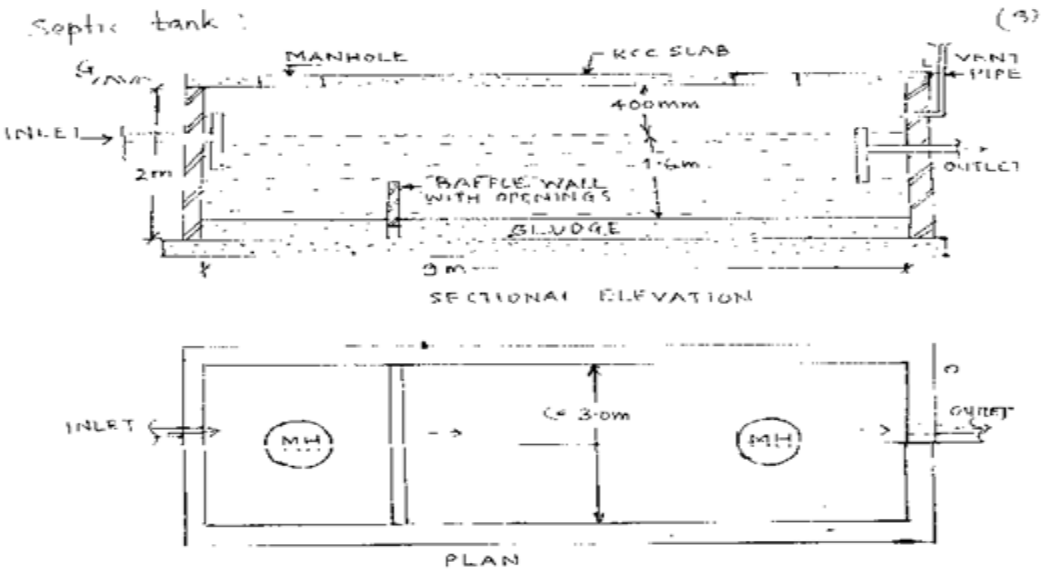


Working: Sewage is allowed to sprinkle or to trickle over a bed of coarse, rough hard material. It is collected through the under-drainage system consisting of specially manufactured blocks or half round tiles. They support the filtering media and lead the effluent to main channel. They also provide ventilation to the filter media.

Sewage is applied for -5 minutes through a siphonic dosing tank. It is then stopped for @ 3-10 minutes. Siphonic dosing tank leads sewage to distributor arm usually 4 in number. Spray nozzles are provided on this arm which carries sewage through air to filter media in the form of drops.

A bio film is formed around the particles of filter media. Oxygen is supplied by intermittent working of filter. Bacteria in the film bring about aerobic oxidation of organic waste and allow fairly clear effluent to trickle through reducing the BOD and colloidal matter to the extent of @75% and 80% respectively.

b) Septic Tank:



Working: A septic tank is a combined sedimentation cum digestion tank where sewage is held for some period when suspended solids settle down to the bottom. Anaerobic digestion of sludge and liquid results in the reduction of volume of sludge and release of gas like CO_2, methane ad H_2S. The effluent though clarified still contains considerable amount of dissolved and suspended putrecible organic matter and pathogens which should be further disposed off carefully.

Adequate water supply should be available. Detergents or disinfectants in excessive quantity should be avoided.

To put septic tank into use, a few buckets of digested sludge and water is filled in it up to @30 cm depth.

Q.5. Attempt any four **(16)**

a) Advantages of recycling and reuse of domestic solid waste:

- Water conservation
- Economic return from reuse of water.
- Better crop yield
- Can be used : recreation, energy production, aquaculture and pisciculture. (4 x 1 = 04)

b) Eight Effects of air pollution on environment:

- Visibility reduction
- Global warming
- Ozone layer depletion
- Acid rain
- Decreases yield of crop
- Eye, nose, throat irritation.
- Discoloration of buildings.
- Dropping of plant leaves. etc. (of such any eight points) (8 x ½ = 04)

c) Characteristics of industrial waste water

Temperature, pH, Total solids, BOD, COD, Nutrients, oil and grease, fatty acids, alkalinity, radioactive substances. (Any four) (4 x ½ =02)

Processes involved in treatment of industrial waste water:

Chemical treatment for color removal, physical treatment-clarifier to remove suspended solids, Biological treatment, grit chambers to remove grit digesters or lagoons for anaerobic treatment, extended aeration with sludge digestion for strong textile water. (Any four) (4 x ½ = 02)

d) i) Refuse: All solid organic waste (garbage, ashes, rubbish and dust) except human excreta and sludge is known as refuse. (02)

ii) Rubbish: All sun dry solid waste such as pin, glass, paper, broken furniture, pottery, waste building material (non biodegradable and non putrecible solid waste). (02)

e) Procedure of Sanitary land filling:

- Deep trench 3 to 5 m deep and @6.0m wide is excavated.
- Fill up with refuse up to depth of 2 to 3m.
- Refuse is compacted by means of mechanical vehicles.
- Cover this with 1 to 2 m earth.
- Micrograms slowly start decomposition of organic matter

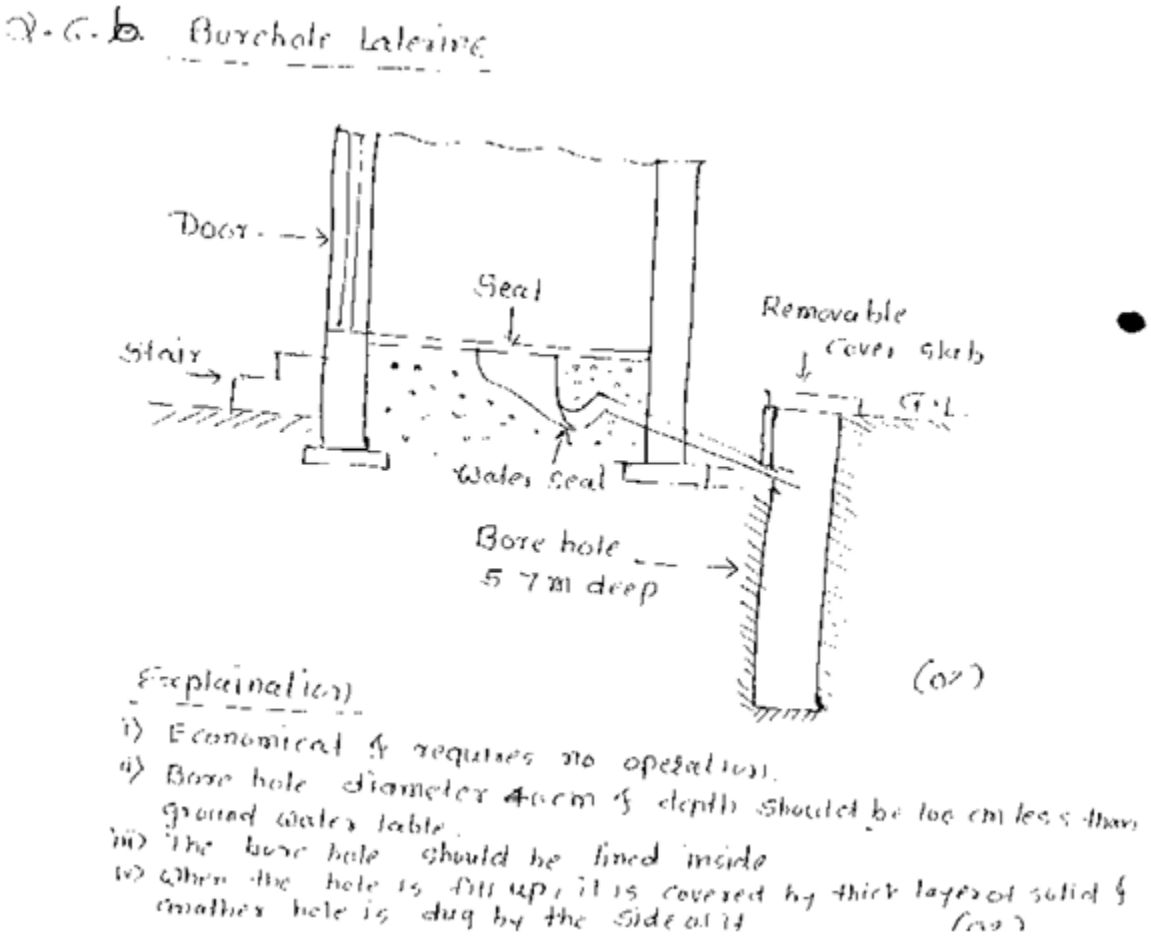
Q.6. Attempt any four (16)

a) Hazardous waste: Hazardous waste is waste that is dangerous or potentially harmful to our health or the environment. Hazardous wastes can be liquids, solids, gases, or sludges. (02)

Types of hazardous waste:

1. Chemical: Used solvent, chemical.
2. Radioactive: Radioactive isotopes, waste from uranium mining. (02)

b)Borehole Laterine



c) Salient features of Saint Gadgebaba Swachhata Abhiyan:

- Village sweeping campaign.
- Soak pit construction campaign
- School and public building cleaning campaign.
- House and surrounding, cleaning and decoration campaign.
- Road maintenance and cleaning campaign
- Personal cleanliness and awareness campaign.
- Exhibition regarding cleanliness and sanitary awareness (any four) (4 x 1 =04)

d) Vermi composting: Earthworms are used as a culture for composting organic matter. (02)

Advantages:

- High NPK value of compost.
- Useful for crops, flower plants, vegetable plants etc.
- High nutrient value and used for agriculture and horticulture.
- Can be used for processing municipal solid waste. (4 x ½ =02)

e) Water supply arrangement of building.