SUBJECT CODE NO:- P-22
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(CIVIL) Examination MAY/JUNE-2016
Environmental Engineering-II
(Revised)

[Time: Three Hours]   [Max Marks:80]

"Please check whether you have got the right question paper."

N.B
  i) <u>Q.No.1 from section A and Q.No.6 from section B are compulsory</u>.
  ii) <u>Answer any Two</u> Question among the remaining Questions (i.e. 2 to 5) of Section A and any two questions(i.e. 7 to 10) of Section B
  iii) Assume suitable data , if required , clearly stating the relevant assumptions made.

Section A

Q.1		Answer the following questions:	10
	a)	What is BOD reaction rate constant and it is dependent on which parameter.	
	b)	Find the gradient required in sewer of 0.5 m diameter self-cleansing velocity at flow full condition.	
	c)	When the drop manhole is used in sewers?	
	d)	What is the expected BOD as SS removal is primary sedimentation tank?	
	e)	A waste water is expected to have BOD_5 of about 200 mg/L. The initial DO of dilution water is 8.0 mg/L. Calculate the dilution requirement for BOD determination.	

Q.2   a) What is time of concentration? What is its role in determination of the storm water runoff?   03

        b) Determine design discharge for a combined system serving population of 60000 with rate of water supply   12
           of 150 LPSD. The catchment area is 100 hectares and the average coefficient of runoff is 0.60. The time of
           concentration for the design rainfall is 30 min and relation between intensity of rainfall and duration is
           $I=1000/(t+20)$.

Q.3   a) Design a bar screen chamber for average sewage flow 20 MLD, minimum sewage flow of 12 MLD and   12
           maximum flow of 30 MLD. Additional data: manual cleaning and angle of inclination of bars with
           horizontal as 30^0 .Assume size of bars 9 mm × 50 mm, 9 mm facing the flow. A clear spacing of 30 mm
           between the bars is provided. Velocity of flow normal to screen as 0.3/sec at average flow.

        b) What are the parameters which will govern performance of PSTs?   03

Q.4   a) Design aerated grit chamber for treatment of sewage with average flow of 60 MLD. Consider the peak   10
           factor of 2.

        b) What are the pollutants that should be removed before the sewage is considered safe for discharging   05
           back to water body?

Q.5   Write in brief about the following: 15
        1) Sewer Construction and maintenance
        2) Sampling and sampling methods for wastewater characterization.
        3) Analysis of Flocculant Settling
        4) Vortex type grit chamber
        5) Drop Manhole

Section B

Q.6   Answer the following questions: 10
   a)   Why aerobic processes produce more sludge as compared to anaerobic process?
   b)   Write the equation of reaction occurs during the oxidation of organic matter in ASP, under endogenous respiration.
   c)   State the difference between sewage forming and effluent irrigation.
   d)   State the causes for bulking of sludge in activated sludge process.
   e)   Activated sludge is an example of a ------ type of biological wastewater treatment process, while a trickling filter or a biological tower is an example of a ------- type of biological wastewater treatment process.

Q.7   a)   Design a continuous flow completely mixed activated sludge process to yield an effluent BOD5 of   20   08
            mg/L and suspended solids of 23mg/L . The influent BOD5 following primary clarification is 200mg/L The waste flow is 0.2 m^3/sec Take Y=0.65, kd=0.05 , θ c=10 day , MLVSS=3000mg/L, return –sludge concentration=15000mg/L of suspended solids (SS), and MLVSS ratio=0.8.
       b)   Draw (boxes , lines, arrows) and label (words) a schematic diagram showing all the typical treatment   07
            processes and liquid flow paths is an entire conventional municipal wastewater treatment plant using complete-mix activated sludge to provide secondary treatment. Also show and label the residuals produced by certain processes.

Q.8   a)   An waste treatment plant is required to digest sludge in such a way that the moisture content is reduced   10
            to 90% from the initial value of 95% The inflow of sludge initially contains 60% volatile matter in the solid portion and during digestion only 60% of the volatile matter is destroyed. The volatile matter has specific gravity of 2.5 and fixed solid has a value of 1,0 Calculate the volume of sludge before and after digestion if the inflow contains 500 kg dry solid.

       b)   What are the essential reasons for an analysis of the composition, characteristics and quantities of solid   05
            wastes?

Q.9   a)   An area consisting of 500 houses contributes solid waste. Estimate the solid waste generation rate, if the   10
            observation is a local transfer station and period of generation is one week. The waste is carried out in two types of vehicles, compactor trucks and flatbed trucks. Number of compactor truck load=10; Number of flatbed truck load=20; volume of each compactor truck=15m^3; Volume of each flatbed truck=1.25m^3; Density of waste of compactor truck =295 kg/ m^3; Density of waste of flat bed Truck=110 kg/ m^3 ; Number of persons in each house=7
       b)   Write a short note on nitrification and denitrification.   05

Q.10   a)   Design facultative stabilization pond to treat a domestic sewage of 2 MLD , located at a place where the   09
            latitude is 20°N and 500 m above mean sea level. The five day 20°C BOD of the sewage is 200 mg/L Take: k=0.23 per day and @ 20° N the yield of photosynthetic oxygen= 250 kg/ha.day.
       b)   Describe organic loading rates used for design of UASB reactor. How reactor height is important for   06
            proper functioning of UASB reactor?

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