(b) Two power generator sets namely *A* and *B* have capacity to produce noise 80 dB and 83 dB respectively. Find out the noise level at the place where both the generators running simultaneously. 7+7=14

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Code : 011618

B.Tech 6th Semester Exam., 2015

ENVIRONMENTAL ENGINEERING—I

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

*(ii) There are **NINE** questions in this paper.*

*(iii) Attempt **FIVE** questions in all.*

*(iv) Question No. **1** is compulsory.*

1. Choose the correct option (any *seven*) : 2×7=14

(a) According to IS 10500 : 1991; the desirable limits for pH in drinking water is

(i) 7

(ii) 7–8

(iii) 7·5–8·5

(iv) 6·5–8·5

(v) None of the above

(b) DDT has property of

(i) bioaccumulation

(ii) biomagnification

(iii) endocrine disrupting agent

(iv) All of the above

(c) Displacement efficiency of a sedimentation tank may defined as

(i) flowing through period/detention period

(ii) detention period/flowing through period

(iii) 1/detention period

(iv) None of the above

(d) Coincident draft is

(i) maximum hourly demand plus maximum daily demand

(ii) maximum hourly demand plus fire demand

(iii) maximum daily demand plus fire demand

(iv) fire demand

(e) Drinking water supply scheme for Patna Municipal area is based on

(i) surface water drawn from Ganga river

(ii) surface water drawn from Sone river

(iii) groundwater

(iv) All of the above

(f) Adsorption process may be adopted for the removal of

(i) hardness

(ii) turbidity

(iii) color

(iv) All of the above

(g) BOD value of potable water should be

(i) zero mg/L

(ii) 5 mg/L

(iii) 20 mg/L

(iv) 30 mg/L

(h) Jaundice is caused by

(i) bacterial infection

(ii) viral infection

(iii) hormonal infection

(iv) None of the above

(i) In drinking water distribution network, which valve is required to be installed at all summits?

(i) Side valve

(ii) Air valve

(iii) Sluice valve

(iv) Gate valve

(j) The method employed for the determination of hardness is

(i) SPAND

(ii) DPT test

(iii) EDTA

(iv) MPN

2. (a) With the help of flow diagram, show the connections of various components involved in supplying drinking water to a city, when the source of water is a river.

(b) A water supply scheme has to be designed for a city having population of 100000. Estimate the important kinds of draft namely average daily draft, maximum daily draft, maximum hourly draft and coincident draft employing 250 lpcd average water consumption. 6+8=14

3. (a) Derive an expression for the settling velocity of a spherical particle in liquid when the Reynolds number is less than 0·5.

(b) For a continuous flow settling tank of 3 m deep and 60 m long in size, calcualte the flow velocity of water for effective removal of 0·025 mm particle at 25 °C. (sp. gravity of the particle = 2·65, kinematic viscosity of water at 25 °C = 0·01 cm^2/sec) 7+7=14

4. (a) How do you determine the optimal dose of a coagulant in laboratory?

(b) Indicate the various components of a slow sand filter with the help of a neat sketch. 7+7=14

5. Determine the dimensions of a rapid sand filter having capacity to treat 4 mld water per day. Also design a suitable under-drain system and wash water troughs for efficient functioning of the filter unit. 14

6. (a) A water treatment plant consists of the unit processes coagulation, flocculation, sedimentation, filtration and distinction. The suspended solids concentration of the raw water is 500 mg/L and the plant treats 36400 m^3/d. Alum $[Al_2(SO_4)_3 \cdot 14H_2O]$ is used as a coagulant with a dose rate of 500 mg/L. Compute the sludge solids produced daily if complete reaction of

alum to aluminium hydroxide [$Al(OH)_3$] occurs and 98% total solids are removed by sedimentation unit. (Molecular weight : Al = 27, S = 32m O = 16, H = 1)

(b) Calculate the hardness in mg/L as $CaCO_3$ of the following water sample :

Cation	*Concentration (mg/L)*	*Molecular wt.*
Na^+	15	23
Mg^{2+}	9	24·4
Ca^{2+}	48	40

9+5=14

7. *(a)* What do you understand by break-point chlorination? Describe in brief.

(b) Results of chlorine demand test on raw water are given below :

Sample No.	*Chlorine dose (mg/L)*	*Residual chlorine after 10 minutes contact (mg/L)*
1	0·2	0·19
2	0·4	0·36
3	0·6	0·50
4	0·8	0·48
5	1·0	0·20
6	1·2	0·40
7	1·4	0·60
8	1·6	0·80

Determine the break-point chlorine dose and chlorine demand. 6+8=14

8. A town with a population of one lakh is to be supplied with water daily at 200 litres per head. The variation in demand is as follows :

6 a.m. to 9 a.m.	40% of total
9 a.m. to 12 noon	10% of total
12 noon to 3 p.m.	10% of total
3 p.m. to 6 p.m.	15% of total
6 p.m. to 9 p.m.	25% of total

Determine the capacity of the service reservoir employing *(a)* mass balance curve and *(b)* analytical method for 12 hours uniform pumping rate from 6 a.m. to 6 p.m. 14

9. *(a)* Water has to be supplied to a town with one lakh population at a rate of 150 lpcd from a river 2000 m away. The difference in elevation between the lowest water level in the sump and reservoir is 36 m, if the demand has to be supplied in 8 hours, determine the size of the mains and the brake horse power of the pumps required. Assume maximum demand as 1·5 times the average demand, $f = 0 \cdot 0075$, velocity in pipe 2·4 m/s and efficiency of pump 80%.