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ET-507(A)

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)

Term-End Examination

00281

June, 2015

ET-507(A) : POLLUTANTS AND WATER SUPPLY

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **six** questions in all. Question number **1** is **compulsory**. Use of calculator is permitted.*

1. Choose the correct answer. *10×1=10*

(a) Carbon monoxide is hazardous to health because

(i) it causes loss of sense of smell

(ii) it is carcinogenic in nature

(iii) it reduces oxygen carrying capacity of blood

(iv) None of the above

(b) Which of the following is ***not*** a secondary air pollutant ?

(i) Sulphur oxides

(ii) Nitrogen oxides

(iii) Ozone

(iv) Hydrocarbons

(c) The Earth's water circulatory system is known as

(i) Water cycle

(ii) Precipitation cycle

(iii) Hydrogen cycle

(iv) None of the above

(d) For an aquifer of width W, thickness B and coefficient of permeability K, the transmissibility (T) is given by T =

(i) KB

(ii) KW

(iii) $\frac{K}{B}$

(iv) $\frac{KB}{W}$

(e) The temporary hardness of water can be removed by

(i) boiling

(ii) adding lime

(iii) adding alum

(iv) filtration

(f) The most widely used coagulant is

(i) chlorine

(ii) alum

(iii) lime

(iv) bleaching powder

(g) At break point of chlorination

(i) chlorine is used to oxidise

(ii) residual chlorine is zero

(iii) residual chlorine is maximum

(iv) residual chlorine reappears

(h) Water sedimentation process involves the settling of the impurities in tank, under the action of

(i) sun rays

(ii) gravitation force

(iii) biological action

(iv) None of the above

(i) The ratio of maximum hourly consumption and average hourly consumption is

(i) 1·5

(ii) 1·8

(iii) 2·4

(iv) 2·7

(j) The water meter installed on individual house connections on municipal supplies, is

(i) a velocity meter

(ii) an interferential meter

(iii) a displacement meter

(iv) None of the above

2. (a) Population explosion is the main pollutant. Discuss. *5*

(b) List the control devices commonly used for the removal of particulate matter. With the help of a suitable diagram, discuss the working of any one of them. *7*

3. (a) What is Biochemical Oxygen Demand (BOD) ? Discuss the limitations of BOD test for the assessment of water quality. *6*

(b) Compute ultimate BOD and 20-day BOD for a sample having BOD_5 at 20°C 150 mg/litre. Assume the value of K as 0·23 per day (base e). *6*

4. (a) What do you understand by the term "assimilative capacity of water" ? Differentiate between 'Grab' and 'Composite' sampling techniques. *6*

(b) Discuss critically the statement — "The amount of water used annually for fire-fighting is small compared with yearly consumption for domestic purposes. Therefore, the determination of pipe sizes in a distribution system is based largely on the analysis of the domestic flow." *6*

5. (a) What is an Intake structure ? Discuss the factors that govern the location of an Intake structure. *6*

(b) Define 'Surface Loading' and 'Detention Period' in the context of sedimentation tank. Prove that 'area' and 'overflow rate', rather than 'Detention Period' govern the design of settling tank. *6*

6. (a) What is 'Jar Test' ? Discuss its importance in water treatment. *6*

(b) A dose of 50 mg/litre of alum is used in coagulation of turbid raw water. Calculate the natural alkalinity consumed. What concentration of Aluminium Hydroxide is produced ? (Given atomic weight of Al = 27, S = 32, O = 16, H = 1, Ca = 40 and C = 12) *6*

7. With the help of a neat sketch describe the working of Slow Sand Filter. Also compare its working with Rapid Sand Filter in terms of the following parameters :

(i) Under drainage system

(ii) Method of cleaning *12*

8. (a) What is compound pipe ? How would you calculate the loss of head due to friction in such a pipe ? *7*

(b) A valve at the outlet of a pipe is closed suddenly to bring water to rest. Find the pressure increase due to sudden closure of the valve, if water was flowing in the pipe at a velocity of 3·5 m/sec. Bulk modulus of water may be assumed to be $2{\cdot}0 \times 10^4$ kg/cm^2. *5*

9. Write short notes on any ***four*** of the following : *4×3=12*

(a) Water-borne diseases

(b) Fabric Filter

(c) Infiltration Galleries

(d) Jet Pump

(e) Spigot and Socket Joint

(f) Orthotolidine Test

(g) Fire Hydrant

(h) Zeolite Softeners