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SUBJECT CODE:- 234

FACULTY OF ENGINEERING AND TECHNOLOGY

B.E.(CIVIL) Examination Nov/Dec 2015

Environmental Engineering-II

(Revised)

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

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

N.B i) Q.No.1 from section A and Q.No.6 from section B are compulsory.
ii) Answer any Two 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.
iv) Neat diagrams must be drawn wherever necessary.

Section A

Q.1 Answer the following questions: 10

a) What are the forces acting on sewer pipes? What are the materials used for constructing sewer pipes?
b) Estimate the sewage quantity to design separate sewerage system serving population of 60000 with rate of water supply of 135 LPCD.
c) Provide the typical Runoff coefficient value for the following covers:
   i. Paved streets
   ii. Parks & lawns
   iii. Apartments areas and
   iv. Business areas
d) In a BOD test, 3.0 ml of raw sewage was diluted to 300 ml and DO concentration of the diluted sample at the beginning was 8.6 mg/L and 4.6 mg/L at the end of 5 day incubation at 20^0 C. determine BOD of raw sewage.
e) Distinguish between primary and secondary treatment of wastewater

Q.2 a) Design an outfall sewer of the separate system for a town with population of 150000 persons with water supply of 180 LPCD. The sewer has to be of brickwork rendered smooth with cement mortar (n=0.012) and the permissible slope is 1 in 1000. A self cleaning velocity of 0.75 m/sec has to be developed; Take DWF as 1/3 of the maximum discharge. What is the equivalent egg-shaped section of this circular sewer? Calculate the velocity in the new section when flowing full and at DWF. 12

b) List six important factors in sewer construction inspection. 03

Q.3 Design a rectangular bar screen with the following data: 15

i. Peak design flow: 60 MLD
ii. Velocity of flow at peak design flow in outfall sewer: 1.1 m/sec
iii. Diameter of outfall sewer: 1.2m
iv. Depth of peak flow in sewer: 1m
v. Fall of screen chamber flow with respect to sewer invert: 0.05m
vi. Width of the rectangular bars: 10mm
vii. Clear spacing between bars: 25 mm

Q.4 Design a primary clarification system for a community with an average wastewater flow of 7500 m^3/day, a maximum of 18000 m^3/day and a minimum of 4000 m^3/day. Use at least two basins and a surface overflow rate of 30 m/day at average flow. Determine the efficiency of BOD removal at all flow conditions with all basin working and with one basin out of service. 15

Q.5 Write a brief note on the following: 15

a) Design aspects of Grit Chamber
b) Sewage Pumping
c) Environmental significance of total solid test of wastewater sample

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d) Working principles of Detritus tank
e) Effluent standards for disposal of wastewater into surface water.

SECTION-B

Q.6 Answer the following questions: 10

a) The BOD removal efficiency of a trickling filter system is 79 percent, and the efficiency of the primary treatment that precedes it is 35 percent. If the raw BOD is 200 mg/L, what is the amount of BOD entering into the trickling filter?
b) Why recirculation of sludge necessary in activated sludge process?
c) List three purposes of solid waste processing.
d) A sludge with a 7 percent solids concentration occupies a total volume of 300 m^3. What is the water content of the sludge?
e) What is meant by effluent polishing?

Q.7 a) Design a complete mixed activated sludge process aeration tank for treatment of 5 MLD sewage having BOD concentration of 200mg/L. the effluent should have soluble BOD of 20mg/L. Consider the following: 09

MLVSS/MLSS=0.8
Return sludge SS concentration =10000mg/L
MLVSS in aeration tank=3500mg/L
Mean cell residence time adopted in design is 10 days
Y=0.5mg/mg, k_d=0.06 per day

b) Explain the Chemical – Biological process of Phosphorous removal in wastewater. 06

Q.8 Compare the area required for treating a wastewater flow of 3550 m^3/day by a waste stabilization pond system and a trickling filter system. The influent BODs following primary clarification is 200mg/L. 15

Data provided: for pond system, the reaction rate coefficient at 30^0 C is 0. 35/day. The operating temperature in winter is 10^0C. Assume a single cell pond system with 85% removal of soluble BOD for a pond depth of 2.0m. assume $\theta = 1.06$

For a tricking filter system the treatability constant is 0.1 min-1 at 10C and packing coefficient is 0.5 with a tank depth of 6.5 m and recirculation ratio as 2.

Q.9 Write a brief note on the following: 15

a) Financing of wastewater systems
b) UASBR
c) Nitrogen removal from wastewater
d) Solids waste processing
e) Leachate control in MSW landfill sites.

Q.10 a) A landfill area of (150 m x 100 m) is available for handling 25 years municipal solid waste (MSW) for a town of 5,00,000 people. Out of the total landfill area only 80% is actually available for land fill and other is used for auxiliary services. Assuming that average per capita MSW discard per year in town is 50 kg, landfill density is 500 kg/m^3, and that the 15 percent of the actual landfill cell volume is used for soil cover, estimate the following: 09

i. The landfill lift in one year.
ii. Number of years for which the landfill can be used if the landfill can't be increased beyond 25 m.

b) Enlist the key characteristics of an engineered landfill that distinguishes it from an open dump 06