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Reg. No. : | | | | | | | | | | | | |

Question Paper Code: U4104

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Fourth Semester

Civil Engineering

21UCE404 WASTEWATER ENGINEERING

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer All Questions

PART A - (5 x 1 = 5Marks)

1. The velocity of flow in a sewer does not depend on: CO1-U

   (a) its grade (b) its length (c) its hydraulic mean depth (d) its roughness

2. Which of the following represents the heavier inert matter in waste water? CO1-U

   (a) Screens (b) Grit (c) Debris (d) Waste

3. Oxidation ditch is also known as_____ CO1-U

   (a) trickling filter (b) Extended aeration lagoons (c) sludge tank (d) none of these

4. Water reclamation processes essentially involve CO1-U

   (a) Reuse of treated wastewater

   (b) Recycling of treated wastewater

   (c) Production of usable quality water by treating wastewater

   (d) All of these

5. Zero Liquid Discharge (ZLD) policy recommended for industries refers to CO1-U

   (a) 100% recycling of industrial effluents ensuring no discharge

   (b) 100% removal of all pollutants from the industrial effluent if it is to be discharged to rivers

   (c) Both (a) and b)

   (d) Neither (a) nor b)

PART – B (5 x 3= 15Marks)

6.	What is meant by Population Equivalent?	CO1-U	
7.	What are the types of screening?	CO3-Ana	
8.	What are the types of filters?	CO1-U	
9.	List out the different stages in anaerobic process.	CO1-U	
10.	Mention the different zones of pollution in a river stream.	CO5-Ana	

PART – C (5 x 16= 80Marks)

11.	(a)	A sewer system has to be laid for a developing city. For effective functioning of this system, suggest the different sewer appurtenances with neat sketch.	CO2-App	(16)
		Or		
	(b)	A combined sewer of a circular section is to be laid to serve a particular area. Calculate the size of this sewer from the following data: Area to be served = 120 hectares. Population = 1,00,000 Maximum permissible flow velocity = 3 m/sec. Time of entry of storm water = 10 minutes. Time of flow in channel = 20 minutes. Per capita water supply = 250 litres / day / person. Coefficient of run-off for the area = 0.45. Hourly, Maximum rainfall for the area at the design frequency= 5 cm Assume any other data not given, and if needed.	CO2-App	(16)
12.	(a)	(i) Design rectangular sedimentation tank (which has mechanical cleaning equipment) to treat sewage. Maximum water supply demand is 12 MLD. Assume other data.	CO2-App	(12)
		(ii) For grit channel, if recommended flow velocity is 0.4m/s and detention time is 1 minute find the length of grit channel.	CO2-App	(4)
		Or		
	(b)	It is mandatory that you have to remove the organic matter from the effluent sent out after the removal of the inorganic floatable grits, elaborate in detail with diagram about the principle, construction details and process involved in carrying out the above mentioned process	CO2-App	(16)

13. (a) Enumerate the various methods that can be adopted for secondary treatment of sewage. Suggest a suitable treatment method which removes 75% of BOD and suspended solids. Explain the process with neat sketch. CO3-Ana (16)

Or

(b) Determine the size of a high rate trickling filter for the following data :
(i) Sewage flow = 4.5 Mld;
(ii) Recirculation ratio = 1.5;
(iii) BOD of raw sewage = 250 mg/l;
(iv) BOD removal in primary tank = 30%;
(v) Final effluent BOD desired = 30 mg/l. CO3-Ana (16)

14. (a) Critically discuss about the various available methods used for nitrogen and phosphorous removal. CO4-App (16)

Or

(b) Sewage treatment plants are functioning at many parts of our country successfully. Give an outline about the reuse of treated wastewater and discuss the same. CO4-App (16)

15. (a) With a neat sketch, elaborate sludge dewatering and thickening process. CO4-App (16)

Or

(b) Domestic sewage has been discharged into river. The quality of water has been degraded. Discuss about the concept of self-purification with various natural forces involved. CO4-App (16)