Class Test on CE 4141

1. Briefly describe Grit chambers, Detritus Tanks and skimming tank with their design considerations. 12

2. Design a screen for an average discharge of 0.2 m^3/sec. 8

Class Test on CE 4141

1. Describe the different types of mechanical aeration systems. 10

2. Design a trickling filter for treating 6 million liters of sewage per day. The B.O.D. of sewage is 120 p.p.m. 10

Full marks 20

Class Test on CE 4141
Department of Civil Engineering
Rajshahi University of Engineering & Technology

Time 20 min

1. Design a septic tank to serve a household of 8 persons who produce 100 lpcd of wastewater. The tank is to be desludged every 4 years. (8)
2. For a domestic sewage having 5-day B.O.D. of 200 mg/l at 20°C, calculate the B.O.D at 1 and 5 days at 12°C. Assume the value of R as 0.18 per day at 20°C (7)
3. Discuss the changes in the climate of earth for green house effect. (5)

Class Test on CE 4141

1. Describe the different types of mechanical aeration systems. 10

2. Design a trickling filter for treating 6 million liters of sewage per day. The B.O.D. of sewage is 120 p.p.m. 10

Full marks 20

Class Test on CE 4141
Department of Civil Engineering
Rajshahi University of Engineering & Technology

Time 20 min

1. What are the principal objectives of providing sanitation facilities? Write down the important factors for sanitation in Bangladesh. (6)
2. Discuss the various important processes that take place in a septic tank. (8)
3. Write down the advantages and disadvantages of VIP latrines and Reed Odorless Earth Closet. (6)

Class Test on CE 4141

1. Briefly describe Grit chambers, ~~Detritus Tanks~~ and skimming tank with their design conside
2. Design a screen for an average discharge of 0.2 m^3/sec.

Class Test-3 **Marks: 20** **Time: 20 min**

1. Design a single-stage trickling filter to yield an effluent BOD_5 of 30 mg/l. The influent BOD_5 following primary clarification is 160 mg/l and the flow is 10000 m^3/day. Maintain an hydraulic loading rate of 20 m/day and a filter depth of 2 m. 10

2. An activated sludge plant with MLVSS as 2000 mg/l treats with an ultimate B.O.D. of 900 mg/l and 300 mg/l VSS which are 86% biodegradable. If the plant effluent contains 20 mg/l ultimate B.O.D. and 15 mg/l VSS, determine the daily VSS accumulation and the oxygen requirement for a flow of 0.40 m^3/s. Take synthesis constant p as 0.55 and the endogenous respiration constant q as 0.15. 10

Time: 20 minutes **CT -1** **CE 4141** **Total Mark: 20**

Q.1. Define the term with examples:a) Sullage b) Wet off-site system c) Night soil d) Sanitation systems. **6.0**

Q.2.What are the basic elements of a VIP latrine? How can the main disadvantages of a simple pit latrine be improved in a VIP latrine system? **6.0**

Q.3. Design a most economic sanitary latrine system for a family of eight persons. The family uses water for anal cleansing. The family wants to use the latrine for eight years. The groundwater table is 4.5 m below the ground surface. The latrine need to be lined with 0.25 m stabilizes soil. The construction cost of latrine per square meter is 500 BDT. Assume any reasonable data if required. The family asked the designer to suggest the most economical one among the rectangular, square, circular shape. **8.0**

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **FOURTH** year **ODD Semester** Examination, 2018

CE 4141

Environmental Engineering - II

Full Marks: 72 **Time: 3 Hours**

N.B.:-
(i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicates full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1(a) What is environmental sanitation? Explain the benefits of an integrated approach of water, sanitation and hygiene education in improving the general health condition. 4.00

(b) Explain the role of sanitation in controlling the transmission of excreta-related diseases. 4.00

(c) Discuss five water and sanitation related diseases including their transmission patterns and possible preventive measures. 4.00

Q.2(a) Discuss the factors that influence the estimation of wastewater flow. Also write down the components of design flow. 4.00

(b) Write down the steps for construction of sewerage system. How can you check the appropriateness of depth of excavation and join of sewer segments? 4.00

(c) Design a grit chamber for a horizontal velocity of 250 mm/s and a flow which ranges from a minimum of 20000 m^3/day to a maximum of 80000 m^3/day. Average flow is 50000 m^3/day. 4.00

Q.3(a) Discuss different types of sewer joins with necessary sketches. 4.00

(b) Discuss about the treatment unit for the removal of grease and oils from wastewater. Also write down its design considerations. 4.00

(c) For a wastewater sample, BOD_5 at 20^0C is 250 mg/l and is 70% of the ultimate. What will be the BOD_4 at 30^0C. 4.00

Q.4(a) Discuss step aeration system, tapered aeration system and extended aeration system with their applicability. 4.00

(b) Write down the necessity of providing ventilation in trickling filter. How can ventilation be provided? 4.00

(c) Compare the area requirements for trickling filters (0.14 kg B.O.D/m^3-d) and activated sludge (0.05 kg B.O.D/m^3-d) for the flow from a town of 30000 population. D.W.F. is 250 lpcd with 300 mg/l B.O.D. Assume a filter depth equal to 2.5 m and 3.5 m deep aeration tank. The primary sedimentation removes 40% of the applied B.O.D. 4.00

SECTION-B

Q.5(a) What are the major components of a pour-flush sanitation system? What is the basic improvement made in the pour-flush sanitation technology compared to simple pit and VIP technologies? 3.00

(b) Briefly discuss the technical aspects of compost latrines. What factors may restrict its successful application in Bangladesh. 4.00

(c) Design a septic tank for a family of 10 persons with a desludging interval of 6 years. The average wastewater flow is 90 liters per capita per day. Mention the suitable dimensions of the septic tank. 5.00

Q.6(a) Discuss the various important processes that take place in a septic tank. 4.00

(b) Distinguish between communal sanitation and public toilet facilities. What is the primary reason for failures of such communal and public sanitation facilities? 4.00

(c) Design a low-cost simple pit latrine for a family of six persons. The soil in the area is highly permeable hence a 2 m safe distance between the bottom of pit and ground water surface must be maintained to protect the groundwater pollution. The ground water table is 4 m below ground level. Determine the size of the pit required for a period of five years. The family uses water for anal cleansing. 4.00

Q.7(a) What is air pollution? Discuss the sources of air pollution. 4.00

(b) What is green-house effect? Discuss the changes occurs in the earth climate due to green-house effect. 4.00

(c) Discuss the effect of water pollution. Also mention possible control measures to reduce the water pollution. 4.00

Q.8(a) What do you mean by sewer? What are the different types of sewer sections? Why circular section is considered better than other sections? 4.00

(b) As you area an environmental engineer, do you think combined sewerage system is suitable for Rajshahi City Corporation? Give reasons on your opinion. 4.00

(c) What do you mean by aquaculture? Describe in your own words the significance of aquaculture from engineering point of view. 4.00

45
30
25

Heaven's Light is Our Guide

DEPARTMET OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **FOURTH** Year **ODD SEMESTER** Examination, **2017**

CE 4141

Environmental Engineering - II

Full Marks: 72 **Time: 3 Hours**

N.B.:-
(i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1 (a) Describe the three different types of sewerage system. Write down the suitable conditions for separate system. 5.00

(b) Describe different types of sewers. 4.00

(c) Design a screen for an average discharge of 0.2 m^3/sec. 3.00

Q.2 (a) Briefly discuss the factors that influence the estimation of wastewater flows for the design of sanitary sewer systems. Outline the procedure of estimating design wastewater flow. 4.00

(b) What are the technical advantages of small bore sewerage systems over a conventional sewerage system. 4.00

(c) Write down the role of microorganisms in wastewater treatment. Classify them bases on their energy and carbon sources. 4.00

Q.3 (a) Mention the important characteristics of industrial wastes. Describe the biological treatment process of them. 4.00

(b) Describe the working principle of two stage trickling filter with flow diagram. 4.00

(c) Design a trickling filter for treating 6 million liters of sewage per day. The B.O.D. of sewage is 120 ppm. 4.00

Q.4 (a) What are sludge bulking and S.V.I.? Write down the causes and remedial measures of sludge bulking. 4.00

(b) Write down the step aeration and tapered aeration system. 4.00

(c) What oxidation pond? Describe the treatment process of wastewater in oxidation pond. 4.00

SECTION B

Q.5(a) What is meant by environmental sanitation? What are the principal advantages of environmental sanitation? 4.00

(b) Briefly discuss the various problems of sanitation faced in Bangladesh. 4.00

(c) Design a leach pit for both single and alternating twin off-set pit pour-flush latrines serving a family of eight members living in a periurban area. Wastewater flow is 15 lped and soil is a porous silty (Infiltration rate for porous silty loam is 20 l/m^2-day). 4.00

Q.6 (a) What is SBS system? Write down the economic and technical advantages of SBS system. 5.00

(b) Write down the characteristics of industrial wastewater. 3.00

(c) Design a septic tank to serve a household of 15 persons who produce 170 lped of wastewater. The tank is to be desluged every three years. 4.00

Q.7 (a) How can you solve the problems of single-pit VIP latrines by the alternating twin pit VIP latrines? 4.00

(b) What variation does the ROEC have from the VIP technology? Briefly discuss the merits and demerits of ROEC and its applicability 4.00

(c) For a waste sample, the 5 day BOD at 20°C is 250 mg/l and is 70% of the ultimate. What will be the 4-day BOD at 30°C? 4.00

Q.8 (a) What is environmental management? What are the main components of environmental management? 4.00

(b) Describe the effects of air pollution. 4.00

(c) What is acid rains? Describe the harmful effects of acid rains. 4.00

The End

Heaven's Light is Our Guide

DEPARTMET OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering FOURTH Year SEVENTH SEMESTER Examination, 2016

CE 441

Environmental Engineering -II

Full Marks: 70 **Time: 3 Hours**

N.B.:-
(i) Answer any SIX questions, taking THREE from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1 (a) What is sewerage system? Briefly describe the essential elements of sewerage system. 2.67

(b) Write down the advantages and disadvantages of separate sewerage system, combined sewerage system and partially combined sewerage system. 5.00

(c) Write down the steps to be followed for construction of sewerage system. 4.00

Q.2 (a) Briefly describe the factors that need to be considered for the selection of sewer materials. 4.00

(b) Discuss the functions of grit chamber and skimming tank with sketches. 4.00

(c) Design a screen for an average discharge of 0.2 m^3/sec. 3.67

Q.3 (a) Describe the contact bed filter and its working procedure. Also write down the advantages and disadvantages. 3.67

(b) Write down the characteristics of activated sludge. Describe the treatment of wastewater by activated sludge process with flow diagram. 4.00

(c) Design a trickling filter for treating 6 million liters of sewage per day. The B.O.D. of sewage is 120 p.p.m. 4.00

Q.4 (a) Write down the design aspects of imhoff tank. Also write down its advantages and disadvantages. 4.00

(b) Discuss the treatment process of sewage in oxidation pond. 4.00

(c) Discuss the decomposition process in wastewater treatment. 3.67

SECTION B

Q.5 (a) Discuss the various important processes that take place in a septic tank. Briefly describe the design procedure of a septic tank. 4.67

(b) Briefly describe the dissolved air flotation (DAF) system for industrial wastewater treatment. 3.00

(c) A common septic tank is to be designed for three adjoining houses with a total of 21 users. The average wastewater flow rate is 180 liters/capita/day. Design a suitable septic tank and show only the dimensions of the septic tank. 4.00

Q.6 (a) Define B.O.D and C.O.D. Why is this test carried out? Why C.O.D of sewage is higher than its BOD in general? 4.00

(b) Describe the important factors for sanitation in Bangladesh. 3.67

(c) For a wastewater sample, the 5-day B.O.D at 20°C is 250 mg/l and is 70% of the ultimate. What will be 4-day B.O.D at 30°C? 4.00

Q.7 (a) What is environmental sanitation? Briefly discuss the technical aspects of compost latrine. 4.67

(b) What factors may restrict the successful application of compost latrine in Bangladesh? Explain. 3.00

(c) Design a leach pits for a twin off-set pit pour flush sanitation unit for a family of 8 members having a life period of 2 years. The average wastewater flow rate is about 10 liters per person per day. The soil is porous silty loam with a long-term infiltration rate of 20 l/m^2day. 4.00

Q.8 (a) Describe green house effect. Explain the role of water, sanitation and hygiene education in improvement of public health. 4.67

(b) What are the sources of air pollution? Describe them briefly. 4.00

(c) Give a clear scenario of sanitation practice in urban and rural area. How can you improve the situation? 3.00

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering Fourth year Seventh Semester Examination, 2014

CE 441

Environmental Engineering-II

Full marks: 70 **Time: 3 Hours**

N.B:-
(i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1(a) Describe the procedure of estimation of waste water design flow according to Melbourne and Metropolitan Board of works. 3.00

(b) Briefly describe the separate system and combined system of sewerage. Write down the conditions favorable for separate system. 4.00

(c) Determine the ratio of D.W.F. and W. W. F. from the following information: Area=30000 ha, water supply rate=200 lped, population= 18×10^5, rainfall intensity=15 mm/hr, average impermeability factor=0.50. Assume 80% of water supplied reached the sewer. 3.67

Q.2(a) Briefly describe the factors are to be carefully considered for selection of sewers materials. 3.50

(b) Describe the laying and testing procedures of sewers. 4.50

(c) Design a combined sewer of circular section from the following data: Area=100 ha, population=90000, velocity of flow=3 m/sec, time of entry=3 min, time of flow=17 min, rate of water supply=240 lped and impermeability factor=0.50. 3.67

Q.3 (a) Write down the technical advantages and economic considerations of SBS system. 4.00

(b) Discuss about trickling filter with its advantages and disadvantages. 4.00

(c) Design a trickling filter for treating 6 ML of sewage per day. The B.O.D. of sewage is 120 p.p.m. 3.67

Q.4 (a) Briefly discuss the objectives of biological treatment of wastewater. Describe the processes of decomposition. 4.00

(b) Explain the basic operations involved in the activated sludge process with the help of a flow diagram. 4.00

(c) Design an oxidation pond for treating sewage produced from 5000 persons. The contribution of sewage is 120 lped and 5 day B.O.D. of sewage is 300 mg/l. 3.67

SECTION-B

Q.5 (a) What are the principal objectives of sanitation? Briefly discuss the various problems of sanitation faced in Bangladesh. 3.67

(b) Briefly discuss the technical aspects of compost latrines. What factors may restrict its successful application in Bangladesh? 4.00

(c) Distinguish between communal sanitation and public toilet facilities. What is the primary reason for failure of such communal and public sanitation facilities? How can these services be made sustainable? 4.00

Q.6 (a) Prepare a schematic diagram showing various components of a septic tank. Position the inlet and outlet devices carefully and explain how these can influence the septic tank operation. 4.00

(b) Describe the VIP latrine with its design consideration. 3.67

(c) Design a septic tank for a family of 10 persons with a desludging interval of 5 years. The average waste water flow is 15 liters per capita per day. Also design the soak pit for the disposal of the septic tank effluent. The soil is silty loam with a long term infiltration rate of 20 l/m^2/day. 4.00

Q.7 (a) What do you mean by environmental management? What is global warming? 4.00

(b) Discuss in brief the preventive measures should be taken to have an effective control for pollution of water. 3.67

(c) Prove that for the same solid contents the quality of sludge with moisture content of 98% is double than that of sludge with moisture content of 96%. 4.00

Q.8(a) Define BOD and COD. What are the limitations of BOD test? 3.67

(b) What do you understand by first stage BOD? Deduce an expression for it 4.00

(c) The 5-days BOD at 20°C of a sewage is 500 ppm. Calculate 1, 2, 3 and 4 days BOD and plot the graph BOD Vs Time. 4.00

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Sunday
10:00 Am to 1:00pm

Heaven's light is our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **FOURTH** year **SEVENTH SEMESTER** Examination, 2013

CE 441

Environmental Engineering-II

Full Marks: 70 **Time: 3 Hours**

N.B.:-
(i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicates full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data not given.

SECTION-A

Q.1(a) What do you mean by environmental management? What is global warming? 4.00
(b) Define air pollution. Explain the effects of air pollution in brief. 3.67
(c) Briefly discuss the technical aspects of compost latrines. What factors may restrict its successful application in Bangladesh. 4.00

Q.2(a) Describe the VIP latrine with its design considerations. 3.67
(b) How do socio-economic aspects influence the water supply, sanitation and health education facilities? 4.00
(c) Design a septic tank to serve 20 persons who produce 180 lpcd of wastewater. Sludge removal frequency is every three years. 4.00

Q.3(a) Define B.O.D. and C.O.D. How can you work out B.O.D. of a sewage sample? 4.00
(b) Why C.O.D. of sewage is higher than its B.O.D. in general? Write the limitation of B.O.D. test. 4.00
(c) For a domestic sewage having 5-day B.O.D. of 200 mg/l at 20°C, calculate the B.O.D. at 1 and 5 day at 12°C. Assume the value of R as 0.18 per day at 20 °C. 3.67

Q.4(a) Briefly discuss sewers of different materials. 4.50
(b) Describe the procedure for laying and testing of sewers and state the points to be carefully attended during this process. 3.50
(c) Calculate the velocity, discharge and Chezy's coefficient for a stone-ware sewer running full. The diameter of sewer is 150 mm and it is laid at a gradient of 1 in 60. Assume N = 0.013 in Manning's formula. 3.67

SECTION-B

Q.5(a) Describe the purpose and location of grit chamber in primary treatment of wastewater. Discuss briefly the design aspects of it. 4.00
(b) What are objectives of plain sedimentation? Discuss the various aspects of primary clarifiers. 4.00
(c) Design a primary clarifier for a town having a population of 34000. The formation of sewage may be assumed at 150 lpcd. 3.67

Q.6(a) Introduce the microorganisms important for wastewater treatment. 2.50
(b) Discuss the various phases of bacterial growth with growth curve. 2.50
(c) Write down the technical advantages and economic considerations of SBS system. 3.67
(d) Write a short note on aquaculture in wastewater treatment. 3.00

Q.7(a) What is the necessity of sludge disposal? How is the sludge disposed off by method of disposal on land? 4.00
(b) Describe the working principle of two-stage trickling filter with flow diagram. 3.00
(c) Design a trickling filter for treating 6 million liters of sewage per day. The B.O.D. of sewage is 120 p.p.m. 4.67

Q.8(a) Write down the advantages and disadvantages of activated sludge process. 4.00
(b) Explain the factors that affect the sludge digestion process in brief. 3.67
(c) A sewage sludge with volume contains a certain moisture content P_1 percent. What will be the volume of this sludge if its moisture content is reduced to P_2 percent? Assume the unit weight of sludge as unity. 4.00

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THE END

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **FOURTH** Year **SPECIAL SHORT SEMESTER** Examination, 2013

CE-441

Environmental Engineering - II

Full Marks: 70 **Time: 3 Hours**

N.B.: (i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicates full marks.
(iii) Use separate answer script for each section.

SECTION-A

Q.1(a)	What is environmental sanitation? What are the principal advantages of environmental sanitation?		2.67
(b)	What is meant by environmental management? What are the objectives of it?		4.00
(c)	What is environmental pollution? Discuss the various components of environmental pollution.		4.00
Q.2(a)	Describe the grease and oil trap. Explain the reasons for excluding grease and oil from sewage.		4.00
(b)	What is meant by secondary treatment of sewage? Discuss the contact bed filtration.		4.00
(c)	Design a trickling filter for treating 6 ml of sewage per day. The B.O.D of sewage is 120 p.p.m.		3.67
Q.3(a)	What are the advantages and disadvantages of coagulation of sewage?		4.00
(b)	Write short notes on (i) lump holes (ii) clean outs		4.00
(c)	What is sludge bulking? What are the factors assisting the development of sludge bulking?		3.67
Q.4(a)	Discuss the importance of micro-organism in waste water treatment.		3.67
(b)	Discuss the different phases of bacterial growth in terms of cell number.		4.00
(c)	Design an oxidation pond for treating sewage from a hot climate residential colony having population of about 5000 persons. The contribution of sewage is at the rate of 120 lped and the 5-day BOD is 300 ppm.		4.00

SECTION-B

Q.5(a)	Discuss the single-stage and two-stage trickling filter treatment plant with flow diagram.		3.00
(b)	What is activated sludge? Write down their characteristics.		4.00
(c)	An activated sludge plant with mixed liquor volatile suspended solids (MLVSS) as 2000 mg/l treat with an ultimate B.O.D. of 900 mg/l and 300 ml/l VSS which are 86% biodegradable. If the plant effluent containing 20 mg/l ultimate B.O.D. and 15 ml/l VSS, determine the daily VSS accumulation and oxygen requirement for a flow of 0.40 m^3/s. Take synthesis constant P as 0.55 and the endogenous respiration constant q as 0.15.		4.67
Q.6(a)	Briefly discuss the various problems of sanitation faced in Bangladesh.		4.00
(b)	What are the basic elements of a VIP latrine technology? Briefly discuss. How can the main disadvantages of a simple pit latrine be improved in a VIP latrine system?		3.67
(c)	Compare the area requirements for trickling filters (0.14 kg B.O.D./m^3-d) and activated sludge (0.65 kg B.O.D./m^3-d) for the flow from a town of 30,000 population. D.W.F. is 250 lped with 300 mg/l B.O.D. Assume a filter depth equal to 250 m and 3.50 m deep aeration tank. The primary sedimentation removes 40% of the applied B.O.D.		4.00
Q.7(a)	Discuss the various important processes that take place in a septic tank. Briefly describe the design procedure of septic tank.		4.00
(b)	Distinguish between communal sanitation system and public toilet facilities. Mention the primary reason for failure of such facilities. How can these services be made sustainable		4.67
(c)	A common septic tank is to be designed for three adjoining houses with a total of 21 users. The average waste water flow rate is 190 lped. Design a suitable tank and show the dimensions.		3.00
Q.8(a)	Define BOD and COD. Why this test is carried out? Why COD of sewage is higher than the BOD in general?		4.00
(b)	Explain the role of water, sanitation and hygiene education in improvement of public health.		4.00
(c)	For a waste water sample, the 5-day BOD at 20°C is 250 ppm and is 80% of the ultimate. What will be the 3-day BOD at 37°C?		3.67

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering FOURTH Year SEVENTH SEMESTER Examination, 2012

CE 441
Environmental Engineering-II

Full Marks: 70 **Time: 3 Hours**

N.B.:- (i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicates full marks.
(iii) Use separate answer script for each section.

SECTION-A

Q.1(a) What is environmental management? What are the main components of environmental management? 3.00

(b) Give five examples of water related diseases and discuss their causes of occurrence and routes of transmission. 4.67

(c) What is environmental sanitation? How sanitation can improve the quality of living in a community? 4.00

Q.2(a) Briefly discuss the suitability of a conventional pit latrine. How can the main disadvantage of a simple pit latrine be improved in a VIP latrine system. 3.67

(b) Classify the various types of pour-flush sanitation systems and discuss their relative advantages and disadvantages and their applicability. 4.00

(c) Design a leach pit for both single and alternating twin off-set pit pour-flush latrines serving a family of 10 members. Wastewater flow is 20 lped and porous silty loam soil having infiltration rate of 20 l/m²-day. 4.00

Q.3(a) Discuss the various important processes that take place in a septic tank. Briefly describe the design procedure of a septic tank. 3.00

(b) Distinguish between communal sanitation and public toilet facilities. Mention the primary reason for failure of such facilities. How can these services be made sustainable? 4.67

(c) A common septic tank is to be designed for three adjoining houses with a total of 21 users. The average wastewater flow rate is 190 lped. Design a suitable septic tank and show the dimensions. 4.00

Q.4(a) Define B.O.D. and C.O.D. Why this test is carried out? Why C.O.D of sewage is higher than its B.O.D in general? 4.00

(b) Explain the role of water, sanitation and hygiene education in improvement of public health. 4.00

(c) For a waste water sample, the 5-day B.O.D at 20°C is 250 mg/l and is 70% of the ultimate. What will be the 4-day B.O.D at 30°C? 3.67

SECTION-B

Q.5(a) Briefly discuss the factors that influence the estimation of wastewater flows for the design of sanitary sewer systems. Outline the procedure of estimating design wastewater flow. 3.00

(b) Write down the conditions which are favorable for a separate system and favorable for a combined system. 4.00

(c) Write down the role of microorganisms in wastewater treatment. Classify them based on their energy and carbon source. 4.67

Q.6(a) What is SBS system? Why self cleansing velocity is not required in SBS system? 3.67

(b) Briefly discuss the aerobic, anoxic and anaerobic decomposition of organic matter. 3.00

(c) Design a sewer line when ¾ th full. Given, Q = 6 cfs, n = 0.013, s = 0.020. 5.00

Q.7(a) What are the objectives of plain sedimentation? Briefly discuss the sedimentation process. 4.00

(b) What are the objectives of providing manholes in sewer line? Where is it located? 3.00

(c) Design a primary clarifier for a town having a population of 40,000. The formation of sewage may be assumed at 150 lped. 4.67

Q.8(a) Describe the skimming tanks with special reference to their purpose, design aspects and disposal of floating substances. 3.67

(b) Write down the reasons of sludge bulking. What are S.V.I and S.D.I? 2.00

(c) Compare the activated sludge process and trickling filter system. 2.00

(d) Discuss the various types of waste stabilization ponds. 4.00

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering **FORTH** Year **SEVENTH SEMESTER** Examination, 2011

CE 441
Environmental Engineering – II

Full Marks: 70 **Time: 3 Hours**

N.B.:
(i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicates full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any missing data.

SECTION – A

Q.1	(a)	What is environmental sanitation? Briefly describe the sanitation systems with respect to human waste management.	4.00
	(b)	What are the objectives of sanitation? Describe the route of transmission of excreta-related diseases.	4.00
	(c)	Explain the role of sanitation in controlling the transmission of excreta-related diseases.	3.67
Q.2	(a)	What are the basic elements of a VIP latrine technology? How can the main disadvantage of simple pit latrine be improved in a VIP latrine system?	4.00
	(b)	What variations does the ROEC have from the VIP technology? Briefly discuss the merits and demerits of ROEC.	3.67
	(c)	Design a VIP latrine for a family of eight. The family uses water for anal cleansing. The ground water table is only 2.0 m below the ground surface. Assume solid accumulation rate, C = 0.05 m^3/person/year and consider the single pit and alternating twin-pit option.	4.00
Q.3	(a)	Discuss the various important processes that take place in a septic tank with neat sketches.	4.00
	(b)	Distinguish between communal sanitation and public toilet facilities. What is the primary reason for failures of such communal and public sanitation facilities?	3.67
	(c)	Calculate the volume of a septic tank to serve a house hold of eight person who produced 90 lped of waste water. The tank is to be desludge every three years. Assume solid accumulation rate is 0.06 m^3/person/year.	4.00
Q.4	(a)	What do you mean by air pollution? Discuss the various sources of air pollution.	4.00
	(b)	Explain briefly the effect of air pollution on the environment.	3.67
	(c)	Discuss in brief the preventive measures should be taken to have an effective control for pollution of water.	4.00

SECTION – B

Q.5	(a)	Differentiate between conventional sewerage system and small bore sewerage system. Justify the scope of introducing small bore sewerage system in Bangladesh.	4.00
	(b)	What are the factors which are considered while determining the quantity of dry weather flow?	3.67
	(c)	A town having a population of 20,000 has a sewerage of DWF 25 l/sec having average BOD of 325 mg/l. The sewerage contains industrial waste to the extent of 2.5 l/sec having a total BOD of 202 Kg/day. Find out the per capita BOD load in Kg/day.	4.00
Q.6	(a)	Describe the different sewer sections with necessary sketches.	4.00
	(b)	What is industrial waste? Mention the important characteristics of industrial waste.	3.67
	(c)	A combined sewer of circular section is to be laid to serve a particular area. Calculate its size from the following data: area = 100 hectares, population = 90000, velocity = 3 m/sec, time of carry = 3 min., time of flow = 17 min., rate of water supply = 240 lped and impermeability factor = 0.50. Assume additional data, where necessary.	4.00
Q.7	(a)	What is meant by secondary treatment of sewage? Mention the design aspects of trickling filters.	3.00
	(b)	State the properties of activated sludge. Briefly describe the various waste stabilization ponds.	4.00
	(c)	An activated sludge plant with mixed liquor volatile suspended solids (MLVSS) as 2000 mg/l treats with an ultimate BOD of 900 mg/l and 300 mg/l VSS which are 86% biodegradable. If the plant effluent contains 20 mg/l ultimate BOD and 15 mg/l VSS, determine the daily VSS accumulation and the oxygen requirement for a flow of 0.40 m^3/s. Take synthesis constant p as 0.55 and endogenous respiration constant a as 0.15.	4.67
Q.8	(a)	What are the purposes of installing sedimentation tank in the sewage treatment plant?	2.00
	(b)	Write the advantages and disadvantages of coagulation process in sewage treatment plant.	3.00
	(c)	Discuss the grit chamber with special reference to their purpose, location, nature of grit and number.	3.67
	(d)	Design a primary clarifier for a town having a population of 34,000. The formation of sewage may be assumed at 150 liters per capita per day. Assume detention time 2.5 hr.	3.00

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