

06CE6014

EXAM SLOT: A

Reg. No _____

Name _____

A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.TECH DEGREE EXAMINATION, MAY 2016

SECOND SEMESTER

Branch: Civil Engineering

Specialization: Environmental Engineering

Principles and Design of Biological Treatment Systems

Time: 3 Hours

Max. Marks: 60

PART A

Answer ALL questions

1. Explain the microbial growth pattern in a batch reactor, with a neat sketch.
2. Write a note on Bio-tower for wastewater treatment.
3. Explain with neat sketch UASB reactor.
4. Write a note on different anaerobic digesters with sketches

(4 x 5 marks =20 marks)

PART B

5. List different types of reactors. Explain each with different bioreactors working on the corresponding principle.

OR

6.
 - a. Explain the Hydraulic characteristic curves of a complete mix and plug flow reactors based on tracer analysis.
 - b. Write a note on Mass- Balance Analysis. **(6 + 4)**
7. Explain in detail design and operation Activated Sludge process with process flow diagram.

OR

8. Design a standard rate circular trickling filter for treating 4mLd of sewage, having BOD₅ of 160mg/l. Also design the rotary distributor for the filter.

9. What is meant by high rate anaerobic bio-reactors? List and explain different types of high rate anaerobic bio-reactors.

OR

10. Explain the working principle of Septic tank with a neat sketch. Design the Septic tank required for a 10 users. How effluent from this septic tank is disposed?

11. Compare various treatment technologies used for controlling pollution problems by waste generated from domestic & industrial sources.

OR

12. Write note on:

a. Nitrification and De-nitrification.

b. Foaming in aeration tank.

(6 + 4)

(4 x 10 marks = 40 marks)

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PART A

Answer ALL questions

1. Differentiate Attached and suspended growth biological treatment.
2. Write a note on Rotating Biological contactor for wastewater treatment.
3. Write a note on High Rate Anaerobic Treatment of wastewater.
4. Explain on Nitrification and De-nitrification.

(4 x 5 marks =20 marks)

PART B

5. Based on Mass balance Analysis, derive the expression for ideal hydraulic characteristic curve for a complete mix reactor analyzed under step dosage & pulse dosage non reactive tracer analysis.

OR

6.
 - a. List & explain the factors affecting Microbial growth rate in bio-reactors.
 - b. List & explain the factors affecting selection of type of reactor. **(5 + 5)**
7. An activated sludge system is to be used for secondary treatment of $10000\text{m}^3/\text{d}$ of municipal wastewater. After primary clarification, the BOD is 150mg/l and it is desired to have not more than 5mg/l BOD in the effluent. A complete mixed reactor is to be used, and pilot plant analysis has established the following kinetic values: $Y = 0.5\text{kg/kg}$, $k_d = 0.05\text{d}^{-1}$. Assuming an MLSS concentration of 3000mg/l

and an underflow concentration of the 10000mg/l from the secondary clarifier, determine (1) the volume of the reactor, (2) the mass and volume of solids that must be wasted each day, and (3) the recycle ratio.

OR

8. Explain in detail design and operation of wastewater treatment using Trickling Filter with a neat sketch.
9. Design a septic tank for 150 users. Also design the soil absorption system for the disposal of the septic tank effluent @ 150 lpcd, assuming the percolation rate as 20minutes per cm. Cleaning frequency 6 months. Sketch the designed systems.

OR

10. Write a note with sketch:

- a. Imhoff tank
- b. UASB Reactor

(5 + 5)

11. Explain in detail design and operation of wastewater using Stabilization pond with a neat sketch.

OR

12. What is the need of sludge treatment? Explain briefly Sludge treatment layout with its disposal options.

(4 x 10 marks = 40 marks)

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Principles and Design of Biological Treatment Systems

Time: 3 Hours

Max. Marks: 60

PART A

Answer ALL questions

1. Explain the microbial growth pattern in a batch reactor, with a neat sketch.
2. Write a note on Bio-tower for wastewater treatment.
3. Explain with neat sketch UASB reactor.
4. Write a note on different anaerobic digesters with sketches

(4 x 5 marks =20 marks)

PART B

5. List different types of reactors. Explain each with different bioreactors working on the corresponding principle.

OR

6.
 - a. Explain the Hydraulic characteristic curves of a complete mix and plug flow reactors based on tracer analysis.
 - b. Write a note on Mass- Balance Analysis. **(6 + 4)**
7. Explain in detail design and operation Activated Sludge process with process flow diagram.

OR

8. Design a standard rate circular trickling filter for treating 4mLd of sewage, having BOD₅ of 160mg/l. Also design the rotary distributor for the filter.

9. What is meant by high rate anaerobic bio-reactors? List and explain different types of high rate anaerobic bio-reactors.

OR

10. Explain the working principle of Septic tank with a neat sketch. Design the Septic tank required for a 10 users. How effluent from this septic tank is disposed?

11. Compare various treatment technologies used for controlling pollution problems by waste generated from domestic & industrial sources.

OR

12. Write note on:

a. Nitrification and De-nitrification.

b. Foaming in aeration tank.

(6 + 4)

(4 x 10 marks = 40 marks)

06CE6014**Reg. No** _____**Name** _____**A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY****M.TECH DEGREE EXAMINATION, MAY 2017****SECOND SEMESTER****Branch: Civil Engineering****Specialization: Environmental Engineering****Principles and Design of Biological Treatment Systems****Time: 3 Hours****Max. Marks: 60****PART A***Answer ALL questions*

1. Differentiate Suspended and attached growth bioreactors.
2. Write a note on SBR.
3. What is the need of special facility for septic tank effluent disposal? Explain different methods used for septic tank effluent disposal.
4. Write a note on Phosphorus removal mechanisms.

(4 x 5 marks =20 marks)**PART B**

5. Based on Mass balance Analysis, derive the expression for ideal hydraulic characteristic curve for a complete mix reactor analyzed under step dosage & pulse dosage non-reactive tracer analysis.

OR

6. Write a note on:
 - a. Give briefing on factors affecting microbial growth rate in bioreactors.
 - b. Monod Equation for substrate utilization and microbial growth rate. **(5 + 5)**
7. Differentiate Standard rate and High rate trickling filters. A municipal wastewater treatment plant of 3mLd capacity need a trickling filter for the treatment in secondary stage. Compare the dimensions of trickling filter as Standard rate and High rate for the following requirements. Raw sewage $BOD_5 = 230\text{mg/l}$;

Efficiency of primary clarifier = 30%; Final Effluent $BOD_5 = 25\text{mg/l}$;
Recirculation ratio of high rate trickling filter = 1.5

OR

8. Explain the working principle of Activated Sludge Process. What are the common variations of Activated sludge Process?
9. Design an Imhoff tank to treat the sewage from a small village with a population of 8000 persons, with sewage flow rate of 150 liters per day. Take hydraulic loading rate of $20\text{m}^3/\text{d}/\text{m}^2$. Give the sketch showing cross sectional details of the Imhoff tank.

OR

10. Explain with design aspects, working principle and sketch:
 - a. Septic Tank
 - b. Imhoff Tank
11. List & explain (any 2) the operational difficulties of TF and ASP.

OR

12. What are the factors affecting capacity of sludge digester? Differentiate Conventional and High Rate Sludge Digesters with net sketches.

(4 x 10 marks = 40 marks)

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A

Reg Number.....

Name.....

A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY
M.TECH DEGREE EXAMINATION, APRIL/MAY 2018
SECOND SEMESTER
Environmental Engineering
Principles and Design of Biological Treatment Systems

Time: 3 Hrs

Maximum Marks:60

PART A

Answer ALL Questions

1. Differentiate Attached and suspended growth biological treatment.
2. Compare standard plug flow aerator with stepped and tapered aeration in ASP.
3. What is meant by high rate anaerobic bio-reactors? List and explain different types of high rate anaerobic bio-reactors
4. Explain on MFC.

4 x 5 marks = 20 marks

PART B

5. Based on Mass balance Analysis, derive the expression for ideal hydraulic characteristic curve for a complete mix reactor analyzed under step dosage and pulse dosage non-reactive tracer analysis.

OR

6. List different types of reactors. Explain each with different bioreactors working on the corresponding principle.
7. .
 - a. Compare Bio-Tower with Trickling Filter.
 - b. Write a note on RBC.

(5 + 5)

OR

8. Explain in detail the extended aeration systems in suspended growth biological treatment process.
9. Design a septic tank for 150 users. Also design the soil absorption system for the disposal of the septic tank effluent at a rate of 150lpcd, assuming the percolation rate as 20 minutes per cm. Cleaning frequency 6 months. Sketch the designed systems.

OR

10. Explain with design aspects, working principle and sketch:
 - a. Septic Tank
 - b. Imhoff Tank

(5 + 5)

11. List and explain the operational difficulties of TF and ASP.

OR

12. What are the factors affecting capacity of sludge digester? Differentiate Conventional and High Rate Sludge Digesters with net sketches.

4 x 10 marks = 40 marks

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Exam Slot: A

Reg Number.....

Name

**A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY
M.TECH DEGREE EXAMINATION, MAY/JUNE 2019
SECOND SEMESTER**

**Environmental Engineering
Principles and Design of Biological Treatment Systems**

Time: 3 Hrs

Maximum Marks:60

PART A

Answer ALL Questions

1. Describe different stages of biomass growth in a batch reactor with neat sketch.
2. Differentiate attached and suspended growth bio reactors.
3. Describe operation of UASB reactor with sketch.
4. What is the need for removal of nitrogenous contamination from effluent disposed into a stream? Give a briefing on removal mechanisms.

4 x 5 marks = 20 marks

PART B

5. Compare Aerobic and anaerobic bioreactors.

OR

6. Derive and sketch hydraulic characteristic curves of a complete mix reactor.
7. Describe the structure, working, biological process and Design Elements of Activated Sludge Process with process flow diagram.

OR

8. A municipal wastewater treatment plant of 2MLd capacity need a trickling filter for the treatment in secondary stage. Compare the dimensions of trickling filter as Standard rate and High rate for the following requirements. After primary clarification, the BOD is 200mg/l and it is desired to have not more than 20mg/l BOD in the effluent.

Recirculation ratio of high rate trickling filter = 1.5

9. Describe the working and design aspects of Imhoff Tank with neat sketch.

OR

10. Design the Septic tank required for a 10 users. Describe the working principle of Septic tank and soak pit with a neat sketch.

11. Give in detail design and operation of wastewater treatment using Stabilization pond with a neat sketch.

OR

12. List the basic rules followed in estimation of quantity of raw and digested sludge. Evaluate the per-capita production of Sludge and its reduced quantity after digestion from primary clarifier based on Basic principles.

4 x 10 marks = 40 marks