INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-2

B.Tech VII Semester End Examinations, November - 2019
Regulations: R16
ENVIRONMENTAL ENGINEERING
CIVIL ENGINEERING

Time: 3 hours   **Max. Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT-I

1. a) Classify the sources of water. On which factor the quantity and reliability of water depends?   **[7M]**
    b) In a recuperation test, the following results were obtained,   **[7M]**
        Initial depression head = 10 m
        Final depression head = 7 m
        Time of recuperation = 3 hours
        Diameter specific capacity of well and yield under a head of 5 m.

2. a) Explain various types of sedimentation tanks based on shapes with neat sketches?   **[7M]**
    b) The population of a town is 2,00,000 and the average per capita demand is 135 liters/day/capita. Design the coagulation cum Sedimentation tank for the water work, supplying water tank to the town. The maximum demand may be taken as 1.5 times the average demand. Assume the detention periods of 5 hours and 30 minutes for setting tank and flow chamber respectively. Also assume the flow rate as 900 liters/hour/m2 of plan area?   **[7M]**

UNIT-II

3. a) Compare and contrast between slow sand filter and rapid gravity filters?   **[7M]**
    b) In an ideal settling tank, 20% of 40 mm diameter particles are removed having specific gravity of 1.20. Temperature at the time of removal in 200 C. What will be the size of the particles for which the tank is actually designed? Assume the specific gravity of these particles same as that of 30 mm diameter particles?   **[7M]**

4.   a)   Write a Hazen William"s formula for flow of water through pipe.   **[7M]**

      b)   For the network shown in the figure, flow rate in each pipe and head at each node A =100   **[7M]**
m. Use Hazen Williams equation for calculation of head loss for all pipes is 100?

UNIT-III

5.   a)   Define the terms,   **[7M]**
(i) BOD
(ii) Sullage
(iii) Sewage
(iv) Aerobic Bacteria
(v) Time of Concentration

      b)   Design a primary sedimentation for treating 1 MLD of waste water. Make suitable   **[7M]**
assumptions.

6.   a)   Distinguish between the pressure filters and toughing filters?   **[7M]**

      b)   Design five slow sand filter beds from the following data for the waterworks of a town   **[7M]**
population 75,000, per capita demand =135 litres/day /capita.

UNIT-IV

7.   a)   What are the condition that are be fulfilled for any closed network of pipes in the   **[7M]**
distribution system?

      b)   What is different method used for the analysis of flow in pipe network. Explain,   **[7M]**
(a) Hardy-cross method and
(b) Equivalent pipe method?

8.   a)   Write is sludge gas? What is its typical composition? What are the used of sludge gas?   **[7M]**

      b)   Design and sketch an oxidation pond of population 30,000 in a tropical country like India,   **[7M]**
assuming necessary data. Determine detention time also?

UNIT– V

9.   a)   Explain the principle of oxidation ponds ?   **[7M]**

      b)   Discuss in brief various design parameters used for settling tanks?   **[7M]**

10.   a)   What do you understand by an equivalent pipe? How do you determine its   **[7M]**
length when the pipes are (i) in series (ii) in parallel?

      b)   Explain the design considerations and working principles of septic tank with neat sketch.   **[7M]**

COURSE OBJECTIVES:
The course should enable the students to:

I	Outline the different sources of water and its per capita demand.
II	Describe the basic characteristics of water and study the procedure for determination
III	Design the water supply lines, water collection and different distribution networks.
IV	Construct and design waste water treatment units such as oxidation ponds, sludge digestion tanks, soak pits etc.

COURSE OUTCOMES (COs):

CO 1	Describe population forecasts, design period, water demand, types of demand, factors affecting fluctuations, fire demand, storage capacity, water quality and testing. Drinking water standards
CO 2	Determine Layout and general outline of water treatment units, sedimentation, uniform settling velocity, principles, design factors, surface loading, jar test, optimum dosage of coagulant, coagulation, flocculation, clarifier design, coagulants, and feeding arrangements. filtration
CO 3	Understand Conservancy and water carriage systems, sewage and storm water estimation, type of concentration, storm water over flows combined flow characteristics of sewage , cycles of decay, decomposition of sewage, examination of sewage.
CO 4	Explore Lay out and general outline of various units in a waste water treatment plant, primary treatment design of screens, grit chambers, skimming tanks-sedimentation tanks-principles and design of biological treatment, trickling filters, standard and high rate..
CO 5	Construction and design of oxidation ponds, sludge digestion tanks, factors effecting, design of digestion tank, sludge disposal by drying, septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming.

COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:
ACE015.01	CLO 1	Understand the concept and importance of Protected water supply..
ACE015.02	CLO 2	Estimate the Population for the design period by using different forecasting methods.
ACE015.03	CLO 3	Calculate and Understand the water demand, types of demand, factors affecting fluctuations.
ACE015.04	CLO 4	Calculate the fire demand, storage capacity, water quality and its testing.
ACE015.05	CLO 5	Understand the concept of Drinking water standards. Comparison from quality and quantity and other considerations..
ACE015.06	CLO 6	Understand the intakes, infiltration galleries, confined and unconfined aquifers.
ACE015.07	CLO 7	Understand the, distribution systems, requirements, methods and different layouts

CLO Code	CLO's	At the end of the course, the student will have the ability to:
ACE015.08	CLO 8	Understand the Layout and general outline of water treatment system
ACE015.09	CLO 9	Explain sedimentation, uniform settling velocity principles, design factors, surface loading
ACE015.10	CLO 10	Understand jar test, optimum dosage of coagulant, coagulation, flocculation, clarifier design, coagulants, and feeding arrangements.
ACE015.11	CLO 11	Evaluate Filtration theory, working of slow and rapid gravity filters, multimedia filters, design of filters, troubles in operation comparison of filters,.
ACE015.12	CLO 12	Understand disinfection, types of disinfection, theory of chlorination chlorine demand and other disinfection.
ACE015.13	CLO 13	Different treatment methods. distribution systems, types of layouts of distribution systems, design of distribution systems
ACE015.14	CLO 14	AnalyzeHardy Cross and equivalent pipe methods
ACE015.15	CLO 15	Understand service reservoirs, joints, valves such as sluice valves, air valves, scour valves and check valves water meters, laying and testing of pipe lines, pump house.
ACE015.16	CLO 16	Explain Conservancy and water carriage systems, sewage and storm water estimation.
ACE015.17	CLO 17	Understand type of concentration ,storm water over flows combined flow.
ACE015.18	CLO 18	Understand characteristics of sewage, cycles of decay, decomposition of sewage, examination of sewage, .B.O.D. and C.O.D. equations
ACE015.19	CLO 19	Analyze the design of sewers, shapes and materials, sewer appurtenances manhole, inverted siphon, catch basins, flushing tanks, ejectors, pumps and pump houses, house drainage.
ACE015.20	CLO 20	Understand different components requirements, sanitary fittings, traps, one pipe and two pipe systems of plumbing, ultimate disposal of sewage, sewage farming, and dilution.
ACE015.21	CLO 21	Understand and analyze Lay out and general outline of various units in a waste water treatment plant, primary treatment design of screens, grit chambers, skimming tanks-sedimentation tanks-principles.
ACE015.22	CLO 22	Evaluate the design of biological treatment, trickling filters, standard and high rate.
ACE015.23	CLO 23	Understand the septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming
ACE015.24	CLO 24	Understand the septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No			Course Learning Outcomes	Course Outcomes	Blooms Taxonomy Level
1	a	ACE015.01	Understand the Layout and general outline of water treatment system	CO 1	Understand
	b	ACE015.02	Estimate the Population for the design period by using different forecasting methods	CO 1	Remember
2	a	ACE015.03	Calculate and Understand the water demand, types of demand, factors affecting fluctuations	CO 1	Understand
	b	ACE015.04	Calculate the fire demand, storage capacity, water quality and its testing	CO 1	Remember

3	a	ACE015.05	Understand the concept of Drinking water standards. Comparison from quality and quantity and other considerations..	CO 2	Understand
	b	ACE015.06	Understand the intakes, infiltration galleries, confined and unconfined aquifers.	CO 2	Remember
4	a	ACE015.07	Understand the, distribution systems, requirements, methods and different layouts	CO 2	Understand
	b	ACE015.08	Understand the Layout and general outline of water treatment system	CO 2	Remember
5	a	ACE015.09	Explain sedimentation, uniform settling velocity principles, design factors, surface loading	CO 3	Understand
	b	ACE015.10	Understand jar test, optimum dosage of coagulant, coagulation, flocculation, clarifier design, coagulants, and feeding arrangements.	CO 3	Remember
6	a	ACE015.11	Evaluate Filtration theory, working of slow and rapid gravity filters, multimedia filters, design of filters, troubles in operation comparison of filters,.	CO 3	Understand
	b	ACE015.12	Understand disinfection, types of disinfection, theory of chlorination chlorine demand and other disinfection.	CO 3	Remember
7	a	ACE015.13	Different treatment methods. distribution systems, types of layouts of distribution systems, design of distribution systems	CO 4	Understand
	b	ACE015.14	Analyze Hardy Cross and equivalent pipe methods	CO 4	Remember
8	a	ACE015.15	Understand service reservoirs, joints, valves such as sluice valves, air valves, scour valves and check valves water meters, laying and testing of pipe lines, pump house.	CO 4	Understand
	b	ACE015.16	Explain Conservancy and water carriage systems, sewage and storm water estimation.	CO 4	Remember
9	a	ACE015.17	Understand type of concentration ,storm water over flows combined flow.	CO 5	Understand
	b	ACE015.18	Understand characteristics of sewage, cycles of decay, decomposition of sewage, examination of sewage, .B.O.D. and C.O.D. equations	CO 5	Remember
10	a	ACE015.19	Analyze the design of sewers, shapes and materials, sewer appurtenances manhole, inverted siphon, catch basins, flushing tanks, ejectors, pumps and pump houses, house drainage.	CO 5	Understand
	b	ACE015.21	Understand the septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self-purification of rivers, sewage farming	CO 5	Remember

Signature of Course Coordinator   **HOD,CE**