

Name :
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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
07 THRISSUR CLUSTER

THIRD SEMESTER M.TECH. DEGREE EXAMINATION DEC 2017

Civil Engineering

Environmental Engineering/Water Resources & Hydroinformatics

07CE7111 PLANNING & DESIGN OF ENVIRONMENTAL FACILITIES

Time : 3 hours

Max.Marks: 60

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

Q.no.	Module 1	Marks
1a	How will you estimate the quantity of water to be stored in the distribution system?	4
	Answer b or c	
b	Determine the distribution of flow in the pipe network ABCD in which BD is the common pipe. The flow entering at the junction A & B are 50 L/s each. The flow emerging from junction C & junction D are 75 L/s & 25 L/s respectively. The values of K for AB, BC, CD, DA and DB are 2,4,3,2 and 1 respectively. The headloss may be assumed as KQ^n . The flow is turbulent and pipes are rough. Use Hardy Cross method.	5
c	How Equivalent Pipe method can be used for the analysis of distribution system? Explain with one example.	5
Q.no.	Module 2	Marks
2a	What points to be kept in mind while designing sewers and how are the sewers designed?	4
	Answer b or c	
b	A rectangular sewer with width 1.5times its depth is hydraulically equivalent to a circular one. Find the relation between the width of the rectangular sewer and diameter of the circular sewer.	5
c	A sewer line carrying an average discharge of 200 L/s has to cross a stream. Design the three-barrel syphon for this purpose, if the length of the syphon, measured along the centre line, including the slopes is 90cm. The invert level at the inlet and outlet ends of the sewer are 152.50m and 151.78m respectively. The maximum and minimum flows are 250% and 40% of the average respectively. Assume that minor losses as 0.07m and self-cleansing velocity of 1m/s.	5

Q.no.	Module 3	Marks
3a	What are the components of a pumping station. Explain with sketch.	4

Answer b or c

- b** Find the BHP of a pump which lifts water from a well to the treatment plant. Following is the data available. **5**

Quantity of water to lifted daily 4000m^3 , Length of suction pipe 30m,

Length of rising main 170m, Coeff. of friction 0.01, Pipe diameter 60cm,

Static head through which water is to be pumped 25m,

Efficiency of pump 75%, Efficiency of motor 90%,

Pumps work for 2 shifts daily, each shift being of 8hours duration.

- c** Design an unlined trapezoidal section for the outfall reach of a storm water drain collecting storm water from a catchment area of 50hectares. **5**

Inlet time 12 minutes, Time of flow in the upper reaches of drain 18minutes,

Rainfall intensity 40mm/hr, Imperviousness factor 0.55,

Water surface slope 1 in 2000, Max. Permissible velocity 0.85m/s, $n=0.025$.

Q.no.	Module 4	Marks
4a	Enumerate and discuss briefly the various methods which are adopted collectively for treating public water supplies drawn from a perennial river.	4

Answer b or c

- b** Find the settling velocity of a discrete particle in water under conditions when Reynold's number is less than 0.05. The diameter and specific gravity of the particle is $5 \times 10^{-3}\text{cm}$ and 2.65 respectively. Water temperature is 20°C (kinematic viscosity of water at $20^\circ\text{C} = 1.010 \times 10^{-2} \text{ cm}^2/\text{sec}$) **5**

- c** Calculate the amount of bleaching powder required to treat 3.0 million litres of water per day. The chlorine required 0.5 ppm to maintain a residual chlorine of 0.15 ppm. If high strength Calcium hypochlorite is used in place of bleaching powder, calculate the difference in amount required. Make your own assumptions. **5**

Q.no.	Module 5	Marks
5a	What are various types of screens? How the head loss in screens can be computed?	5

Answer b or c

- b** Design a grit chamber cum detritus tank for a sewage treatment plant with **7**

average flow 600 l/s. The flow velocity through the tank is 0.2m/s and detention period is 3minutes. The maximum flow is 3 times the average flow.

- c** For a conventional activated sludge treatment plant, wastewater flow 30000m³/d, volume of aeration tank 9900m³, Influent BOD 200mg/l, Effluent BOD 20mg/l, Mixed liquor volatile suspended solid 2800mg/l, Effluent suspended solids 35mg/l, Waste sludge suspended solids 9000mg/l and Quantity of waste sludge 220m³/d. Compute aeration period, F/M ratio and sludge age. **7**

Q.no.	Module 6	Marks
6a	How the design of stabilization pond can be done?	5
Answer b or c		
b	Design a septic tank with soil absorption system for 200 users.	7
c	The design flow of sewage is 4 million litres per day and BOD of raw sewage is 250mg/l. Design a biofilter to produce an effluent having a BOD of 40mg/l.	7