

COLLEGE OF ENGINEERING PUNE

Subject code : EW- 503

Name of subject: Advanced Treatment in Water and Wastewater

Programme: F Y M Tech Civil)

Specialization: (Environmental & Water Resource Engineering)

Year: 2011-12

Date: 19/11/ 2011

Duration: 3 Hours

Max. Marks: 50

Instructions:

- 1 Attempt any five questions
- 2 Assume suitable data if required
- 3 Use of scientific calculator is allowed

Q.1. A	Write classification of filtration processes. Write mechanism and phenomena contributing to removal of materials within a granular filter	07
B	A dual media filter bed is composed of sand with effective size 0.55 mm and specific gravity 2.65 and anthracite of specific gravity 1.7. Determine effective size of anthracite to avoid significant intermixing.	03
Q.2 A	Discuss following with respect to ion Exchange process Process with Chemical reactions Ion Exchange resin classification Regeneration of ion exchange material	05
B	A raw water has the following constituents expressed in meq/l, $Ca^{++} = 4.6$, $Mg^{++} = 1.0$, $Na^+ = 2.1$, $HCO_3^- = 2.4$, $SO_4^{--} = 2.9$, $Cl^- = 2.4$ and $CO_2 = 0.6$ 1) Check if ions are balanced 2) What is the hardness expressed as $CaCO_3$ in mg/l 3) Calculate requirement of CaO and soda for removing hardness in 20000m ³ /day flow	05
Q.3 A	Explain in brief working principles of following process. State their applications, 1) Reverse Osmosis 2) Electro dialysis	10
Q.4 A	Explain factors which affect adsorption process.	05
B	A wastewater containing 50 mg/l of phenol is subjected to an equilibrium test to determine Langmuir isotherm . One liter samples were dosed with powdered activated carbon in four jars and when	05

	equilibrium was reached the equilibrium concentrations of phenol were analyzed. From the results shown below, determine the constants																
	<table border="1"> <thead> <tr> <th>Test Jar no.</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Carbon added in gms.</td> <td>0.52</td> <td>0.62</td> <td>1.2</td> <td>2.3</td> </tr> <tr> <td>Equilibrium concentration of Phenol in mg/l</td> <td>6.2</td> <td>1.1</td> <td>0.3</td> <td>0.09</td> </tr> </tbody> </table>	Test Jar no.	1	2	3	4	Carbon added in gms.	0.52	0.62	1.2	2.3	Equilibrium concentration of Phenol in mg/l	6.2	1.1	0.3	0.09	
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Equilibrium concentration of Phenol in mg/l	6.2	1.1	0.3	0.09													
Q.5. A	The total phosphorus content of a domestic wastewater with a flow of 20000 m ³ /day is 7mg/l a) If 3000kg/day of sludge solids containing 75% VSS is wasted, calculate the concentration of total Phosphorus in the effluent. Assume sludge contains 2% solids and density of water 1000kg/m ³ b) If process is done with luxury uptake (1mg/l of total P in the effluent) how much total P wasted in the sludge?	05															
B	Explain Removal of Nitrogen by Biological Nitrification-Denitrification.	05															
Q.6. A	Explain various purposes for which reclaimed wastewater can be used.	04															
B	Discuss in details issues related to centralized and decentralized wastewater treatment systems.	06															
Q.7 A	Explain in details methods of phosphorus removal from wastewater	05															
B	Draw a sketch and explain principle of Ammonia stripping	05															

College of Engineering, Shivajinagar, Pune

(An Autonomous Institute of Government of Maharashtra)

Department of Civil Engineering

End Semester Examination

Subject: CE 5504 Principle of Water and Air Quality Legislation

Date: 21/11/2011

Timing: 4 pm to 7 pm

Programme: MTech –I (Environmental and Water Resources Engineering)

Instructions to candidate:

1. All questions are compulsory
2. Figure to the right indicate the full marks
3. Assume suitable data wherever is necessary
4. Programmable calculator is not allowed

Q.No.1 a) Write the application of following water quality model (5)

i) AQUATOX ii) CORMIX1 iii) CORMIX2 iv) CORMIX3 v) WASP

b) What is water allocation? Explain in brief the principle of laws applied to water allocation. (5)

Q.No.2 a) Explain with neat sketch the working of vacuum transport system. (5)

b) Enumerate the guidelines on management aspects of WQMP (5)

Q.No.3 An air stream with a flow rate of $7 \text{ m}^3/\text{s}$ is passed through a cyclone of standard proportions. The diameter of the cyclone is 2.0 m, and the air temperature is 77°C .

(i) Determine the removal efficiency for a particle with a density of 1.5 g/cm^3 and a diameter of $10 \mu\text{m}$

(ii) Determine the collection efficiency based on the above if a bank of 64 cyclones with diameters of 24 cm are used instead of the single large unit.

Take $N_e = 5$ turns and μ at $77^\circ\text{C} = 2.1 \times 10^{-5} \text{ kg/m.s}$

Ratio of d/d_{50}	0.5	0.7	1.0	2.0	3.0
Removal efficiency	0.22	0.35	0.51	0.7	0.9

(10)

- Q.No.4 a)** An electrostatic precipitator is to be constructed to remove fly-ash particles from stack gases flowing at $10 \text{ m}^3/\text{s}$. Analysis of similar system shows the drift velocity can be taken as

$$w = 3.0 \times 10^5 d_p \text{ m/s}$$

Determine the plate area required to collect a $0.5 \text{ }\mu\text{m}$ particle with

- (i) 90 percent efficiency
 - (ii) 99 percent efficiency
- (5)

and make comment on results

- b)** It is desired to construct a settling chamber to remove particles from an airstreams of $120 \text{ m}^3/\text{min}$. The temperature of the air is 50°C , and the specific gravity of the particle is 2.5. The chamber is to be strapped to the ceiling of an industrial building, and the space is limited vertically to 2 m and horizontally to 1.5 m. Determine the length required to remove 100 percent of $50 \text{ }\mu\text{m}$ particles. (Take μ at $50^\circ\text{C} = 0.85 \times 10^{-5} \text{ kg/m.s}$)
- (5)

- Q.No.5 a)** Explain in detail the Environmental (Protection) Act (4)
- b)** Define the following term
- i) Environmental lapse rate (ELR) (2)
 - ii) Adiabatic lapse rate (ALR) (2)
- c)** Write a short note on the Water (Prevention and Control of Pollution) Cess, Act (2)
- d)** Explain the effect of excessive moisture content on ambient air quality (2)

1/2

COLLEGE OF ENGINEERING PUNE

Test: End Semester Examination for Nov 2011

Subject code: CE -5501

Name of subject: **ADVANCED NUMERICAL METHODS**

Programme: M. Tech. (Civil-EWRE)

Year: 2011-12

Duration: 3 hrs

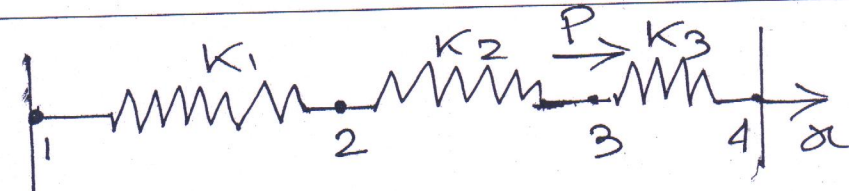
Date: 27/11/2011

Max. Marks: 50

Instructions:

1. All questions are compulsory.
2. Draw neat figures wherever required
3. Assume suitable data if necessary
4. Use of scientific calculator is allowed
5. Figures to the right indicate full marks
6. from each unit there are three sub questions, solve any two of them

Q1-a	Solve the system of equations using any suitable method correct to three decimal places. $10x - 2y + z = 12$ $x + 9y - z = 10$ $2x - y + 11z = 20$	05
b	What do you mean by iterative method? Where do you come across them in Environmental and Water Resource Engineering?	05
c	Solve the system of equations by Gauss-Seidel method $28x + 4y - z = 32$ $x + 3y + 10z = 24$ $2x + 17y + 4z = 35$	05
Q2-a	$X^3 - 2x + 17 = 0.$ Solve it by Bisection Method.	04
b	From the Taylor's series for $y(x)$ find $y(0.1234)$ correct to four decimal places if $y' = x - y^2$ and $y(0) = 1$	04
c	Given $y' = x^2 - y$, $y(0) = 1$ find $y = (0.1)$ using Runge-Kutta fourth order.	04

Q-3a	What do you mean by initial and boundary value problems? Give one example of each.	04
b	What do you mean by Finite Difference Method. By using Taylor's series find the first and second derivative from the first principle. Show all the Mathematical expressions in detail.	04
c	Write down about the application of Finite Difference Method in Environmental and Water Resource Engineering in detail.	04
Q-4a	What do you mean by Partially Penetrating Well? Draw the neat sketch of a Partially Penetrating Well and label all the parts of it.	04
b	Derive any one of the Partial Differential Equations related to parabolic type equations. Show all the boundary conditions and analyze the equation in detail.	04
c	What do you mean by Relaxation Method? How it is applied in the field of Ground Water Hydrology. Give one example.	04
Q-5a	What is the basis of Finite Element Method? What do you mean by Discretization? Give one example of line element, plane element and solid element?	04
b	 <p>For the spring system shown above, $K_1 = 100\text{N/mm}$, $K_2 = 200\text{ N/mm}$, $K_3 = 100\text{N/mm}$ $P = 500\text{N}$, $u_1 = u_4 = 0$. Find i) The global stiffness matrix ii) The displacement at node 2 & 3.</p>	04
c	What are the applications of Finite Element in Ground Water Hydrology?	04
Q-6a	What do you mean by Neural Network? What is ANN? Why ANN is preferred than Statistical Methods?	04
b	Draw a figure for an Artificial Neural Network. Consider four neurons in input and consider one hidden layer. In output consider only one neuron.	04
c	Write in brief about feed forward method and back propagation method.	04

COLLEGE OF ENGINEERING, PUNE
END SEMESTER EXAMINATION

(CE- 5524) **ECONOMICS, PLANNING AND MANAGEMENT OF SYSTEMS**
Program: S. Y. M.Tech
Branch: Civil (EWRE)
Time: 3 Hrs.

Year: 2011-2012
Date: 29/11/2011
Max. Marks: 50

Instructions:

1. All questions are compulsory.
2. Assume suitable data if necessary.
3. Use of scientific calculator is allowed.

- Q.1 a) List out the various discounting techniques and explain any one in detail. 05
- b) Water is supplied from a project for two types of users: rural and urban. The benefits to rural community are given by $B_r = 30 y_r - 3/2 y_r^2$ and those to the urban community are given by $B_u = 10 y_u - y_u^2/8$. If the total cost of the project is $C = Y^2/2 + 2Y$, where Y is the aggregate demand, determine the optimum level of total water supply. Also determine the corresponding components of rural and urban water supply levels. 05

- Q.2 a) How will you estimate environmental benefits from a reservoir providing recreation facilities? 04
- b) Cropland within a certain floodplain is planted 40% to corn, 50% to potatoes and 10% of tomatoes. The hydrologic analysis it is found that 50% of this historical floods have occurred in season I, 24% in season II, 10% in season III and 15% in season IV. Crop income without flooding and with flooding in season in Rs. Per hectare per year is as given below: 06

Table 1

Crop	Income without flooding	Income without flooding			
		Season I	Season II	Season III	Season IV
Corn	1200	700	300	300	1100
Potatoes	650	150	450	550	400
Tomatoes	2000	1000	300	500	1800

What is expected damage per hectare to this cropland when it is flooded?

- Q.3 a) Discuss steps in planning a single purpose irrigation project. 04
- b) A 20 hectare woodlot is to be harvested. The harvestable volume on the woodlot is $300m^3$ /hectare which can be sold for a unit volume of $10/m^3$. The standard logging produces 3.6 metric tons/hectare of sediment, whereas the acceptable sediment load is 1.8 metric tons/hectare. The other data for standard logging is given in Table 2. 06

1) Buffer strip (non cutting) along the river-
Shore length = 1600m, strip width = 25m, harvested woodlot = nil.

2) Filter strip- (no machine allowed)
Shore length = 1600m, strip width = 40 m, harvested woodlot = 300m³/hec.
Total additional winched out cost = 8094

Table 2: Standard logging

	Hours/hectare	Cost/hr
Labour	50	2
Tractor	12.5	25
Loading and transport	6	20

Determine the most suitable alternative and estimate the cost of sediment discharge restriction.

- Q.4 a) Discuss various environmental consequences of water resources projects. 05
- b) The flow duration curve of a run-off river hydropower plant is as given below. 05

Table3: Weekly flow duration curve

Stream discharge in cumecs	Period during which discharge is equaled or exceeded in %
0.60	8
0.35	21
0.30	28
0.17	80
0.12	100

If the constant head is 50 m and the power plant efficiency is 60%,

- (i) calculate total amount of firm energy available,
- (ii) If the power plant capacity is 90 kW, calculate the amount of peak energy available
- (iii) Calculate the total energy potential available
- (iv) If at least 0.05 cumecs must be maintained in the stream for environmental considerations, calculate peak energy available.
- Q.5 a) Calculate annual cost of a project, if annual interest rate is 9%, rate for sinking fund method computation is 6% and annual OM cost is 3%. The cost and life of the project are 110million Rupees and 30 years respectively. 02
- b) Differentiate between skimmed price and penetrating price. 02
- c) Explain kinked demand curve model. 02
- d) Differentiate between economic analysis and financial analysis. 02
- e) Discuss the necessity of capital budgeting. 02
