EXAM SLOT: C

06CE6034

Reg. No _____

Name _____

A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.TECH DEGREE EXAMINATION, MAY 2016

SECOND SEMESTER

Branch: Civil Engineering

Environmental Systems Modelling

Time: 3 Hours **Max. Marks: 60**

PART A

Answer ALL questions

1. Explain model validation
2. Discuss application of water quality models in river protection
3. What is plume rise? How it influences air quality modeling?
4. Explain the role of Darcy's law in ground water modelling

(4 x 5 marks =20 marks)

PART B

5. Explain the objectives and principles of environmental modeling (10 marks)

OR

6. What are the different classifications of mathematical models? (10 marks)

7. Discuss the historical development of water quality models (10 marks)

OR

8. A factory is situated near a river and discharging its wastewater at 105 l/hr. The BOD concentration in wastewater is estimated as 100 mg/l. The hydrographic survey of the river determined its discharge as 5×10^5 l/hr. There is no BOD present is river water upstream of the waste disposal site. The velocity of river water is estimated, on average as being 0.1 km/ hr.
   Other relevant data are:
   Initial DO = 5 mg/ l, Saturation DO = 9 mg/l,
   $k_1 = 0.1$/ day ; $k_2 = 0.2$/day
   Determine BOD concentration and DO concentration at a site 10 km downstream of waste disposal. (10 marks)

9. Discuss the role of receptor models in air quality management. How receptor models are different from dispersion models? (10 marks)

OR

10. Sulphur dioxide is emitted at a rate of 2kg/s from the top of a chimney that is 120m high. The plume initially rises vertically a further 10m above the chimney exit, before being convected horizontally by a wind speed of 15m/s under conditions of neutral stability. The dispersion parameters shall be derived from the following table.

Stability		x ≤1 km			x ≥ 1 km		
Category	a	c	d	f	c	d	f
A	213	440.8	1.941	9.27	459.7	2.094	-9.6
B	156	106.6	1.149	3.3	108.2	1.098	2
C	104	61	0.911	0	61	0.911	0
D	68	33.2	0.725	-1.7	44.5	0.516	-13
E	50.05	22.8	0.678	-1.3	55.4	0.305	-34
F	34	14.35	0.74	-0.35	62.6	0.18	-48.6

Calculate the ground level concentration at a distance of 800m downwind of the chimney (10 marks)

11. What are the contaminant, soil and site properties and their combinations that are critical in the transport of contaminants to ground water (10 marks)

OR

12. Water levels in two wells far from shoreline are 50 cm and 1.0 m respectively. The wells are separated by a distance of 1 km. Hydraulic conductivity of the aquifer is 10m/d. Thickness of aquifer is 50m. Calculate the length of saltwater wedge and position of interface. Density of salt water can be taken as 1.025 g/cm^3 (10 marks)

(4 x 10 marks =40 marks)

C

06CE6034 **Reg. No _____**

Name _____

A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.TECH DEGREE EXAMINATION, APRIL/MAY 2017

SECOND SEMESTER

Branch: Civil Engineering

Environmental Systems Modelling

Time: 3 Hours **Max. Marks: 60**

PART A

Answer ALL questions

1. Explain the need for models in environmental studies
2. Explain Streeter- Phelps model
3. What is temperature inversion? How it affects the dispersion of atmospheric pollutants
4. Explain Ghyben-Herzberg relation

(4 x 5 marks =20 marks)

PART B

5. Explain the different types of mathematical models available for application in environmental management (10 marks)

OR

6. Discuss the steps in environmental systems modeling (10 marks)

7. Explain factors affecting self purification of natural streams (10 marks)

OR

8. A river is having discharge of 22m^3/s receives wastewater discharge of 5 m^3/s. The initial DO of the river water is 6.3 mg/L, and DO content in the wastewater is 0.6 mg/L. The five day BOD in the river water is 3 mg/L, and the wastewater added to river has five day BOD of 130 mg/L. Consider saturation DO of 8.22 mg/L and deoxygenation and reoxygenation cefficient values of 0.1 and 0.3 per day, respectively. Find critical DO deficit and DO in

the river after one day. The average velocity of flow in the stream after mixing of wastewater is 0.18 m/sec. (10 marks)

9. Discuss in detail various air quality models and their applications (10 marks)

OR

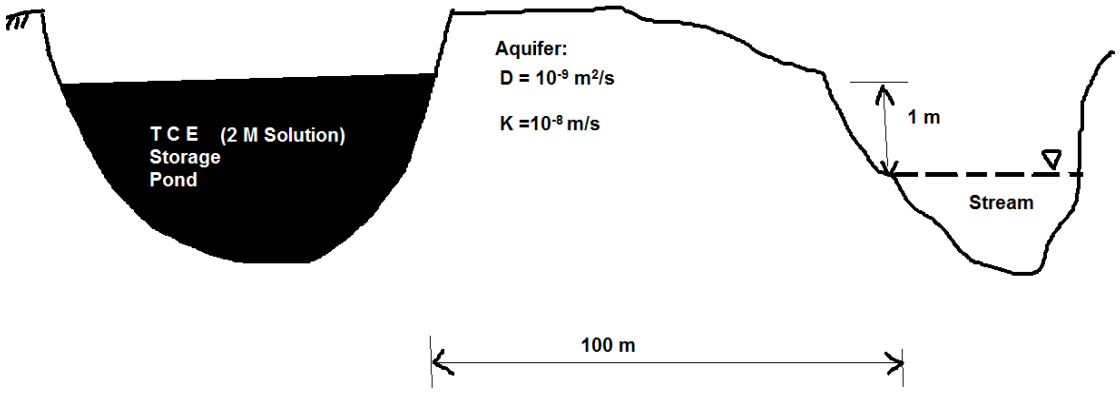
10. An air sampling station is located at an azimuth of 203° from a cement plant at a distance of 1500 meters. The cement plant releases particulate matter at the rate of 94.5 g/s from a 30 meter stack.What is the contribution from the cement plant to the total suspended particulate concentration at the sampling station when the wind is from 30° at 3 m/s. Consider
$\sigma y = 150m$; $\sigma z = 87$ m

(10 marks)

11. Discuss the basic mechanisms that drives the contaminant transport in ground water (10 marks)

OR

12. Calculate the total annual discharge of 2M solution of Trichloroethylene (TCE) into the stream from an industrial storage as shown below. Diffusion coefficient is 10^{-9} m^2/s and hydraulic conductivity of the aquifer is 10^{-8} m/s. One mole of TCE is equivalent to 131.4 g.



(10 marks)

(4 x 10 marks =40 marks)

C

06CE6034 **Reg.Number……...**

Name……

A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.TECH DEGREE EXAMINATION, APRIL/MAY 2018
SECOND SEMESTER
BRANCH: CIVIL ENGINEERING

SPECIALIZATION: ENVIRONMENTAL ENGINEERING

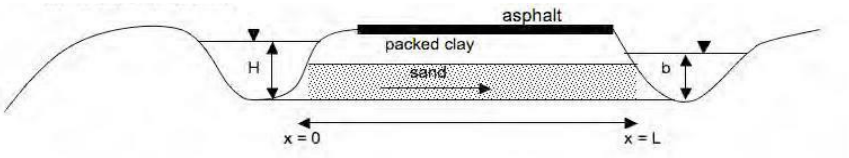
ENVIRONMENTAL SYSTEM MODELLING

Time: 3 Hrs **Maximum Marks: 60**

PART A

Answer ALL Questions

1. How model performance is assessed? Reliability of a model does not necessarily increase with model complexity. Why?
2. Explain the influence of basin characteristics on river flow
3. What are the assumptions used in a box model?
4. What is the equation of flow for the following situation?



4 x 5 marks =20 marks

PART B

5. Discuss in detail the classification of mathematical models

OR

6. Discuss model validation, calibration and verification

7. Describe Streeter-Phelps model. What is its application in river water quality modeling?

OR

8. The initial BOD of a river just below a sewage outfall is 25 mg/L. The oxygen deficit just upstream from the outfall is 2 mg/L. The deoxygenation rate coefficient k_d is 0.4/day, and the reaeration rate coefficient k_r is 0.7/day. The river is flowing at a speed of 30 km /day.
   (a) Find the critical distance downstream at which DO is a minimum [5 marks]
   (b) Find the minimum DO [5 marks]

9. Explain plume behavior under various atmospheric stability conditions

OR

10. An air sampling station is located at an azimuth of 203^{o} from a cement plant at a distance of 1500 meters. The cement plant releases fine particulate matter at the rate of 94.5 g/s from a 30 meter high stack. What is the contribution from the cement plant to the ambient particulate matter concentration at the sampling station when the wind is from 30^{o} at 3 m/s. Given that $\sigma y = 150m$ and $\sigma z = 87m$

11. A chemical spill occurs above a sloping, shallow unconfined aquifer consisting of medium sand with K=1 m/d and a porosity of 30%. Several monitoring wells are drilled in order to determine the regional hydraulic gradient. The hydraulic head from a well drilled near the spill location yielded a value of 5m. At a distance of 200m down the slope another well yielded a hydraulic head of 1m. How long will it take for the contaminants to travel 200m?

OR

12. The distance from the base of a pumping well to the freshwater-saltwater interface is 100 m, the pumping rate is 3000 m3/day, and the hydraulic conductivity is 10 m/d.
    What will be the position of the interface?
    What's the maximum permitted pumping rate for the well?

4 x 10 marks =40 marks

Exam Slot : C

06CE6034 **Reg Number…….....**
Name....…….

A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY
M.TECH DEGREE EXAMINATION, MAY/JUNE 2019
SECOND SEMESTER
ENVIRONMENTAL ENGINEERING
ENVIRONMENTAL SYSTEMS MODELLING

Time: 3 Hrs **Maximum Marks:60**

PART A

Answer ALL Questions

1. Why do we need models in the environmental studies?
2. Describe historical development of water quality models.
3. How an area source can be modelled using Gaussian Plume Model?
4. Explain Ghyben-Herzberg relationship

4 x 5 marks= 20 marks

PART B

5. Discuss various types of models used in environmental science

OR

6. Explain various steps in environmental modelling

7. The following 7 day low flows were compiled for a river. Determine 7Q10

Year	1980	1981	1982	1983	1984	1985	1986	1987
Flow (m3/s)	1.68	2.04	3.42	1.78	2.42	1.87	2.11	4.48
Year	1988	1989	1990	1991	1992	1993	1994	
Flow (m3/s)	5.39	3.00	2.57	1.52	2.47	3.08	1.78	

OR

8. A river is having discharge of 22 m3 /s receives wastewater discharge of 5 m3 /s. The initial DO of the river water is 6.3 mg/L, and DO content in the wastewater is 0.6 mg/L. The five day BOD in the river water is 3 mg/L, and the wastewater added to river has five day BOD of 130 mg/L. Consider saturation DO of 8.22 mg/L and deoxygenation and reoxygenation constant values of 0.1 and 0.3 per day, respectively.

Find critical DO deficit and DO in the river after one day. The average velocity of flow in the stream after mixing of wastewater is 0.18 m/sec.

9. An air sampling station is located at an azimuth of 203^o from a cement plant at a distance of 1500 meters. The cement plant releases fine particulate matter at the rate of 94.5 g/s from a 30 meter high stack. What is the contribution from the cement plant to the ambient particulate matter concentration at the sampling station when the wind is from 30^o at 3 m/s. Given that $\sigma y = 150m$ and $\sigma z = 87m$

OR

10. (a) What is receptor modelling? How does it compare with dispersion modelling? [5 marks]

    (b) Derive a line source model from Gaussian Plume Model [5 marks]

11. Water levels in two wells far from shoreline are 50 cm and 1.0 m respectively. The wells are separated by a distance of 1 km. Hydraulic conductivity of the aquifer is 10m/d. Thickness of aquifer is 50m. Calculate the length of saltwater wedge and position of interface. Density of salt water can be taken as 1.025 g/cm3

OR

12. Explain the critical combination of contaminant, soil and site properties for the transport of contaminants to ground water

4x 10 marks= 40 marks