OR iv. Carry out one iteration of network analysis by Hardy-Cross flow correction Method. Assume initial pipe discharges in pipes 1 and 2 as 0.6 and 0.8 m^3/sec, respectively. **6**

Q.6 i. Explain linear programming technique to optimal design of branched network? **5**

ii. The following data pertains to a reservoir: **5**

Time, Hrs	0-2	2-4	4-6	6-8	8-10	10-12
Demand, m^3/min	2	6	9	16	26	18

Time, Hrs	12-14	14-16	16-18	18-20	20-22	22-24
Demand, m^3/min	10	12	16	13	10	5

The pumping is to be done at a uniform rate from 4 to 8 am and 4 to 8 pm. Determine: The minimum reservoir capacity.

OR iii. How NFA technique is applied to serial networks. **5**

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2022

CE6CW03 Environmental Hydraulics

Programme: Ph.D. Branch/Specialisation: Civil (Course Work).

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. The unit of Dynamic viscosity in MKS system of unit: **1**
(a) Kg. sec/m² (b) N-sec/m² (c) m²/sec (d) Stoke

ii. Kinematic Viscosity is the ratio of: **1**
(a) Density/ Dynamic Viscosity
(b) Density of liquid / Density of standard fluid
(c) Dynamic Viscosity/ Density
(d) Dynamic Viscosity/ Specific Density

iii. Ratio of area irrigated in Rabi season to area irrigated in kharif season is known as: **1**
(a) Crop Ratio (b) Crop Season
(c) Crop Period (d) Base Period

iv. The time between the first watering of a crop at the time of its sowing to its last watering before harvesting is called: **1**
(a) Crop Ratio (b) Crop Season
(c) Crop Period (d) Base Period

v. A plot between rainfall intensity versus time is called as: **1**
(a) Hydrograph (b) Mass curve
(c) Hyetograph (d) Isohyets

vi. A hydrograph is a plot of: **1**
(a) Rainfall intensity against time
(b) Stream discharge against time
(c) Cumulative rainfall against time
(d) Cumulative runoff against time

vii. Surge tank is provided in the water pipelines: **1**
(a) To safeguard against water hammer pressure
(b) To control flow
(c) To measure discharge
(d) To raise pressure

viii Define NFA. **1**
(a) Node Flow Analysis (b) Negative Flow Analysis
(c) Node Fast Analysis (d) None of these

ix. Which of the method is used for design of a network? **1**
(a) Cost-head loss ratio method
(b) Linear Programming Technique
(c) Both (a) and (b)
(d) None of these

x. What is primary Network? **1**
(a) Having sizes of 70 mm and less
(b) Having sizes of 100 mm only
(c) Having sizes of 150 mm only
(d) Having sizes of 100 mm, 150mm and more

Q.2 i. What is continuity equation? **2**

ii. Define the following: **3**
(a) Steady and unsteady flow
(b) Uniform and non-uniform flow
(c) Laminar and turbulent flow

iii. State and prove the Bernoulli's equation. Also list the assumption made by deriving Bernoulli's equation. **5**

OR iv. The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure 6 m at section 2. **5**

Q.3 i. Define: Kor-watering, Intensity of Irrigation, Field capacity. **3**

ii. Define duty, delta and base period. Compute the relationship between **7**

these three. A water course has a cultural commanded area of 1200 hectare. The intensity of irrigation for a crop A is 40% and for B 35% both the crop being Rabi crops. Crop A has a Kor period of 20 days and crop B has a Kor period of 15 days. Calculate the discharge of water course if the Kor depth for the crop A is 10cm and for the B it is 16cm.

OR iii. Discuss in detail various methods of Surface Irrigation. **7**

Q.4 i. Define the following terms: **3**
(a) Precipitation (b) Runoff (c) Evaporation

ii. The ordinates of a 4-hour unit hydrograph for a particular basin are given below. Determine the ordinates of the S-curve hydrograph and therefore the ordinates of the 2-hour unit hydrograph and plot them, area of the basin is 630 km? **7**

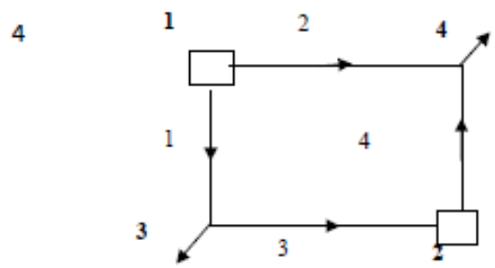
TIME	0	2	4	6	8	10	12	14	16	18	20	22	24
4-h UH	0	25	100	160	190	170	110	70	30	20	6	1.5	0

OR iii. List the different type of self-recording Rain-gauge. Explain the working of any two of them with the help of neat sketches. **7**

Q.5 i. Write the difference between analysis and design of a network? **2**

ii. What are the assumption used in Hardy cross method? **2**

iii. The network as shown in figure given below, has Nodes 1 and 2 as fixed head nodes with HGL 120 m and 100 m, respectively. Nodes 3 and 4 are demand nodes with demands of 0.5, and 1.25 m^3/s. The pipe resistance constants i.e. R values in head loss equation h = R Q^2 (h in m and Q in m^3/s) for pipes 1 through 4 are 20, 20, 40 and 30, respectively. **6**



Frame Q-Equations, H-Equations and Loop Head Loss Equation.

P.T.O.

Scheme of Marking

	Faculty of Engineering End Sem (Even) Examination May-2022 CE6CW03 Environmental hydraulics
Programme: Ph.D. (Course Work).	Branch/Specialisation:

Note: The Paper Setter should provide the answer wise splitting of the marks in the scheme below.

Q.1	i)	(B) N-sec/m²	1
	ii)	(C) Dynamic Viscosity/ Density	1
	iii)	(A) Crop Ratio	1
	iv)	(C) Crop Period	1
	v)	(C) Hyetograph	1
	vi)	(B) Stream discharge against time	1
	vii)	(A) To safeguard against water hammer pressure	1
	viii)	(A) Node Flow Analysis	1
	ix)	(C) Both a and b	1
	x)	(D) Having sizes of 100 mm, 150mm and more	1
Q.2	i.	Continuity Equation Statement 2 Marks	2
	ii.	Steady and unsteady flow 1 Mark Uniform and non-uniform flow 1 Mark Laminar and turbulent flow 1 Mark	3
	iii.	Statement 1 Mark Assumption and Derivation Bernoulli's equation. 4 Marks	5
OR	iii	The water is flowing through a pipe having diameters 20 cm and 10 cm at sections I and 2 respectively. The rate of flow through pipe is 35 litres/s. The section I is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1	5
Q.3	i.	Kor-watering 1 Mark Intensity of Irrigation 1 Mark Field capacity 1 Mark	3
	ii.	Duty, delta and Base Period. 2 Marks Compute the relationship between these three. 2 Marks For Correct answer 3 Marks	7
OR	iii.	Any four methods of Surface Irrigation in details.	7
Q.4	i.	A) Precipitation 1 Mark B) Runoff 1 Mark C) Evaporation 1 Mark	3
	ii.	Determine the ordinates of the S-curve hydrograph 5 Marks Plotting of Diagram 2 Marks	7
OR	iii.	Self recording Rain-gauge 2 Marks Working of any two of them with the help of neat sketches 5 Marks	7
Q.5	i.	For Appropriate Answer 2 Marks	2
	ii.	Any two assumption used in Hardy cross method 2 Marks	2
	iii.	Frame Q-Equations 2 Marks H-Equations 2 Marks Loop Head Loss Equation 2 Marks	6
OR	iii.	Derivation 2 Marks Correct Answer 4 Marks	6
Q.6			
	i.	Objective Function 2 Marks Constraints 3 Marks	5
	ii.	Correct Answer 5 Marks	5
OR	iii.	Correct Answer 5 Marks	5

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