	iii.	What do you understand by "Economical Diameter" of a pumping main? How is it different than "Optimal Diameter"?	**5**
OR	iv.	Write short note on any two: (a) Types of valves used in the distribution systems. (b) Critical path method. (c) Pumps in distribution network analysis.	**5**
Q.6		Attempt any two:	
	i.	Discuss LP Technique to optimal design of branched network.	**5**
	ii.	Describe the method of Cost head loss ratio method.	**5**
	iii.	Give Formulation of optimization model.	**5**

******

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

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2022

CE3EL08 Water Distribution System

Programme: B.Tech. Branch/Specialisation: CE

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.	What is the use of Check Valve? (a) To check water flow in all directions (b) To release accumulated air (c) To remove silt in a pipeline (d) To control flow of water through pipelines	**1**
	ii.	Among the following which of the network is most reliable- (a) Serial network (b) Branch network (c) Looped network (d) None of these	**1**
	iii.	What is hydraulic grade line- (a) Sum of Datum head and Pressure head (b) Kinetic head (c) Velocity head (d) None of these	**1**
	iv.	Which method is used for analysis of pipe network? (a) Hardy-cross method (b) Equivalent pipe method (c) Gradient method (d) All of these	**1**
	v.	Node Flow Analysis indicates- (a) Network becomes deficient (b) Uncertainty Exists (c) Normal analysis (d) None of these	**1**
	vi.	Define Analysis. (a) To check performance (b) To determine the dimensions of the network (c) Both (a) and (b) (d) None of these	**1**
	vii.	What is CPM? (a) Critical pipe method (b) Critical path method (c) Cost path method (d) None of these	**1**

viii. Analysis of a network- **1**
(a) To check performance (b) To design the network
(c) To design network with uncertainty (d) None of these

ix. Full form of LP- **1**
(a) Linear Programming (b) Least Programming
(c) Both (a) and (b) (d) None of these

x. Purpose of design of branched network- **1**
(a) To know performance (b) To know dimensions
(c) Both (a) and (b) (d) None of these

Q.2 i. Write Darcy-Weisbach formula and Hazen–Williams's formula. **2**

ii. Find the diameter of a 900-m long equivalent pipe (CHW = 100) to replace the series-parallel system shown in Fig. 1. The length, diameter and CHW coefficient values for the pipes are Pipes 1 - 300 m, 250 mm,120; Pipes 2-400m ,300mm, 130; Pipes 3 - 200m, 200mm, 100; Pipes 1- 500 m, 400 mm, 130; Pipes 1 – 300 m, 250 mm, 80. Assume suitable data if necessary **8**

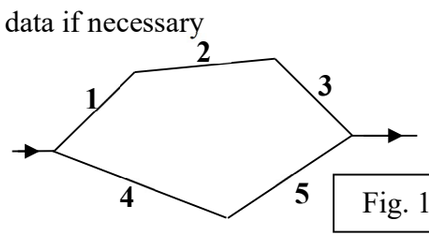

Fig. 1

OR iii. Write short notes on **8**
(a) Serial, branched and looped network
(b) Node flow continuity relationship

Q.3 i. What the Hardy-Cross method? Explain any one assumption used in the method. **2**

ii. Explain loop head loss relationship. **2**

iii. The branched network shown in Fig. 2, has Node 1 as fixed head nodes with HGL 120 m. Nodes 2 and 4 are demand nodes with demands of 0.05, 0.15, 0.10 and 0.25 m^3/s. The pipe resistance constants i.e. R values in head loss equation h = R Q1.85 (h in m and Q in m^3/s) for pipes 1 through 4 are 20, 20, 40 and 30, respectively. **6**
Answer the following: (a) What is the head loss in pipe 1; (b) Find diameter of pipe 3, if its length is 300 m & H-W C value is 100; (c). Find HGL at node 5.

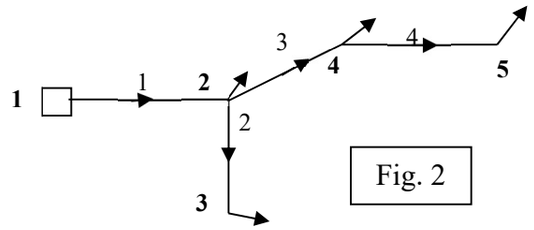

Fig. 2

OR iii. The water distribution network as shown in Fig. 3 has Nodes 1 and 2 as fixed head nodes with HGL 120 m and 100 m, respectively. Nodes 3, 4 and 5 are demand nodes with demands of 0.5, 0.25 and 0.3 m^3/s. The pipe resistance constants i.e. R values in head loss equation h = R Q1.85 (h in m and Q in m^3/s) for pipes 1 through 6 are 20, 20, 40, 25, 40 and 30, respectively. Carry out one iteration of network analysis by Hardy-Cross Method. Assume initial pipe discharges in pipes 1, 2 and 4 as 0.63, 0.32 and 0.13 m^3/sec, respectively. **6**

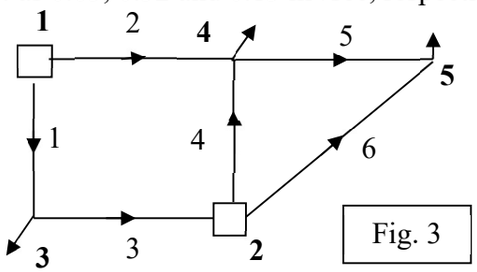

Fig. 3

Q.4 i. Describe node flow analysis? **2**

ii. A serial water distribution network consists of source node 0 and demand nodes 1 to 4. The HGL at the source node is 100 m and the minimum required HGL, and nodal demands given in parentheses at the demand nodes 1 to 4 are: node 1 (90 m, 2.0 m^3/min); node 2 (88 m, 3 m^3/min); node 3 (89 m, 3 m^3/min); and node 4 (87 m, 1.5 m^3/min); respectively. The head loss formula is h = R Q2, in which 'h' is head loss in meters, and Q is discharge in m^3/min. The pipe resistance constant of pipes 0-1, 1-2, 2-3, and 3-4 are 0.08, 0.12, 0.20 and 0.25, respectively. Carry out the node flow analysis. **8**

OR iii. Write short notes on the following: **8**
(a) Discuss about Node category compatibility
(b) Head dependent Analysis

Q.5 i. Describe Service and Balancing Reservoirs **2**

ii. Describe various functions of distribution Reservoir **3**

Marking Scheme
CE3EL08 Water Distribution System

Q.1	i.	What is the use of Check Valve?		**1**
		(a) To check water flow in all directions		
	ii.	Among the following which of the network is most reliable-		**1**
		(c) Looped network		
	iii.	What is hydraulic grade line-		**1**
		(a) Sum of Datum head and Pressure head		
	iv.	Which method is used for analysis of pipe network?		**1**
		(a) Hardy-cross method		
		(d) All of these		
	v.	Node Flow Analysis indicates-		**1**
		(a) Network becomes deficient		
	vi.	Define Analysis.		**1**
		(a) To check performance		
	vii.	What is CPM?		**1**
		(b) Critical path method		
	viii.	Analysis of a network-		**1**
		(a) To check performance		
	ix.	Full form of LP-		**1**
		(a) Linear Programming		
	x.	Purpose of design of branched network-		**1**
		(b) To know dimensions		
Q.2	i.	Darcy-Weisbach	1 Mark	**2**
		Hazen–Williams's	1 Mark	
	ii.	Solve 1,2 and 3 series pipes	3 Marks	**8**
		Solve 4,5 pipe in series	3 Marks	
		Solve parallel combination of both pipes and final answer	2 Marks	
OR	iii.	Define Serial, branched and looped network	4 Marks	**8**
		Define Node flow continuity relationship	4 Marks	
Q.3	i.	Hardy-Cross method	1 Mark	**2**
		Each assumption	1 Mark	
	ii.	Correct relation	2 Marks	**2**
	iii.	For a part	2 Marks	**6**
		For b part	2 Marks	
		For c part	2 Marks	
OR	iii.	For ΔQ_1	2 Marks	**6**
		For ΔQ_2	2 Marks	
		ΔQ_3 and final answer	2 Marks	
Q.4	i.	Definition of node flow analysis	1 Mark	**2**
		Importance of it	1 Mark	
	ii.	For each iteration mark should be given	8 Marks	**8**
OR	iii.	(a) Define Node category compatibility	2 Marks	**8**
		Importance, need and applicability	2 Marks	
		(b)Define Head dependent Analysis	2 Marks	
		Importance, need and procedure in brief	2 Marks	
Q.5	i.	Define Service Reservoirs	1 Mark	**2**
		Define Balancing Reservoirs	1 Mark	
	ii.	Functions of distribution Reservoir		**3**
		Each function in detail	1 Mark	
			(1 Mark*3)	
	iii.	Explanation of Economical Diameter	3 Marks	**5**
		How it different from Optimal Diameter	2 Marks	
OR	iv.	Any two:	(2.5 marks * 2)	**5**
		(a) For correct answer		
		(b) For correct answer		
		(c) For correct answer		
Q.6		Attempt any two:		
	i.	Formulation of a model	3 Marks	**5**
		Constraints and other explanation	2 Marks	
	ii.	Formulation	2 Marks	**5**
		Other details and constraints	3 Marks	
	iii.	Formulation of model and its correct explanation	5 Marks	**5**