B.E.Eighth Semester (Civil Engineering) (C.B.S.)

Elective - II : Water Transmission & Distribution System

P. Pages : 4 **NKT/KS/17/7535**

Time : Three Hours * 0 8 5 8 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. A multi reservoir system consists of four reservoirs P, Q, R & S with their HGL values 125m, 95m, 135m & 85m resp. They are connected by pipe system as given below with two Junctions J1 & J2. **14**

The details of pipes as per their connectivity are given below.

Pipe	length m	resistance R
PJ_1	250	200
J_1Q	200	350
J_1J_1	300	250
J_1R	270	200
J_2S	300	280

The head loss is given by $hf = RQ^2$ in which hf is in meters & Q in m^3/sec. Determine the discharges & their directions in each pipe & also HGL values at the junctions.

OR

2. Three Reservoir are connected to each other at junction point J. Find out the discharge in each pipe & also HGL at junction point J. The water table in the reservoir their length, diameter & CHw values are given in table. **14**

A pump is installed as shown in fig. 1. whose characteristic equation is given by $Hp = 17.19 – 42.2\ Qp^{1.852}$ where Hp is the head developed by pump & Qp is the discharge flowing through pump.

Pipe	FSL of reservoir (met)	length of pipe (met)	Diameter (mm)	CHw
1-J	100	300	300	100
2-J	90	150	200	130
3-J	80	200	300	100

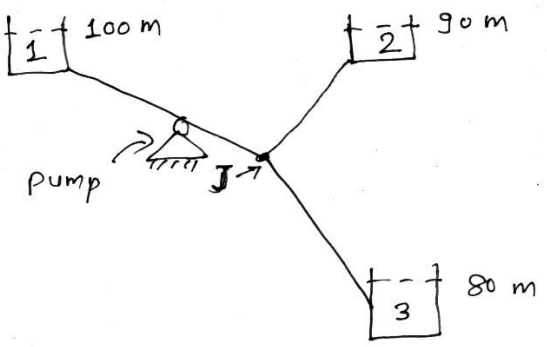


Fig. 1.

3. A Network as shown in fig 2 is to be analysed by Newton Raphson method using H-eq^{n}. Frame the equations & carry out one interation of Network analysis, use head loss equation as $hf = rQ^{1.85}$. **13**

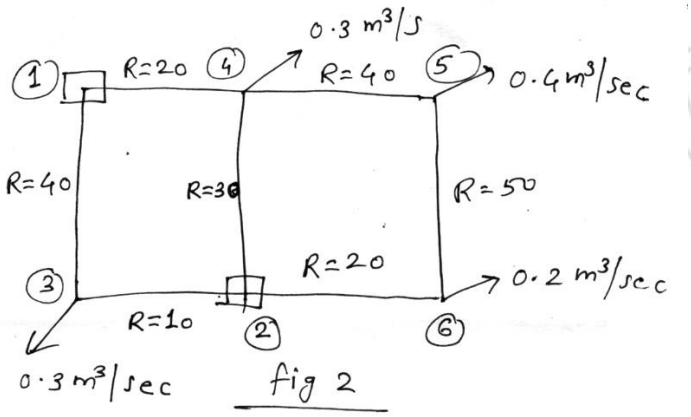
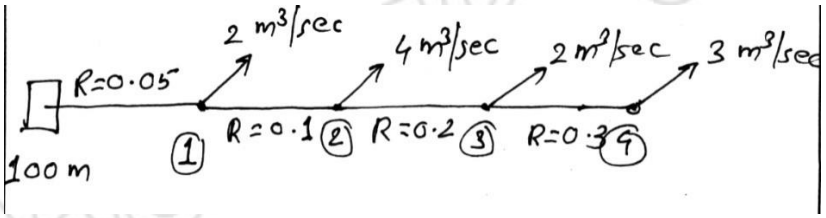


fig 2

OR

4. Analyse the distribution network shown in fig. 2 by using ΔH equation of linear theory method. **13**

5. Using node flow analysis determine discharges & available heads at all nodes. Minimum HGL required at all nodes 1, 2, 3, 4 are 92 m, 94 m, 91 m & 88 m resp. Use the relation $nf = RQ^{1.852}$. The resistance of the pipe are shown along the length of pipe in fig. 3. **13**



OR

6. a) What is node flow compatibility ? Explain in detail. **7**

b) Differentiate between Hardy-Cross method of balancing head & balancing flow. **6**

7. For the network shown in fig. 4. Find the total number of trees using graph theory & sketch all the trees in which 3, 4, 6 & 8 are absent. **14**

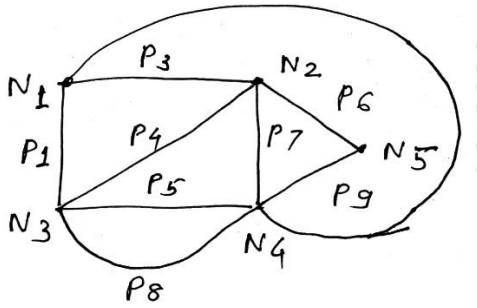


Fig 4

OR

8. a) Differentiating path concept & minimum spanning of tree method. **5**

b) Explain cost head loss ratio criterion method of network optimisation. **8**

9. In the network shown in fig. 5 node '1' is source node with HGL value 100 m. node 2 to 6 are demand nodes with minimum HGL values of 92m, 91m, 90m, 88 m & 87 m resp. The nodal demands at node 1 to 5 are 3.1, 4.2, 2.9, 4.81 & 4.15 m^3/m resp. The length of pipe from 1 to 5 is 320, 380, 340, 250 & 270 m resp. The cost function is given by formula $C = 0.15\ D^{L.45}$ where C is the unit cost of pipe in Rs. D is diameter in mm. Assume CHW for all links 100. Design the network by using cost-head loss ratio method. **13**

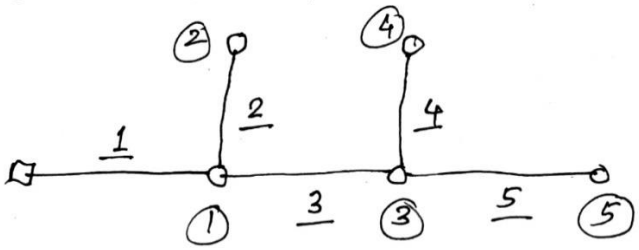


Fig. 5

OR

10. Design the network described in Q. 9 & shown in fig. 5 by using linear programming method : **13**

a) Frame LP model.

b) Obtain basic feasible solution.

11. A pumping main used to fill a reservoir of 5 million litres capacity in a day. The static lifts is 32 m. The pumping is to be done in two equal instalments of 6 hours each per day. The length of the main is 8 kms. The overall efficiency of pumping system is 70%. The cost of electricity is Rs. 5.0 per kwh. & assumed to be constant for next 30 years. The rate of interest is 9%. The OMR charges are 10% of the initial capital cost select the optimal diameter of the pumping main : **13**

Pipe size (mm)	Unit cost (Rs)	CHw
250	490	90
350	700	110
450	1020	100

OR

12. The following data refers to a Storage Reservoir- **13**

Time (Hrs)	Demand (m^3 / min)
0 - 2	2
2 - 4	4
4 - 6	8
6 - 8	12
8 - 10	20
10 - 12	14
12 - 14	8
14 - 16	6
16 - 18	10
18 - 20	14
20 - 22	12
22 - 24	6

Pumping is continuously for 24 hours. Determine :

i) Uniform rate of pumping.

ii) Storage capacity of reservoir.

iii) Time when reservoir is full or empty.

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