

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- May 2017

M.Tech 2nd Semester

COURSE CODE: 14M31CE212

MAX. MARKS:35

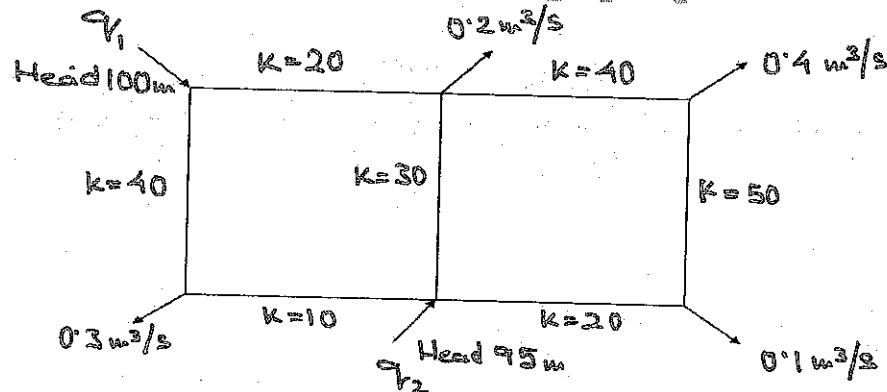
COURSE NAME: Contaminant Transport

COURSE CREDITS: 03

MAX. TIME: 2 Hrs

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. Analyze the water distribution network as shown in following figure using procedure of balancing flow by correcting assumed heads. The head loss is given by $h = KQ^{1.85}$. Determine value of supply q_1 and q_2 and head at demand nodes. (Assume any other necessary data suitably)



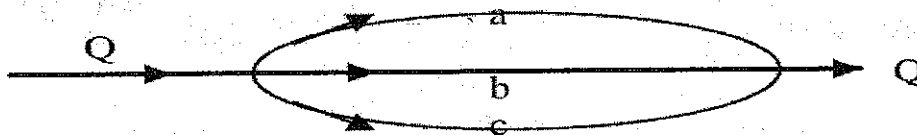
(6)

2. The distribution system of a town having population of 50,000 is fed by gravity system. The elevation difference between clear water reservoir and town is 100 m. The length of conveyance main from clear water reservoir to distribution system is 1500 m. Assume per capita water supply @135 lpcd and C.I. pipe with $C = 100$. Find (a) Size of conveyance main (b) Average and minimum pressure available in the distribution system. (Assume any other necessary data suitably)
3. Derive the following one dimensional contaminant transport model. Also find the general solution of the given equation. Assume that the contaminants are reactive in nature. The symbols are used with their usual meaning.

$$R \frac{\partial C}{\partial t} = D \frac{\partial^2 C}{\partial Z^2} - V_s \frac{\partial C}{\partial Z}$$

(4)

4. 10 kg of a tracer are released instantaneously into a stream at point A. What will be the concentration of tracer 5000 m downstream from point A, flow velocity of stream is 0.5 m/s, the dispersion coefficient is $50 \text{ m}^2/\text{s}$ and cross sectional area at point A is 20 m^2 ? (3)
5. Compound A reacts to compound B in a first order reaction with a rate constant equal to 0.5 d^{-1} . Concurrently, compound B reacts to form compound C in a first order reaction with a rate constant of 0.8 h^{-1} . What will be the concentration of three compounds 24 h after the reactions are initiated if the initial concentration of A is 1 mol/l ? (3)
6. Explain the following in brief: Advection, Dispersion, Diffusion, Fick's Second Law. (4)
7. Discuss the characteristics differences between the continuous and finite volume models. How do the dispersion terms differ? Discuss the advantage of one model over the second one. (5)
8. Discuss the significance of maturation pond. (1.5)
9. Discuss the distinction between water quality criteria and water standards. (1.5)
10. The pipe diameter ratios for the following simple network are given as $D_b/D_a=2$ and $D_c/D_a=3$. Determine the ratio of the lengths of pipes a, b and c such that each pipe has the same discharge. Use the Darcy-Weisbach equation with constant f for each pipe. (3)



(3)