FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
FIRST SEMESTER EXAMINATION (MARCH 2018)
2017/2018 ACADEMIC SESSION

HOD'S SIGNATURE

Instructions:

1) Answer 5 questions in full-2 questions from part A and 3 questions from B
2) **Time Allowed:** 3 Hours
3) **SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAMINATION**

Course Title: WATER RESOURCES ENGINEERING

Course Code: CVE 505

ELIZADE UNIVERSITY ILARA-MOKIN
DEPARTMENT OF CIVIL ENGINEERING
Second Semester 2017/2018 Session Examination
CVE 505: WATER RESOURCES ENGINEERING

Unit:2 Time Allowed: 3HOURS

Instruction: Answer 5 questions in full-2 questions from part A and 3 questions from B

PART A

Question 1 (20 marks)

a) Outline the concept of design periods for water resources infrastructure and why they must be accurately estimated. (10 marks)

b) (Suggest the design period with valid reasons for the following:

i. A medium sized dam for a small community water supplies
ii. Water Supply distribution mains
iii. A borehole for an estate
iv. Low lift pump for water supply reservoir. (10 marks)

Question 2 (20 marks)

a) Sketch a flow diagram for a typical community water supply system from the following sources.

i. Flowing stream/river
ii. Borehole / wells
iii. Dam reservoir (15 marks)

b) Discuss the merit and demerits of the various sources of water supply for a community. (5 marks)

Question 3 (20 marks)

a) Outline the factors affecting the choice of a site for a dam. (10marks)

b) Once a site is selected, what are the factors affecting the of type of a dam to be constructed? (5marks)

c) What are the advantages of constructing a large dam / reservoir, no matter the beneficial purpose of its establishment? 5marks

Question 4 (20 marks)

a) Outline the factors that influence per capita demand of water in a community. (4 marks)

b) Give a reasonable estimate of average daily consumption of water use for a residential town of 50,000 population. Suggest a possible breakdown of the consumption. What percentage of the water consumption is retained as wastewater? (8 marks)

c) Explain any three methods of estimating the future population of a city. What are the relative merits? (6 marks)

PART B

Question 5 (20 marks)

a) Pipes 1, 2, 3 and 4 (Figure Q5a) meet at junction J of a water distribution network. The diameter of pipes 1, 2, 3, and 4 are 300 mm, 100 mm, 200 mm, and 200 mm respectively. The velocity of flow in pipes 1, and 3 are 2m/s towards J and 3m/s away from J respectively, whereas the discharge in pipe 4 is 0.020 m^3/s away from J. Determine the velocity and discharge in pipe 2. (10 marks)

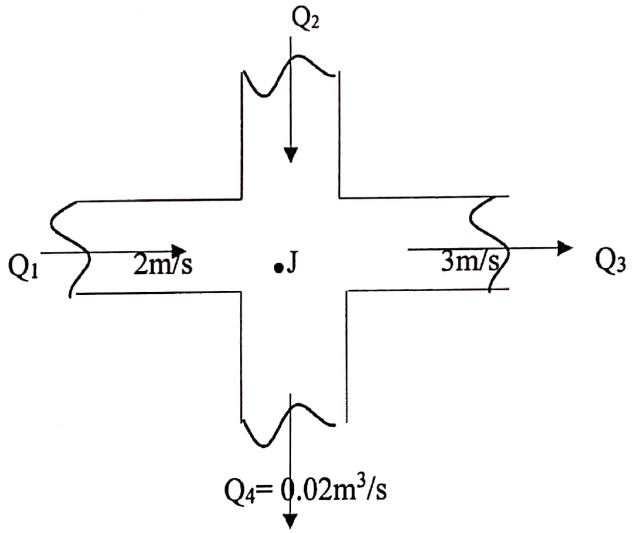

Figure Q5a: Flow at Joint J

b) Determine the supply rate at junction 6 and the discharge in pipe of the distribution network shown in the figure Q5b.

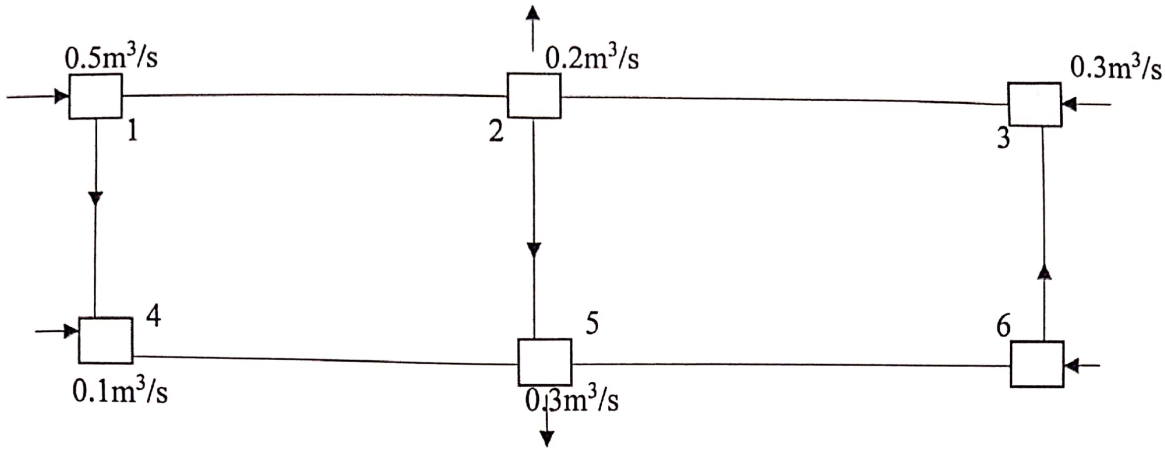

Figure Q5b: Flow in a closed loop

Question 6 (20 marks)

The velocity distribution for a particular flow in a 200 mm diameter pipe is given by $v = 1.2(y/r)^{1/7}$ in which r = radius of the pipe in meters and velocity, m/s. at y meter from the pipe wall (Figure Q6). Determine:

i. The discharge (10 marks)

ii. Average velocity. (5 marks)

iii. Maximum velocity. (5 marks)

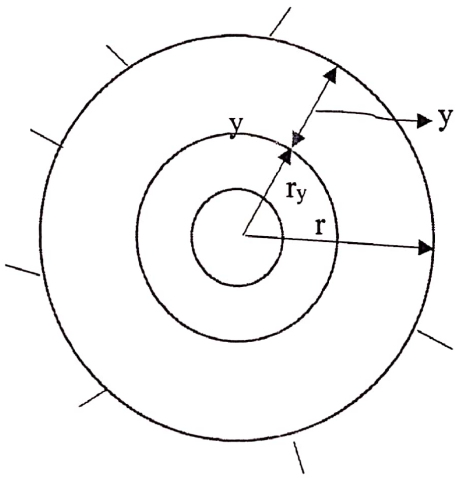

Figure Q6: Flow in a pipe

a) In the figure Q7a, in which a liquid flow in a pipe, if the difference in elevation between A and B is 10m and the pressures at A and B are 150kPa and 250kPa respectively, find the direction of flow and the head loss. The liquid has a specific gravity 0.85. (10 marks)

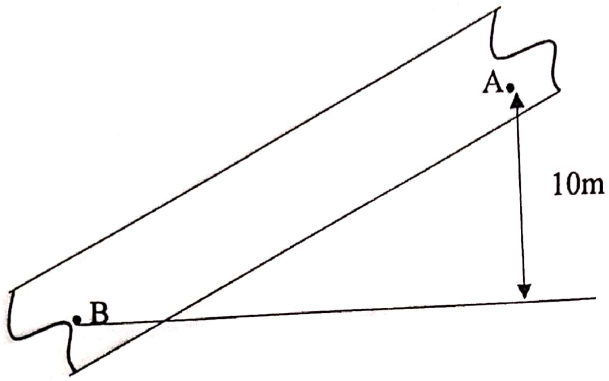

Figure Q7a: Liquid flow in a pipe

b) Water is flowing in an open channel at a depth of 2 m and velocity of 3 m/s as shown in the figure Q7b. It then flows down a contracting chute into another channel where the depth and velocity are 10m/s. assuming frictionless flow, determine the difference in elevation of the channel floor. (10marks)

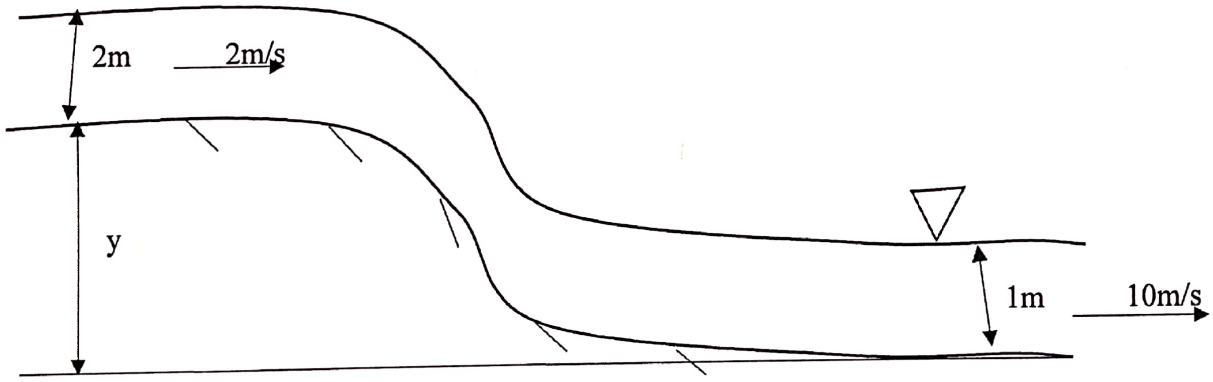

Figure Q7b: Water flowing in a open Channel

b) After a flood had passed an observation station on an engineer visited the site and by locating flood marks, performing appropriate surveying and doing necessary computations, determined that the cross-sectional area, wetted perimeter and water surface slope at the time of the peak flooding were 2960 m^2, 341 m and 0.00076, respectively. The engineer also noted that the channel bottom was earth with grass and weeds (n =0.030). Estimate the peak flood discharge. (10 marks)

c) Water at a flow rate of 2.1m^3/s is to be carried in an open channel at a velocity of 1.3m/s. determine the dimensions of the channel cross-section and required slope if the cross-section is rectangular with depth equal to one half of the width. Use manning roughness coefficient n = 0.020. (10 marks)