NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF INDUSTRIAL TECHNOLOGY
BACHELOR OF ENGINEERING (HONS) DEGREE
DEPARTMENT OF CIVIL AND WATER ENGINEERING
PART II SECOND SEMESTER EXAMINATIONS – MAY 2014

HYDROLOGY – TCW 2202

Instructions:	Total marks:	100
Answer any four (4) questions	Time:	3 Hours

QUESTION 1

a. Differentiate between depression storage and surface detention and how each term affect surface runoff. (8 marks)

b. A station 'X' was inoperative for some time during which a storm occurred. The storm totals at 3 stations A, B and C surrounding 'X', were respectively 6.6, 4.8 and 3.7 cm. The normal annual precipitation amounts at stations X, A, B and C are 65.6, 72.6, 51.8 and 38.2 cm respectively. Estimate the storm precipitation for station X (7 marks)

c. Describe the processes forming the hydrologic cycle? (10 marks)

QUESTION 2

a. Explain reservoir routing and channel routing. (8 marks)

b. Derive the Muskingum routing equation and the expression for the routing coefficients C_0, C_1, and C_2. (10 marks)

c. What are flood control measures? Describe 2 of the flood control measures to mitigate the effect of floods. (7 marks)

QUESTION 3

a. Explain with neat sketches various types of aquifers. (10 marks)

b. A 30 cm well fully penetrates an unconfined aquifer of 25 m depth when a discharge of 2100 l/min was being pumped. The observation wells at radial distances of 30 m and 90 m indicates draw down of 5 m and 4m respectively. Estimate (i) the coefficient of permeability, (ii) transmissibility (T) and (iii) draw down at the pumping well. (15marks)

QUESTION 4

a. What is the importance of infiltration in hydrologic cycle? Explain the typical shape of an infiltration curve and discuss the practical importance of the ϕ-index (10 marks)

b. The infiltration rates for different time intervals are given in Table Q4. Determine f_0 and derive an equation for the infiltration capacity (I.C) curve

Table Q4

Time since start of test (mins)	5	10	20	30	40	50	60
f_t (cm/hr)	6.1	4.0	2.0	1.0	0.5	0.3	0.3
f_t-f_c	5.8	3.7	1.7	0.7	0.2	0	0

(15 marks)

QUESTION 5

a. i. A bridge has an intended design life of 120 years and is designed for a 1 in 100 year flood. What is the probability that something bigger will be experienced? (3 marks)

ii. A bridge pier is to be constructed inside a temporary cofferdam. If the cofferdam is designed for a 1 in 20 year flood and will be in the river for 2 winters, what is the probability that a larger flood will occur? (4 marks)

b. The annual maxima for a series of water years is shown in Table Q5b
i. Determine the magnitude of a 1 in 5, 1 in 20 and 1 in 100 year flood.
ii. The catchment is 25.3 km^2 and is almost entirely rural in character. There is a proposal for a urban housing development. Investigate the effect of the development on catchment flood magnitude and frequency. (18 marks)

.

Table 5b

Water year	1981	1982	1983	1984	1985	1986	1987	1988
Discharge Q m^3/s	17.914	10.085	4.651	5.673	12.973	9.813	9.543	8.629
Water year	1989	1990	1991	1992	1993	1994		
Discharge Q m^3/s	6.239	4.936	3.807	13.843	7.074	7.525		