MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2013/2014

THIRD YEAR SECOND SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN EARTH SCIENCES WITH INFORMATION TECHNOLOGY

(MAIN CAMPUS)

NGA 307: SURFACE WATER HYDROLOGY II

Date: 17th July 2014   *Time: 8.30 – 10.30 a.m*

INSTRUCTIONS:

- Answer Question ONE (1) and any other TWO (2) questions
- Illustrations should be used where appropriate

NGA 307: SURFACE WATER HYDROLOGY II

1. a) Discuss the baseflow separation methods. (10 marks)

    b) Determine the probability that a 25-year storm may:
    - (i) occur once a year (4 marks)
    - (ii) occur in the next 5 years (4 marks)
    - (iii) not occur in another 20 years (4 marks)

    c) How long will an earth dam remain in a river, with 0.75 chance of not being overtopped, if it is designed to be secure against a 20year flood? (5marks)

2. a) Examine the major causes and impacts of floods in urban areas. (12marks)

    b) Discus the methods of controlling floods urban in urban areas. (8marks)

3. a) Discuss the basic prepositions of the unit hydrograph. (8 marks)

    b) The ordinates of 3-hour unit hydrograph are given below.

Time(hr)	3	6	9	12	15	18	21	24	27	30
OUH (m³/s)	0	110	175	130	95	65	40	22	10	0

    Determine the flood hydrograph resulting from a 3 hour storm rainfall of 2.0cm, 6.75cm and 3.75 cm assuming a constant base flow of 17m³/s. (12 marks)

4. a) Examine the concept of frequency analysis. (6marks)

    b) The maximum values of 24 hours rainfall at a rain gauge station expressed in cm from 1930 to 1950 are given in the table below

Year	Rainfall (cm)	Year	Rainfall (cm)	Year	Rainfall (cm)
1930	12.7	1937	13.6	1944	15.8
1931	11.7	1938	18.9	1945	17.2
1932	19.1	1939	11.6	1946	14.7
1933	13.2	1940	13.9	1947	14.9
1934	13.3	1941	17.4	1948	14.0
1935	19.7	1942	16.9	1949	8.4
1936	12.8	1943	14.4		

    Estimate the maximum rainfalls having a recurrence interval of 10 years and 50 years. (20marks)

5. The following data are obtained from the records of mean daily flows of a river for 4 years.

Mean daily flow (m³/s)	Frequency	Mean daily flow (m³/s)	Frequency
Over 475	3	65–75	83
420–475	5	50–65	105
365–420	5	47–50	72
315–365	8	42–47	75
260–315	25	37–42	73
210–260	36	32–37	84
155–210	71	26–32	103
120–155	82	21–26	152
105–120	52	16–21	128
95–105	42	11–16	141
85–95	50	Below 11	8
75–85	58		

    i) Construct a flow duration curve.   (14 marks)
    ii) Estimate Q90, Q50, Q10 and Q5   (4 marks)
    iii) Determine the base flow index   (2 marks)

6. Examine the main steps of hydrological data processing and storage.
    (20marks)