MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2015/2016

FOURTH YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN EARTH SCIENCE WITH INFORMATION TECHNOLOGY

MAIN CAMPUS

NGA 401: SURFACE AND GROUND WATER MODELLING

Date: 13th January, 2016 Time: 11.00 - 1.00 pm

INSTRUCTIONS:

- Answer questions ONE and any other TWO questions.
- Sketch maps and diagrams should be used whenever appropriate.

NGA 401: SURFACE AND GROUND WATER MODELLING

1. a) Differentiate between concentrated and distributed storage. (8 marks)

   b) Consider the following time series with a record length of 8:

   $Y=\{13, 13, 22, 22, 22, 31, 31, 34\}$

   Determine a smoothed and a residual series using a moving-average filter with equal weights of one-third for a smoothing interval of three. (6 marks)

   c) Explain the criteria used for the selection of a model. (8 marks)

   d) Explain the application of system's analysis to hydrological modeling. (8 marks)

2. Examine the application deterministic model in rainfall runoff modeling. (20 marks)

3. Examine the classification of hydrological models. (20 marks)

4. Examine the application of watershed modeling system in the study of floods in a river flood plain. (20 marks)

5. A 15 min unit hydrograph for a 2.1km^2 urban catchment is given in the table 1 below. Estimate the runoff resulting from the 120 minute storm given in the table 2

Table 1: A 15 minute hydrograph.

Time (min)	Runoff (m^3/s)	Time (min)	Runoff (m^3/s)
0	0	210	0.66
30	1.4	240	0.49
60	3.2	270	0.36
90	1.5	300	0.28
120	1.2	330	0.25
150	1.1	360	0.17
180	1.0	390	0

Table 2: 120 min storm

Time (min)	Rainfall (cm)
0 -30	2.4
30 – 60	4.5
60 – 90	2.1
90 - 120	0.8

6. Discuss the principle of Clark model. (20 marks)