(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2014/2015 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE OF MASTER OF SCIENCE IN WATER RESOURCES ENGINEERING

COURSE CODE: CWE 802

COURSE TITLE: APPLIED ENGINEERING HYDROLOGY

DATE: 15TH DECEMBER 2014 **TIME: 8.30AM - 11.30AM**

INSTRUCTIONS:

1. Answer any **THREE** questions
2. Each questions carries equal marks
3. Examination duration is **3 Hours**

MMUST observes ZERO tolerance to examination cheating

QUESTION ONE

(a) Diferentiate between distribution and probability density function [4Marks]

(b) Given discharge data of a river for 12yrs as: 80,70,50,195,90,100,88,95,79,99,110,65. Assuming EVI distribution, and using the probability weighing method estimate:

(i) μ and ά [16 Marks]

(ii) X_{220} [6 Marks]

(iii) Comment on the result on (ii) above [2Marks]

QUESTION TWO

(a) In time series analysis , distinguish between Forcasting and Prediction [4 Marks]

(b) A sample time series of mean flows for eight consecutive years in ariver in m^3/s is given as follows: 75,53,100,170,130,142,95,42. Estimate the first four sample autocorelation coefficient [16 Marks]

(c) A first order autoregressive model is given by

$$x_i - 7.5 = 0.45(x_{i-1} - 7.5) + a_i$$

Where a_i is normally distributed white noise having zero mean and variance $\sigma_a^2 = 9.5$. Given a starting value X_1=53, generate the next five values , X_2, X_3, X_4 X_5 and X_6 , assuming the following random N(0,1) values: 0.522,-0.874,1.235,0.09 5,0.187,-0.654……. [10 Marks]

QUESTION THREE

(a) Briefly describe precipitation Intensity-duration-frequency relationship [5Marks]

(b) Calculate the potential evapotranspiration from an area in the month of August by Peman's formula. The following data are given

Latitude: 20 ° North
Elevation: 200 m above sea level
Mean monthly temperature: 22.5 ° C
Mean relative humidity; 65%
Mean observed sunshine hours: 8h
Wind velocity at 6m height: 74 km/d
Mean monthly solar radiation=15.3mm of water/day
Mean monthly possible sunshine houres=12.8hrs
Nature of surface cover: close crops– ground green, i.e reflection coefficient of 0.2
The Stefan- Boltzman constant, $\sigma=2.01\times10^{-9}$ mm/day
Psychometric constant $\alpha= 0.49 mmHg/^0C$
H = heat budget

$$= H_a(1-r)(0.29\cos\phi + 0.55 n/N) - \sigma T_a^4 (0.56 - 0.092\sqrt{e_a})(0.10 + 0.9 n/N)$$

[10Marks]

(c) On a catchment of 40 km^2, after a 4 hour storm, the time and discharge of a river is given below. Determine as accurately as possible the peak flow and the time of occurrence in a flood exerted by

a 6hr storm which produces 1.55cm runoff during the first 4hrs and 2.5cm of runoff during the second 2hrs from the unit hydrograph of the 4hour storm in catchment of area 40 km^2 above.

[10marks]

Time	0	2	4	6	8	10	12	14	16	18	20
Discharge m^3/ sec	3	3	6	13	17	20	19	15	10	7	5

QUESTION FOUR

(a) Using Muskingum method for flood routing, determine the following hydrograph through the river reach for which the Muskingum constants, K and *x* are estimated to be 12h and 0.2 respectively. Assume the Initial outflow is 15 m^3/s. [15 Marks]

Time(h)	0	3	6	9	12	15	18	21	24	27	30	33	36
Inflow (m^3/s)	15	22	43	65	84	98	105	100	79	75.5	60	54	45

(b) Briefly discuss the operations and Management principles of reservoirs [15 Marks]

SATURATION VAPOUR PRESSURE OF WATER

Temperature (^{0}C)	Saturation Vapour pressure e_s		A (mm/^{0}C)
	(mm of Hg)	milibar	
0	4.58	6.11	0.30
5.0	6.54	8.72	0.45
7.5	7.78	10.37	0.54
10.0	9.21	12.28	0.60
12.5	10.87	14.49	0.71
15.0	12.79	17.05	0.80
17.5	15.00	20.00	0.95
20.0	17.54	23.38	1.05
22.5	20.44	27.95	1.24
25.0	23.76	31.67	1.40
27.5	27.54	36.71	1.61
30.0	31.82	42.42	1.85
32.5	36.68	48.89	2.07
35.0	42.81	57.07	2.35
37.5	48.36	64.46	2.62
40.0	55.32	73.14	2.95
45.0	71.20	94.91	3.66