Hydrology
2nd Year Civil
FIRST SEMESTER 2019-2020
Total Assessment Marks : 85

KFS UNIVERSITY
FACULTY OF ENGINEERING
Final Exam Time: 3 hour

ILOS: A.4, A.12, A.13, A.14, B.3, B.5, B.15, B.17 C.1,C.9, D.3 and D.9

Question (1): *Answer as many questions as you can.*

(1) Calculate the average rainfall using two methods according to the data below:

Station	1	2	3	4	5
Precipitation (mm)	33.8	37	33	35	40
Area of each station (km^2)	54	40	45	50	44

(2) Area of a lake is 7 km^2. The inflow rate from surface run off is 11 m^3/sec. The annual evaporation is 100 cm. The annual precipitation is 130 cm. Estimate the maximum out flow from the lake to be stable.

(3) A well (with 25 cm diameter) penetrated a confined aquifer with 35 m thickness. After long time with constant pumping of 1500 L/min, the drawdown was 2 m and 1.5 m in the two observation wells at distance 20 m and 50 m respectively.

Requirements:

1) Calculate the transitivity in m^2/sec.
2) Calculate radius of zone influence in m.

(4) Calculate the volume of the infiltrated water in m^3 from a canal to a river. The water level was 30 m and 20 m in the canal and the river, respectively. The distance between the canal and the river was 1 km. Let K = 12 m/day and the canal length was 5 km.

(5) Calculate the discharge of an aquifer with 80 m width and 5 m depth if the water velocity through the soil was 5 cm/sec.

(6) A constant head meter was used to determine the permeability coefficient. A sand sample was used. The length and area of the sand were 20 cm and 20 cm^2 respectively under a head of 20 cm. If the permeability coefficient of the used sand was 10 m/day, find the water volume that passed from the sand in 3 hr.

(7) The total observed runoff volume during a 6 hours storm with a uniform intensity of 1.5 cm/h is 21.6×10^6 m^3. If the area of the basin is 300 km^2, find the average infiltration rate for the basin.

(8) Annual class A pan evaporation for a year is tabulated below:

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Evaporation cm	11	12	10	14	15	18	20	22	16	14	12	12

1/2.

Area of catchment region is 500 km^2 . The annual precipitation in the region is 60 cm, where 40 % reaches the river. If reservoir surface area 50 km^2, calculate the net change in average stream flow in m^3/sec that will result from the construction of reservoir. ? Assume a pan coefficient is 0.65.

(9) For a basin, it was found that the rates of rainfall for successive 30 minutes period of 210 minutes duration storm are 3, 3, 10, 8, 2, 2, and 6 cm/hr. Values of infiltration rate versus time for the soil are listed in the following table. It is required to calculate the following: Ø-index, W-index, and surface runoff in cm.

Time (hr)	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5
Infiltration rate f_p (cm/hr)	4	3.5	3	2.5	2	1.8	1.5	1.5	1.5	1.5	1.5	1.5

(10) The observed hydrograph produced by a storm continued for 3 hours with a uniform intensity on a drainage basin of 500 Km^2 area has the following ordinates:

Time hours	Flow m^3/sec	Time hours	Flow m^3/sec	Time hours	Flow m^3/sec
0	12.0	24	99.0	48	30.3
3	156.0	27	85.0	51	26.9
6	255.0	30	73.6	54	23.8
9	212.4	33	62.6	57	21.2
12	184.0	36	53.5	60	18.7
15	158.6	39	46.0	63	16.9
18	134.0	42	39.6	66	16.0
21	116.0	45	34.5		

Assuming that base flow varies linearly from 12.0 m^3/s at the beginning to 16.0 m^3/s at the end. Compute the ordinates of the 3 h unit hydrograph of the basin and plot the hydrograph and 3 h unit hydrograph.

(11) The data obtained during a stream gauging using a current meter with a rating equation V = 2N + 0.10 where N is the angular velocity of the meter in rev/sec and V is the water velocity in ft/sec. the meter was positioned in the center of each of the subsections and velocity measurements made at the water surface. In each case, the number of revolutions during a 40 sec interval was counted. The subsection depth and number of revolutions per 40 sec are tabulated below. Each section has a width of 8 ft. what is discharge?

Section	1	2	3	4	5	6	7	8	9	10	11
Depth ft	1	3	4	5	10	10.5	20	16	6	5	2
Number of revolutions	40	45	66	160	125	120	140	110	100	60	65

with my best wishes Dr/ Sabry El-Morsy

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