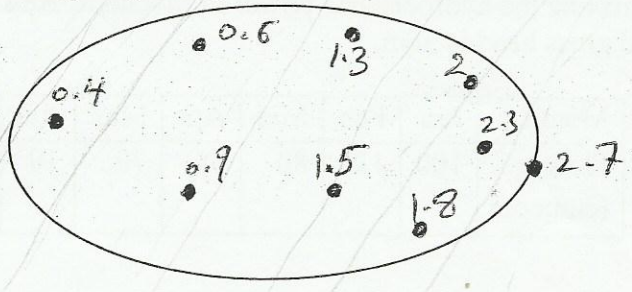
University of Baghdad
College of Engineering
Civil Engineering Department

Time: 3 hours
Date: 10 June, 2013
First Attempt

Engineering Hydrology

NOTE: Answer five questions only

Q1/The net areas between two adjacent isohyets were measured using planimeter, and recorded as follows (100,300,500,650,800,230) km^2. Determine the average depth of precipitation for the catchments area shown below.



Q2/A reservoir have the following areas enclosed by contoures of various elevations. Determine reservoir capacity and normal pool level.

Elevation(m)	200	220	240	260	280	300
Area(km^2)	150	175	210	270	320	400

Q3/ Using S-Curve method, derive 2hr unit hydrograph from the ordinates of 6hr unit hydrograph

Time (hr)	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28
UH (cm^3/sec)	0	203	506	700	628	451	269	174	119	81	52	29	12	3	0

Q4/ The ordinates of the inflow hydrograph at 12hr interval are as follows:

Time(hr)	0	12	24	36	48	60	72	84	96
Discharge(m^3/s)	125	355	785	1700	1075	725	510	365	250

The discharge over the spillway crest and the surcharge storage above the crest for different water surface elevations are as follows:

Water surface elevation(m)	100	100.25	100.50	101	101.50	102	103	104
Discharge(m^3/s)	0	11.5	42.5	155	295	455	800	1180
Storagex10^6(m^3)	0	4.25	9.5	20.25	31.75	44.5	73	107

Determine: maximum reservoir level, maximum out flow rate, reduction in the peak. Use trial and error method

Q5/ Answer the following:

1-What are the six cases for plume behavior and state the best case

2-Define: The blue jet, Aurora, Storativity, Transmissivity, Evapotranspiration

Q6/The average monthly inflow for a river are shown in the table below.

A-Draw flow duration curve

B-Determine the hydroelectric power in Mwatt, at 50% and 90% dependability. Assume plant efficiency is 80% and gross head is 36m.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flow (cumecs)	100	120	80	65	70	10	45	20	30	55	50	40

GOOD LUCK

Instructor: Dr. Nawar O.A.AL-Musawi

Q4/ Trial and Error Method

Time	initial elev.	inflow Vol	initial outflow	final elev	final outflow	Mean out flow	out flow Vol.	ΔS E
0-12	100	10.37	0	100.5	42	21	0.9	10
12-24	100.5	23.54	42	101.3	220	131	5.66	23
24-36	101.3	52.6	220	102.5	600	410	17.7	52
36-48	102.5	59.94	520	103.5	980	750	32.4	59
48-60	103.5	38.88	980	103.4	976	978	42.25	39
60-72	103.4	26.68	976	103	800	888	38.36	26
72-84	103.	18.9	800	102.5	600	700	30.24	18
84-96	102.5	13.28	600	102.2	450	525	22.68	13.6

2)

elevation (m)	Area (Km^2)	ΔV	V
200	150	0	0
220	175	3246.79	3246.79
240	210	3844.68	7091.47
260	270	4787.45	11878.92
280	320	5892.92	17771.85
300	400	7185.13	24956.99

Capacity of reservoir = 25000 km^3

Normal pool level = 270 m

3

Time	6hr UH	6hr Sum	lag 2hr	abs.	2hr UH $\times \frac{6}{2}$
0	0	→ 0	—	0	0
2	203	→ 203	0	203	203 × 3 = 609
4	506	→ 506	203	303	303 × 3 = 909
6	700	700	506	194	582
8	628	831	700	131	393
10	451	957	831	126	378
12	269	969	957	12	36
14	174	1005	969	36	108
16	119	1076	1005	71	213
18	81	1049	1076	-27	0
20	52	1057	1049	8	0
22	29	1105	1057	48	0
24	12	1061	1105	-44	0
26	3	1060	1061	-1	0
28	0	1105	1060		

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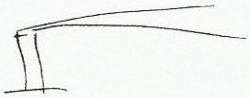
5/ A/ plume behavior:

1- Looping

2- coning

3- Fanning



4- Fumigation

5- lofting → best one

6- Trapping

(B) Blue Jet:

وهي ظاهرة تفريغ كهربائي على شكل برق او عواصف رعدية
ممتدة الى اسفل طبقة الستراتوسفير وهي نادرة الحدوث

Sprite: هو نوع من انواع الضوء المتوهج المتكونة
في طبقة الميزوسفير وتتشكل فوق الغيوم الرعدية بعدة
اميال

Aurora:
ضوء يتولد عند الاقطاب في طبقة الثرموسفير

Storativity :-

It is the volume of water released from a unit cross sectional area as the water table drops by a unit depth (unitless)

Transmissivity :-

It is equal to the discharge rate at which water is transmitted through a unit width of an aquifer under unit hydraulic gradient

$T = Kb$ (m^2/day)

Evapotranspiration :-

Evaporation + transpiration = consumptive use

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وهي ظاهرة تفريغ كهربائي على شكل برق او عواصف رعدية ممتدة الى اسفل طبقة الستراتوسفير وهي نادرة الحدوث

Spirit: هو نوع من انواع الضوء المتوهج المتكونة في طبقة الميزوسفير وتتشكل فوق الغيوم الرعدية بعدة اميال

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