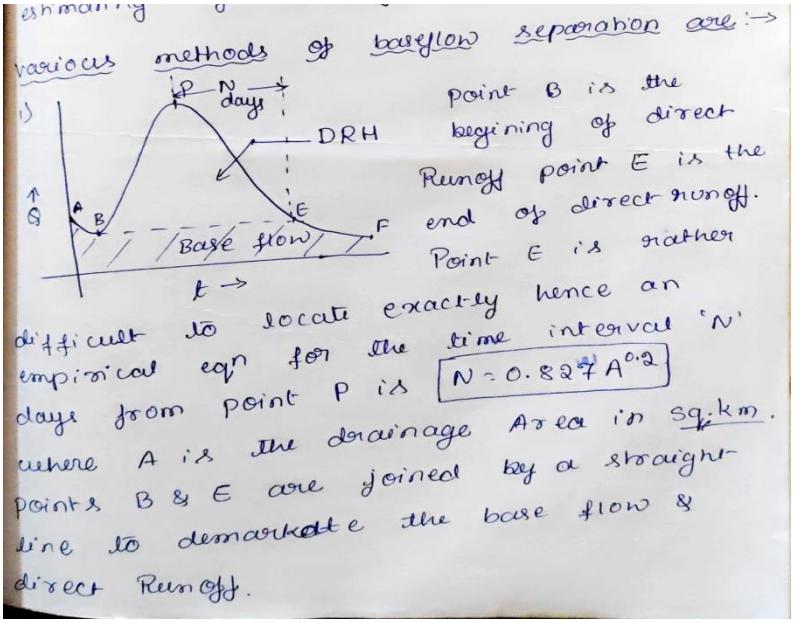
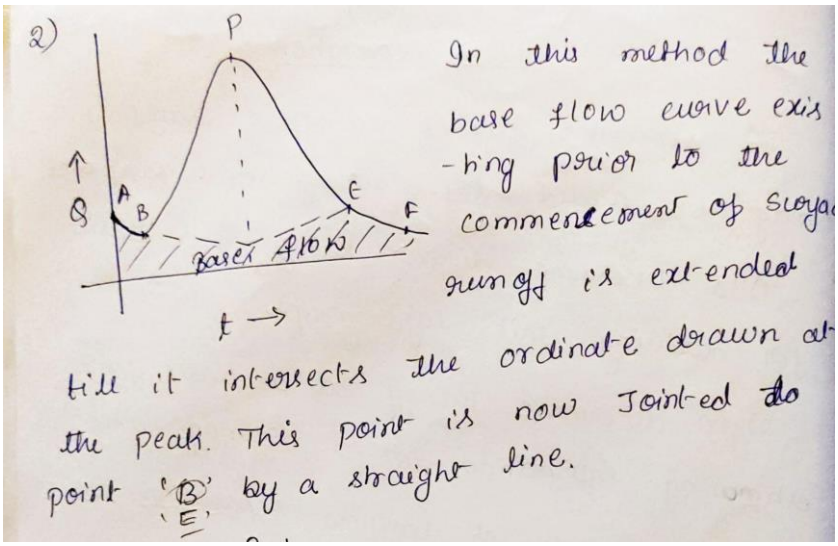
Internal Assessment Test 3
Scheme of Evaluation

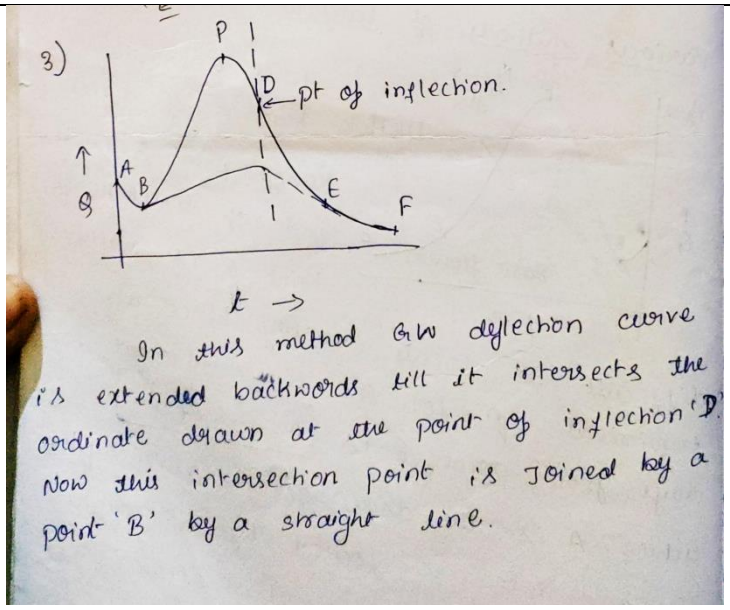
Sub:	HYDROLOGY AND IRRIGATION ENGIEERING					Sub Code: 18CV63		Branch	CV
									OBE
							Marks	CO	RBT
1	Describe with neat sketches, the methods for base flow separation from total runoff.						[10M]	CO3	L2



[4M]



[3M]

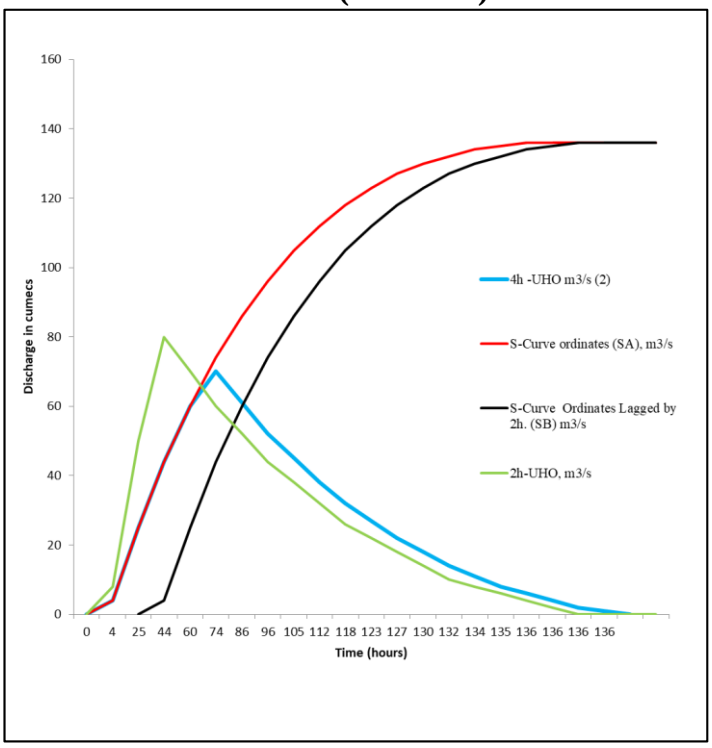
		[3M]		
2	**Define Unit Hydrograph. What are the assumptions underlying UH theory? How do they limit the applicability of UH?** Unit hydrograph is defined as the hydrograph of direct runoff resulting from 1cm of effective rainfall accruing uniformly over the basin at a uniform rate for a specified duration –D hours. **Assumptions** ▪ The effective rainfall is uniformly distributed over the entire area of the basin. ▪ The effective rainfall is uniformly distributed within its duration. ▪ The base periods of the direct runoff hydrographs[DRH] produced by effective rainfall of same duration [through the intensities may be different] are also same. **Limitations** • For Unit Hydrograph [UH] analysis of storms of short durations should be selected since uniform intensity over long duration is less likely to occur. • UHs can be effectively applied to drainage basins with small area [usually less than 5000 km^2] since uniform areal distribution of rainfall over large areas is less likely to occur. • Basins with odd shapes particularly those which are long & narrow will commonly have uneven rainfall distribution & hence UH are not well adopted to such basins. • The UH method can be applied when the major portion of the precipitation is in the form of SNOW.	[10M] [2M] [4M] [4M]	CO3	L3
3	Given below are the ordinates of a 4h unit hydrograph of a basin in cumecs at one hour intervals. 4, 25, 44, 60, 70, 61, 52, 45, 38, 32, 27, 22, 18, 14, 11, 8, 6, 4, 2, 1 Construct the S-curve hydrograph using the 4h UH. Hence derive the 2h unit hydrograph. Area of the basin is 195.84 sq.km.	[10M]	CO3	L4

Time (hr)	4h - UHO m3/s	S-Curve aditions for 4h UH m3/s	S-Curve ordinates (S_A), m3/s	S-Curve Ordinates Lagged by 2h. (S_B) m3/s	Difference in (S_A - S_B), m3/s	2h-UHO, m3/s
(1)	(2)	(3)	(4)=(2)+(3)	(5)	(6) = (4) - (5)	(7) = (6) × (4/2)
0	0		0		0	0
1	4		4		4	8
2	25		25	0	25	50
3	44		44	4	40	80
4	60	0	60	25	35	70
5	70	4	74	44	30	60
6	61	25	86	60	26	52
7	52	44	96	74	22	44
8	45	60	105	86	19	38
9	38	74	112	96	16	32
10	32	86	118	105	13	26
11	27	96	123	112	11	22
12	22	105	127	118	9	18
13	18	112	130	123	7	14
14	14	118	132	127	5	10
15	11	123	134	130	4	8
16	8	127	135	132	3	6
17	6	130	136	134	2	4
18	4	132	136	135	1	2
19	2	134	136	136	0	0
20	1	135	136	136	0	0
21	0	136	136	136	0	0
22		136	136	136	0	0

[7M]

Equilibrium Discharge Qs = 2.778* (A/D)

= 2.778 × (195.84 / 4) = 136.01 m^3/s



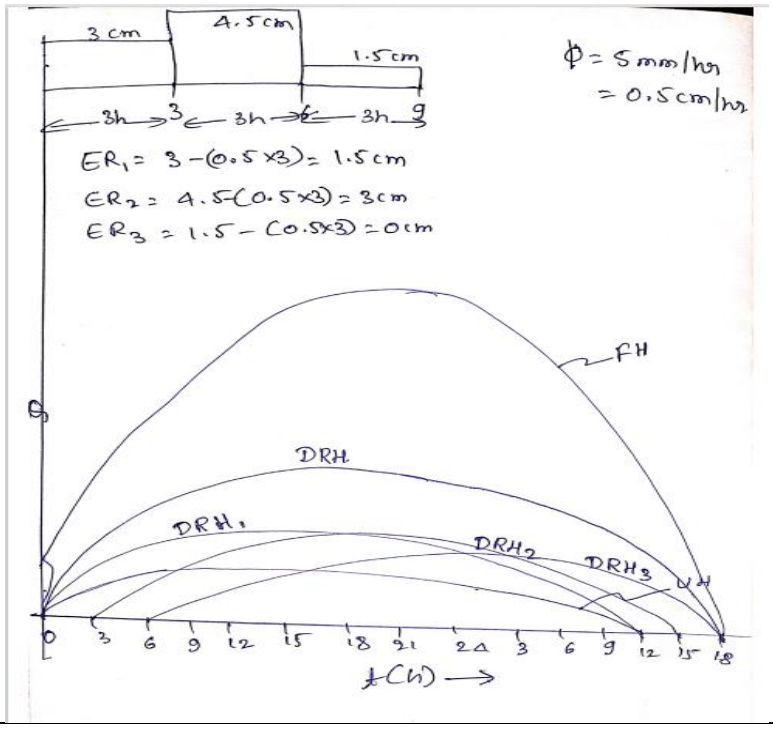
[3M]

4	Find out the ordinates of a storm hydrograph resulting from a 3hour storm with rainfall of 3, 4.5 and 1.5cm during subsequent 3hour intervals. The ordinates of unit hydrograph are given in table below.	[10M]	CO3	L3

Hours	00	03	06	09	12	15	
UHO (m^3/s)	00	90	200	350	450	350	
Hours	18	21	24	03	06	09	12
UHO (m^3/s)	260	190	130	80	45	20	00

Time (hr)	UHO m3/s	Direct runoff ordinates (DRO), m^3/s			Ordinates of Direct runoff hydrograph, m3/s	Base flow m3/s	Flood hydrograph Ordinates(FHO), m3/s
(1)	(2)	(3) ER1=1.5cm	(4) ER2= 3cm	(5) ER3=0cm	(6)= (3)+(4)+(5)	(7)	(8) = (6) + (7)
0	0	0			0	20	20
3	90	135	0		135	20	155
6	200	300	270	0	570	20	590
9	350	525	600	0	1125	20	1145
12	450	675	1050	0	1725	20	1745
15	350	525	1350	0	1875	20	1895
18	260	390	1050	0	1440	20	1460
21	190	285	780	0	1065	20	1085
24	130	195	570	0	765	20	785
3	80	120	390	0	510	20	530
6	45	67.5	240	0	307.5	20	327.5
9	20	30	135	0	165	20	185
12	0	0	60	0	60	20	80
15			0	0	0	20	20
18				0	0	20	20
	ER1 =	3 - (0.5×3)	**1.5cm**				
	ER2 =	4.5 - (0.5×3)	**3cm**				
	ER3 =	1.5 - (0.5×3)	**0cm**				

[7M]

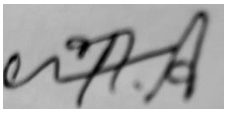


[3M]

5	What are the factors affecting duty? What are the methods to improve duty? **Duty:** Duty represents the irrigating capacity of a unit volume of water. It is the relation b/w the area of crop irrigated and the quantity of water required during the entire base period of the crop. **Factors affecting Duty:** • Methods and system of irrigation • Mode of applying water to the crop • Method of cultivation • Time and frequency of irrigation, tilling • Type of crop • Base period of crop • Climatic conditions of the area • Quality of water • Method of assessment of irrigation method • Canal conditions • Characteristic of soil and subsoil of the canal • Characteristic of soil and subsoil of the irrigation field **Methods of improving Duty:** • Select the suitable method of irrigation which has highest irrigation capacity • The land should be properly leveled before sowing. • The land should be cultivated frequently. Since frequent cultivation reduces loss of soil moisture. • The canal sides & bottom should be lined properly. • The source of the water supply should be such that it gives good quality of water. • The rotation of crops should be practiced in order to increase the fertility of soil. • Volumetric method of assessment should be used.	[10M] [2M] [4M] [4M]	CO5	L3
6	Define Duty, Delta and Base period and establish a relationship between them. **Duty**: Duty represents the irrigating capacity of a unit volume of water. It is the relation b/w the area of crop irrigated and the quantity of water required during the entire base period of the crop. **Delta (Δ)** is the total depth of water required by a crop during the entire base period of the crop. **Base period:** for a crop refers to the whole period of cultivation from the time when irrigation water is first issues for preparation of the ground for planting the crop to its last watering before harvesting. **Relationship b/w duty and delta of irrigation water** Let D is Duty in ha/cumec Δ is total depth of water supplied in m B is the Base period of crop in days Consider a field of area 'D' hactares and the water supplied to the field corresponding to the water depth 'Δ' m will be $= D \times \Delta$ ha-m	[10M] [1M] [1M] [1M]	CO6	L2

	$= D \times \Delta \times 10^4\ m^3$ ---------(1) Also for the same field of area 'D' ha, 1 cumec of water is supplied during the entire Base period of 'B' days. Hence total quantity of watr supplied to the field $= 1 \times B \times 60 \times 60 \times 24\ m^3$ ----------(2) Equating equations (1) and (2) $D \times \Delta \times 10^4\ m^3 = 1 \times B \times 60 \times 60 \times 24\ m^3$ Therefore $\Delta = 8.64 \frac{B}{D}\ m$	[7M]		

P. T.O



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