Total number of printed pages:01 **PG/2th /PCEW2111**

2023

Optimization Techniques in Water Resources Engg

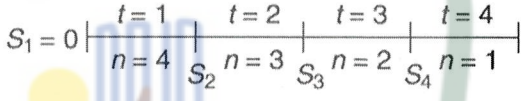
Full Marks: 100

Time: 3 hours

The figures in the margin indicate full marks for the questions.

1. Inflows during four seasons to a reservoir with storage capacity of 4 units are, respectively,2,1,3 and 2 units. Overflows from the reservoir are also included in the release. Reservoir storage at the beginning of the year is 0 units. Release from the reservoir during a season result in the following benefits which are same for all the four seasons. Obtain the release policy of the reservoir using dynamic programming. 20

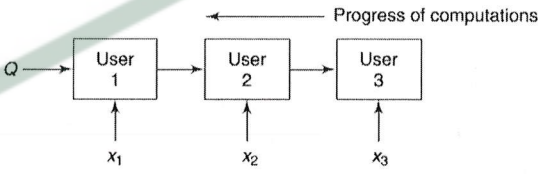
Release	*Benefits*
0	−100
1	250
2	320
3	480
4	520
5	520
6	410
7	120



2. A total of 6 units of water is to be allocated optimally to three users. The allocation is made in discrete steps of one unit ranging from 0 to 6. With the three users denoted as User 1, User 2 and User 3 respectively, the returns obtained from the users for a given allocation are given in the following table. find allocations to the three users such that the total return is maximized.

20

Amount of Water Allocated	*Return from*		
	User 1	*User 2*	*User 3*
x	$R_1(x)$	$R_2(x)$	$R_3(x)$
0	0	0	0
1	5	5	7
2	8	6	12
3	9	3	15
4	8	−4	16
5	5	−15	15
6	0	−30	12



3. Minimize $f(x) = 5x_1^2+x_2^2 + 4$ 20
Subject To, $x_2 -4 \geq -4x_1$; $-x_2+3\leq 2x_1$

4. Minimize $f(x) = 5x_1^2 + 2x_2 - x_1x_2$ 20
Subject To, $x_1+x_2=3$

5. Maximize $Z= 2x_1+x_2$ 20
Subject To, $3x_1+x_2\leq 300$; $4x_1+2x_2\leq 500$, $x_1,x_2 \leq 0$