232-8028 Zaid Bin Naveed

Assignment AI

Date 18/4/2025

(#02)

(Q2)

step 1: Population Initialization

$C_1 = [1, 3, 1, 2, 3, 2, 1]$

$C_2 = [3, 2, 2, 1, 1, 3, 2]$

$C_3 = [3, 3, 2, 2, 1, 1, 3]$

$C_4 = [1, 1, 2, 3, 1, 2, 2]$

$C_5 = [1, 3, 3, 1, 1, 1, 2]$

$C_6 = [2, 2, 3, 2, 1, 1, 3]$

step2: Evaluate fitness

Chromosome	Task1	Task2	Task3	Task4	Task5	Task6	Task7	F_1	F_2	F_3
C_1	50	128	32	70	72	24	99	5+13 = 18	7+3 =10	8+6=14
C_2	45	112	36	84	84	30	108	7+6=13	8+4 +9 = 21	5+3=8
C_3	45	128	36	70	84	27	117	6+3=9	4+7 =11	5+8+9=22
C_4	50	120	36	91	84	24	108	5+8 +6=19	4+3+ 9=16	7
C_5	50	128	28	84	84	27	108	5+7+86 +3=21	9	8+4=12
C_6	60	112	28	70	84	27	117	6+3=9	5+8 +7 =20	4+9=13

Fitness:

$C_1 = 50+128+32+70+72+24+99 \Rightarrow 475$

$C_2 = 45+112+36+84+84+30+108 \Rightarrow 499$

$C_3 = 45+128+36+70+84+27+117 \Rightarrow 507$

$C_4 = 50+120+36+91+84+24+108 \Rightarrow 513$

$C_5 = 50+128+28+84+84+27+108 \Rightarrow 509$

$C_6 = 60+112+28+70+84+27+117 \Rightarrow 498$

Step 3: Roulette wheel selection:

	Inverse	Probability
C_1	$\frac{1}{475} = 0.002105$	$P(C_1) = \frac{0.002105}{0.012003} = 0.1753$
C_2	$\frac{1}{499} = 0.002004$	$P(C_2) = \frac{0.002004}{0.012003} = 0.1669$
C_3	$\frac{1}{507} = 0.001972$	$P(C_3) = \frac{0.001972}{0.012003} = 0.1643$
C_4	$\frac{1}{513} = 0.001949$	$P(C_4) = \frac{0.001949}{0.012003} = 0.1624$
C_5	$\frac{1}{509} = 0.001965$	$P(C_5) = \frac{0.001965}{0.012003} = 0.1637$
C_6	$\frac{1}{498} = 0.002008$	$P(C_6) = \frac{0.002008}{0.012003} = 0.1673$

C_1 & C_6 favoured because of lower costs

Date _____ 20___

Step4: Crossover (Single Point) C_6: [2,2,3,2,1,1,3]

Pair1 : C_1 = [1,3,1,2,3,2,1] ^ Pair2 : C_1 = [1,3,1,2,3,2,1] C_2 = [3,2,2,1,1,3,2]

Pair3 : C_3 = [3,2,2,1,1,3,2] C_6 = [2,2,3,2,1,1,3]

Crossover at '3': O_1 = [1,3,1,2,1,1,3] O_2 = [2,2,3,2,3,2,1]

Crossover at '2': O_3 = [1,3,2,1,1,3,2] O_4 = [3,2,1,2,3,2,1]

Crossover at '4': O_5 = [3,2,2,1,1,1,3] O_6 = [2,2,3,2,1,3,2]

Step 5: Mutation (20-1 chance)

O_1 = [1,3,1,2,1,1,3] → swapping position 1 & 5 => [1,1,1,2,1,3,3]

O_2 = [2,2,3,2,3,2,1]

O_3 = [1,3,2,1,1,3,2]

O_4 = [3,2,1,2,3,2,1] → swapping position 4 & 5 => [3,2,1,2,2,3,1]

O_5 = [3,2,2,1,1,1,3]

O_6 = [2,2,3,2,1,3,2]

Step 6: Fitness of new population.

Offspring	Task1	Task2	Task3	Task4	Task5	Task6	Task7	F_1	F_2	F_3
O_1	50	120	32	70	84	30	117	23	7	12
O_2	60	112	28	70	72	24	99	9	23	10
O_3	50	128	36	84	84	30	108	18	13	11
O_4	45	112	32	70	78	30	99	13	21	8
O_5	45	112	36	84	84	27	117	16	12	14
O_6	60	112	28	70	84	30	108	6	29	7

Fitness:

O_1 = 50+120+32+70+84+30+117 = 503

O_2 = 60+112+28+70+72+24+99 = 465

O_3 = 50+128+36+84+84+30+108 = 520

O_4 = 45+112+32+70+78+30+99 = 466

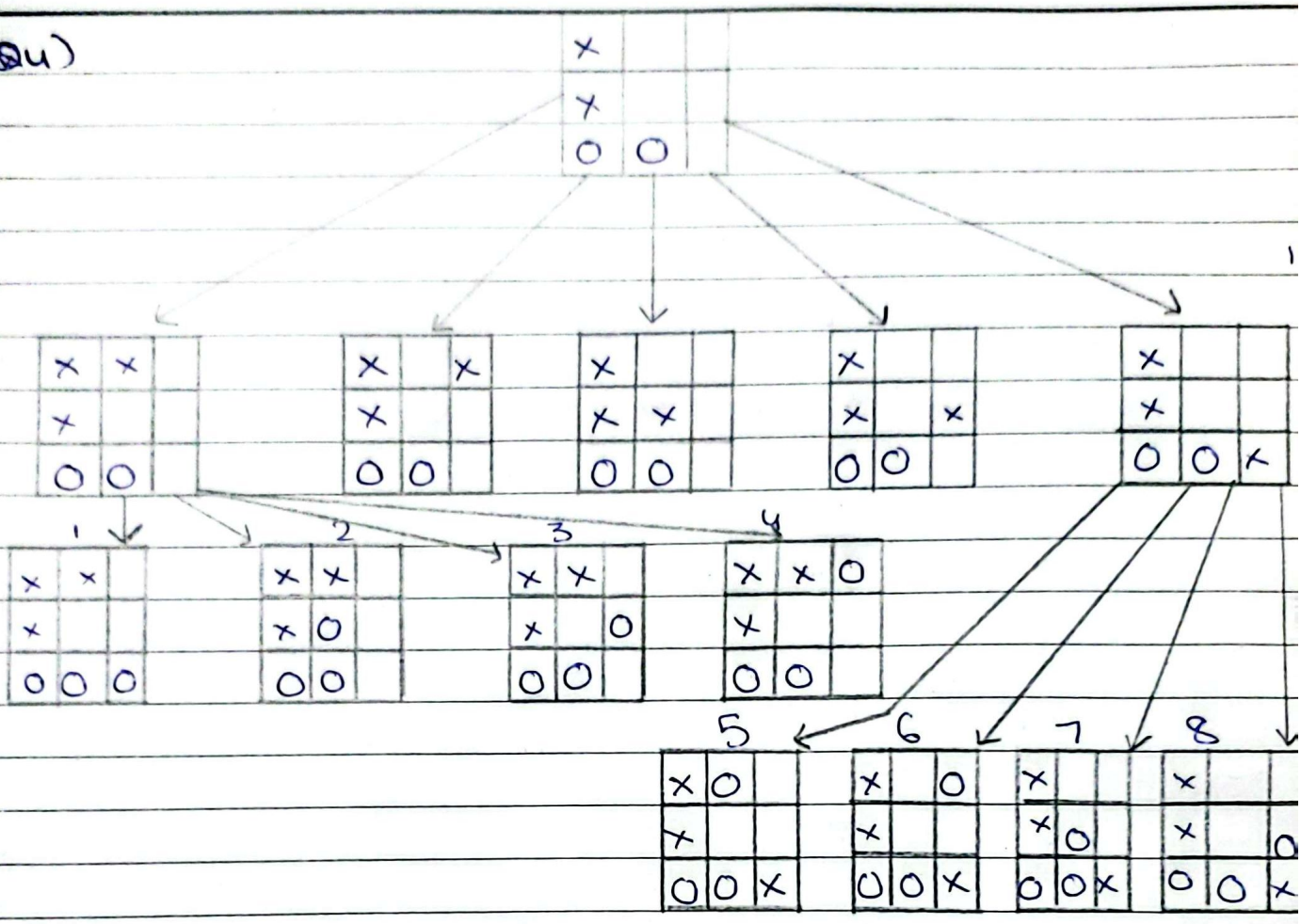
O_5 = 45+112+36+84+84+27+117 = 505

O_6 = 60+112+28+70+84+30+108 = 492

23K-0028 Zaidbin Naveed

Date _____ 20___

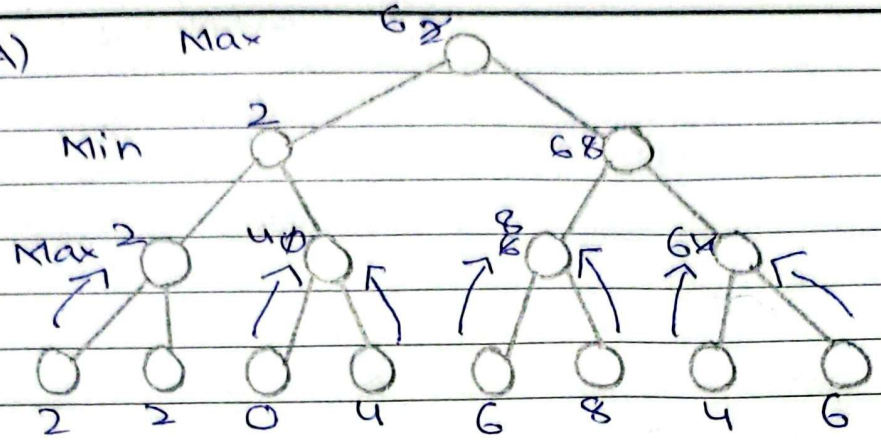
Q4)



States	R_1	R_2	R_3	C_1	C_2	C_3	D_1	D_2	SumR	SumC	SumD	V=Sum(R,C,D)
1	100	10	-1000	0	0	-10	0	-10	-890	-10	-10	-910
2	100	0	-100	0	0	0	0	-100	0	0	-100	-100
3	100	0	-100	0	0	-10	10	-10	0	-10	0	-10
4	0	10	-100	0	0	-10	10	-100	-90	-10	-90	-190
5	0	10	0	0	-100	10	100	-10	10	-90	90	+10
6	0	10	0	0	-10	0	100	-100	10	-10	0	0
7	10	0	0	0	-100	10	0	-100	100	-90	-100	-180
8	10	0	0	0	-10	0	100	-10	10	-10	90	90

Date _____ 20__

Q5) A)



B) Max