

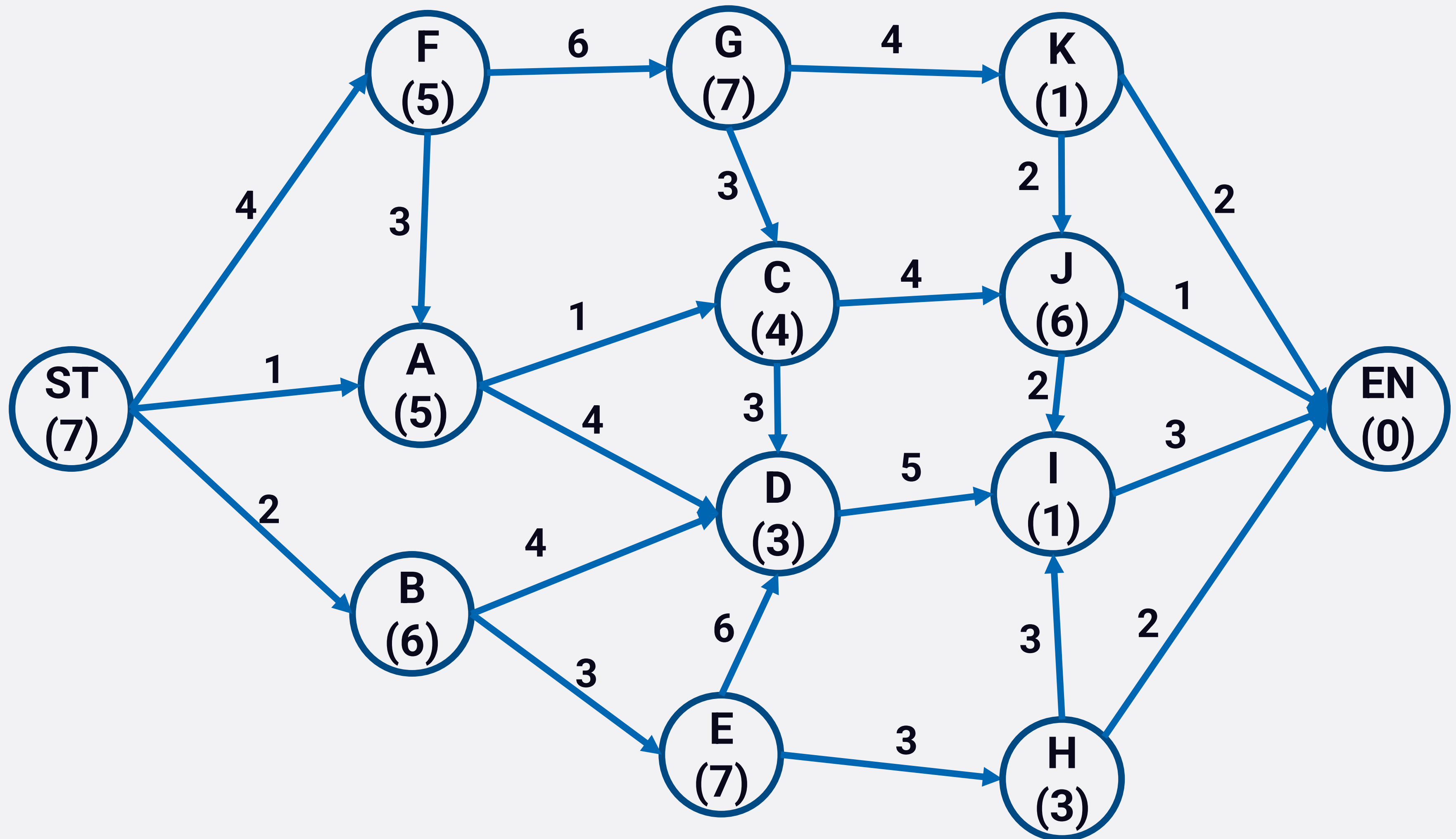
Fundamentals of Artificial Intelligence

Laboratory

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Exercise 3.19



Exercise 3.19

Writing the solution by using the full path.

Step	Queue	Expanded Path	Children
1	ST(7)	ST(7)	ST-A(1+5) ST-B(2+6) ST-F(4+5)
2	ST-A(6) ST-B(8) ST-F(9)	ST-A(6)	ST-A-C(2+4) ST-A-D(5+3)
3	ST-A-C(6) ST-A-D(8) ST-B(8) ST-F(9)	ST-A-C(6)	ST-A-C-J(6+6) ST-A-C-D(5+3)
4	ST-A-D(8) ST-B(8) ST-F(9) ST-A-C-J(12)	ST-A-D(8)	ST-A-D-I(10+1)
5	ST-B(8) ST-F(9) ST-A-D-I(11) ST-A-C-J(12)	ST-B(8)	ST-B-D(6+3) ST-B-E(5+7)
6	ST-B-D(9) ST-F(9) ST-A-D-I(11) ST-A-C-J(12) ST-B-E(12)	ST-B-D(9)	ST-B-D-I(11+1)

Exercise 3.19

Writing the solution by using the full path – Step 9 – Option 1.

Step	Queue	Expanded Path	Children
7	ST-F(9) ST-A-D-I(11) ST-A-C-J(12) ST-B-E(12)	ST-F(9)	ST-F-A(7+15) ST-F-G(10+7)
8	ST-A-D-I(11) ST-A-C-J(12) ST-B-E(12) ST-F-G(17)	ST-A-D-I(11)	ST-A-D-I-EN(13+0)
9	ST-A-C-J(12) ST-B-E(12) ST-A-D-I-EN(13) ST-F-G(17)	ST-A-C-J(12)	ST-A-C-J-EN(7+0) ST-A-C-J-I(8+1)
10	ST-A-C-J-EN(7+0) ST-A-C-J-I(9) ST-B-E(12) ST-A-D-I-EN(13) ST-F-G(17)		

Exercise 3.19

Writing the solution by using the full path – Step 9 – Option 2.

Step	Queue	Expanded Path	Children
7	ST-F(9) ST-A-D-I(11) ST-A-C-J(12) ST-B-E(12)	ST-F(9)	ST-F-A(7+15) ST-F-G(10+7)
8	ST-A-D-I(11) ST-A-C-J(12) ST-B-E(12) ST-F-G(17)	ST-A-D-I(11)	ST-A-D-I-EN(13+0)
9	ST-B-E(12) ST-A-C-J(12) ST-A-D-I-EN(13) ST-F-G(17)	ST-B-E(12)	ST-B-E-D(11+3) ST-B-E-H(8+3)
10	ST-B-E-H(11) ST-A-C-J(12) ST-A-D-I-EN(13) ST-F-G(17)	ST-B-E-H(11)	ST-B-E-H-EN(10+0)
11	ST-B-E-H-EN(10) ST-A-C-J(12) ST-F-G(17)		

Exercise 3.20

- Maximize the following $f(x)$: $x^3 - 60 * x^2 + 900 * x - 100$
- Admissible values of x : $0 \leq x \leq 31$
- Selection: roulette wheel
- Crossover probability: 1.0
- Mutation probability: 0.0
- How to represent x ?

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- How to represent x ? → By using five binary digits.

Chromosome	Binary string	X	f(x)
P1	11100	28	212
P2	01111	15	3475
P3	10111	23	1227
P4	00100	4	2804
		Total	7718
		Average	1929.50

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- Selection:
 - 1-212 → P1
 - 213-3687 → P2
 - 3688-4913 → P3
 - 4914-7718 → P4

Round 1: 4416 (P3) and 1925 (P2)

Round 2: 5482 (P4) and 3184 (P2)

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- Crossover:

P3	1	0	1	1	1
P2	0	1	1	1	1

C1	1	1	1	1	1
C2	0	0	1	1	1

P4	0	0	1	0	0
P2	0	1	1	1	1

C3	0	0	1	1	1
C4	0	1	1	0	0

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- How to represent x ? → By using five binary digits.

Chromosome	Binary string	X	f(x)
P1	11111	31	131
P2	00111	7	3803
P3	00111	7	3803
P4	01100	12	3889
		Total	11735
		Average	2933.75

Exercise 3.21

- Maximize the following $f(x)$: $x^3 - 60 * x^2 + 900 * x - 100$
- Admissible values of x : $0 \leq x \leq 63$
- Selection: roulette wheel
- Crossover probability: 0.9
- Mutation probability: 0.05

Chromosome	Binary string	X	f(x)
P1	101001	41	4861
P2	011011	27	143
P3	101011	43	7167
P4	010100	20	1900
		Total	14071
		Average	3517.75