Artificial Intelligence

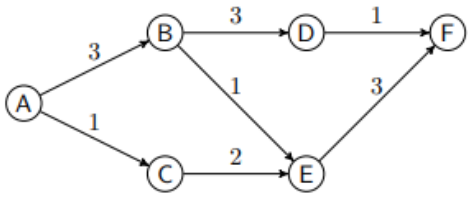
Quiz1 (Fall 2023)

Total Marks: 20 Maximum Time Allowed: 25 mins

Registration No. _____ Name _____ Section: _____

Question No. 1

Following Graph was mistakenly missed, based on following graph, the answers are provided.



[3+ 2 + 2 = 7 Marks]

a) Give an ordered list of the nodes with their associated costs using UCS.

	$h(x)$
A	0
B	1
C	2
D	1
E	1
F	0

visited: $[A_0, C_1, B_3, E_3, E_4, D_6, F_6]$ shortest-path:A→C→E→F

b) Use the search tree to show two steps of A* search, (dequeuing two nodes and enqueueing their children). Give the nodes visited and the state of the queue (including associated priority values) at each step.

$A \leftarrow [B_4, C_3]$
$C_4 \leftarrow [B_4, E_4]$
$B_4 \leftarrow [E_4, D_7, E_5]$

c) If, in the table, we change the value of h(E) to 3, is h still an admissible heuristic? Why or why not?

Yes, since $h(E) = h^*(E) = 3$ so $\forall s, h(s) \leq h^*(s)$.

Question No. 2 **[8 marks]**

Mr. Ali and Imran are lost in an NxN maze and would like to meet; they don‟t care where. In each time step, both simultaneously move in one of the following directions: {NORTH, SOUTH, EAST, WEST, STOP}. They do not alternate turns. You must devise a plan which positions them together, somewhere, in as few time steps as possible. Passing each other does not count as meeting; they must occupy the same square at the same time. a. Formally state this problem as a single-agent state-space search problem and fill the following.

Artificial Intelligence

Quiz1 (Fall 2023)

What information is required for the state ?	$\{((x_1, y_1), (x_2, y_2)) \mid x_1, x_2, y_1, y_2 \in \{1, 2, \ldots, N\}\}$
Total Number of State?	N^2 for both, total= N^4
Goal Test	Answer: $isGoal((x_1, y_1), (x_2, y_2)) := (x_1 = x_2) \wedge (y_1 = y_2)$
Legal Actions given a state	Based on state, pick actions from the following {NORTH, SOUTH, EAST, WEST, STOP}
Transition function	
Give a non-trivial admissible heuristic for this problem.	Manhattan distance between Ali and Imran DIVIDED BY 2 (since both take a step simultaneously

Question No. 3 **[2 marks]**

If h1 and h2 are admissible, which of the following are also guaranteed to be admissible? Circle all that apply. Also justify the reason.

a) h1 + h2

b) h1 * h2

c) max(h1 , h2)

d) min(h1 , h2)

e) (α)h1+(1−α)h2 for any value α between 0 and 1.

Answer: $max(h_1, h_2)$, $min(h_1, h_2)$, $(\alpha)h_1 + (1 - \alpha)h_2$, for $\alpha \in [0, 1]$

Question No. 4 **[3 marks]**

Please specify the environment under these categories for taxi driving examples and mention the reason.

Observable(Fully/Partial)	Partial
Agents(single/Multiple)	Multiple
Deterministic/Stochastic	Stochastic
Episodic/Sequential	Sequential
Static/Dynamic	Dynamic
Discrete/ Continuous	Continuos