BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination: Semester Final | Semester: Spring 2022
Duration: 1 Hour 30 Minutes | Full Marks: 40

CSE 422: Artificial Intelligence

Answer 4 out of 5 from the following questions

Name:	ID:	Section:

1. a) Consider the training data below

CO3, CO4

i. Considering 'Edible' as the class, **Compute** entropy for this dataset. 2

ii. **Compute** information gain for: 6
   a) Color
   b) Size

iii. **Compare** between *Color* and *Size*. Which one is the better feature? Why? 2

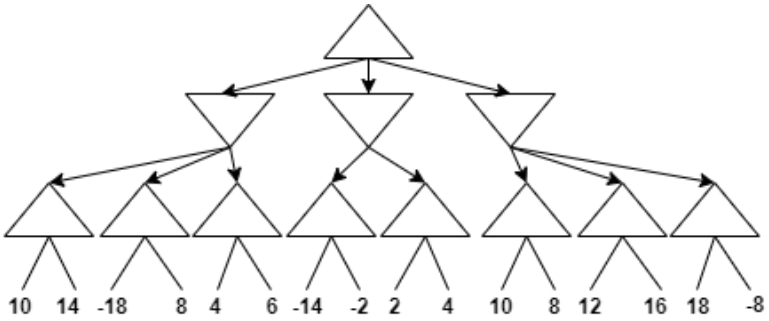
Color	*Size*	*Shape*	*Edible*
Yellow	Small	Round	Yes
Yellow	Small	Round	No
Green	Small	Irregular	Yes
Green	Large	Irregular	No
Yellow	Large	Round	Yes
Yellow	Small	Round	Yes
Yellow	Small	Round	Yes
Yellow	Small	Round	Yes
Green	Small	Round	No
Yellow	Large	Round	No
Yellow	Large	Round	Yes
Yellow	Large	Round	No
Yellow	Large	Round	No
Yellow	Large	Round	No
Yellow	Small	Irregular	Yes
Yellow	Large	Irregular	Yes

2. a) **Explain** population, selection, crossover, mutation and fitness function in light of 5-Queen problem. 5

CO4, CO5, CO6

b) Consider two chromosomes. X1: 12256748 X2: 32828991. 5
Your job is to maximize the difference of sum of numbers in even positions and sum of numbers in odd positions. Now make a fitness function that is suitable for your job. **Evaluate** the chromosomes X1 and X2 in light of the fitness function that you just designed. **Apply** crossover between X1 and X2 at mid point and make two chromosomes X3 and X4 and **evaluate** X3 and X4 as well.

3.
CO3

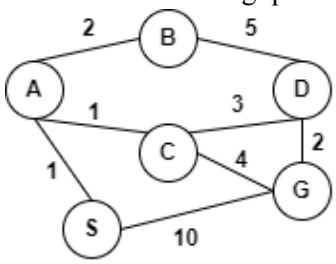


a) **Apply** Minimax algorithm to calculate the values of the nodes 2

b) **Apply** alpha-beta pruning on the tree and mark the pruned branches. Show the values of the nodes in this case too 8

4.
CO2, CO3, CO6

Answer the following questions based on the given scenario



State (n)	h (n)
S	5
A	3
B	4
C	2
D	6
G	0

a) For the above graph**, Apply** A* search algorithm to find the optimal path from start node S to the goal node G. 5

b) If the value of h(A) was changed to 5, would that affect the internal characteristics of the A* search? **Explain** your opinion. 2.5

c) Suppose the given heuristic is not a consistent one. Now if it was made to be consistent, how could that affect your search? **Explain** your opinion. 2.5

5.
CO3, CO5

	Pandemic		No Pandemic		Total
	Online Class	Offline Class	Online Class	Offline Class	
Public Uni	**0.142**	**0.037**	**0.165**	**0.072**	
Private Uni	**0.103**	**0.146**	**0.217**	**0.118**	
Total					**1**

a) **Apply** Probabilistic Inference to answer the following questions (a-d) based on the given data,

i) Is Pandemic Conditionally Independent of Public Uni Given Online Class? 3

ii) Is Private Uni Independent of Online Class? 2

iii) Find the marginal probability of Offline Class. 1

iv) Find the value of P(Private Uni ^ Offline Class | No Pandemic) 1.5

v) **Explain** why Naive Bayes is called Naive? How can it outperform bayes theorem? 1.5

vi) Explain why you can omit the denominator while comparing two probabilistic results and make decisions using Bayes theorem? 1