BRAC UNIVERSITY

Department of Computer Science and Engineering

CSE422: Artificial Intelligence

Question 1

P(Study^Cheat ^Pass)	Study		~Study	
	Cheat	~Cheat	Cheat	~Cheat
Pass	.25	.15	.10	.13
~Pass	.02	.03	.22	.10

a) Compute whether cheat and pass conditionally independent given study. Show all calculations.

b) Compute P(Pass or Cheat).

Question 2

P(Cold^Cloudy ^Rain)	Cloudy		~Cloudy	
	Rain	~Rain	Rain	~Rain
Cold	.32	.06	.26	.03
~Cold	.12	.04	.10	.07

a) Compute the marginal probability of ~Cold.

b) Compute the probability of not cloudy given the it is not raining and the weather being not cold

c) Compute the probability of not raining given it is not cloudy.

d) Compute P(~Rain or cloudy)

Question 3

	Left-Handed	Right-Handed
Cricket	.24	.1
Football	.15	.1
Other	.15	.26

a) Compute the probability of playing football for a left-handed person

b) If someone plays Cricket, estimate the probability of being right-handed

c) Compute the probability of playing Football and Cricket

d) Compute the probability of being right-handed or left-handed

e) Infer whether playing football depends on being Right-Handed

Question 4

A patient went to the hospital and diagnosed Covid Positive. The doctors informed him that their test can successfully detect Covid positive 92% of the time and can not detect Covid negative 4% of the time. If stats say that around 7% people are covid affected globally, what is the marginal probability of being detected covid positive?

Question 5

SL	Outlook	Humidity	Temp	Wind	Play Tennis
1	Overcast	Cool	Normal	TRUE	Yes
2	Sunny	Mild	High	FALSE	No
3	Sunny	Cool	Normal	FALSE	Yes
4	Rainy	Mild	Normal	FALSE	Yes
5	Sunny	Mild	High	FALSE	No
6	Overcast	Mild	High	TRUE	Yes
7	Sunny	Hot	High	TRUE	No
8	Sunny	Mild	Normal	TRUE	Yes

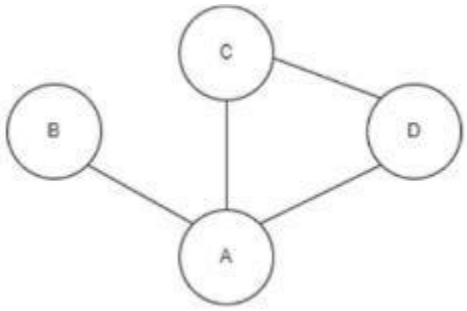
a) Is a player going to play tennis given the outlook is Sunny, humidity is Mild, temperature is Normal, and the weather is windy? Apply Naive Bayes and show proper calculations with the learning phase.
b) Is the player going to play tennis if the outlook is overcast, humidity is hot instead? Show full calculation.

Question 6

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

a) Considering ‘Edible’ as the class, Compute entropy for this dataset.
b) Between Color, Size, and Shape, which one is the better feature? Show full calculation and explain.

Question 7



Consider the constraint graph of a problem above, where each region has to be filled up with either 1, 2, or 3. No two adjacent regions can have the same digit.

a. Formulate the variable, domain, constraint, and the goal of the problem.

b. Based on the variable ordering procedure, mention the order of variables to be assigned with digit. Provide adequate explanation for your ordering.

c. Consider that node B already has digit 1 and all the other nodes are empty. If you are to provide digit to node D next, which digit should you pick? Identify your choice based on value selection procedure.

d. If node B has digit 1, node D has digit 2, and rest of the nodes are unassigned, does the constraint graph remain arc consistent? Why or why not? Explain.