United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Final Exam: Summer 2020

Course Code: CSI 341, Course Title: Artificial Intelligence

Total Marks: 25 Duration: 1 hour 15 minutes

Answer all questions. Marks are indicated in the right side of each question.

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1. Suppose you are trying to make a schedule for use of the auditorium for different clubs in a school. The auditorium can be used in the afternoons from Sunday to Thursday. There are five clubs: Music, Drama, Dance, Photography, Computer. There are a few rules that must be followed:

   The auditorium can be used by only one club on a day.

   Computer club wants to use on Monday or Thursday.

   Drama club wants on Wednesday or Thursday.

   Music club is fine with any day.

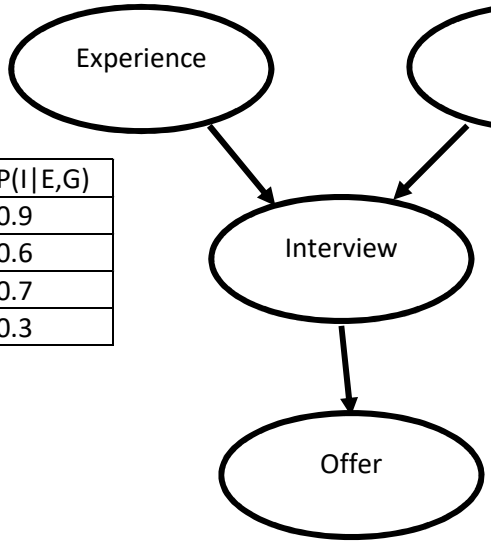
   Dance club wants on Monday or Wednesday.

   Photography club wants on Sunday, Tuesday or Wednesday.

   Formulate this problem as a CSP. Draw the constraint graph. Show the steps followed by backtracking search algorithm and derive a solution. [3+1+3=7]

2. One box has 7 red balls and 3 white balls; a second box has 6 red balls and 4 white balls. A pair of dice are tossed. If the sum of the dice are less than five, a ball is selected from the first box, otherwise the ball is selected from the second box. Find the probability of getting a red ball. [3]

3. Consider the following bayes net and answer the questions:



P(E)
0.6

P(G)
0.7

E	G	P(I|E,G)
T	T	0.9
T	F	0.6
F	T	0.7
F	F	0.3

I	P(O|I)
T	0.8
F	0.2

i) How many probability entries are required for your bayes net? How many probability entries are required to represent your random variables in a full joint probability distribution? [2]

ii) Calculate probability P(+e|+o). [4]

4. Consider the following data set consisting of three features (Type of family, Age group and Income level) and class label Buys_car . Use Naïve bayes classifier with Laplacian smoothing (k=1) to determine whether a person with the features <Extended, Young, Low> is likely to buy a car or not. [5]

Type of family	Age group	Income level	Buys_car
Nuclear	Young	Low	Yes
Extended	Old	Low	No
Childless	Middle-aged	Low	No
Childless	Young	Medium	Yes
Extended	Middle-aged	Medium	Yes
Childless	Young	Low	No
Nuclear	Old	High	Yes
Nuclear	Middle-aged	Medium	Yes
Extended	Middle-aged	High	Yes
Nuclear	Old	Low	No

5. Suppose you are analyzing the relocation pattern of people in your country. You have calculated the probabilities of people relocating from one area to another. The following matrix represents these probabilities:

Present → Past ↓	Dhaka	Chittagong	Khulna
Dhaka	0.8	0.1	0.1
Chittagong	0.2	0.7	0.1
Khulna	0.3	0.1	0.6

Determine the probability of relocating to each city in the long run (stationary distribution). [4]