United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Final Exam: Fall 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.

[Note: Any examinee found adopting unfair means will be expelled from the trimester / program as per UIU disciplinary rules.]

1. Suppose you have to prepare a schedule for a factory for a particular day. The factory remains open for 8 hours. 5 jobs need to be finished within this period. The duration of each job is given below:

    Job 1: 2 hours, Job 2: 1 hour, Job 3: 3 hours, Job 4: 2 hours, Job 5: 1 hour

    Job 1 and Job 3 must be started at the same time.
    Job 3 must be done before Job 2.
    Job 1 and Job 5 cannot be done at the same time.
    Job 4 has to be done last.

    Formulate this problem as a CSP. Draw the constraint graph. Show the steps followed by backtracking search algorithm and derive a solution. [3+1+2]

2. A survey has been done among the customer groups of a multi-cuisine restaurant to analyze customers' preferences. The survey was conducted among 100 customer groups. Among the sampled customer groups, there were 40 family groups and among these groups 15 chose Indian, 11 chose Chinese, 8 chose Italian and the rest chose Thai menu. There were 30 friends groups and among these groups 7 chose Indian, 5 chose Chinese, 10 chose Italian and the rest chose Thai menu. The rest of the groups were colleagues groups and among them 11 chose Indian, 8 chose Chinese, 4 chose Italian and the rest chose Thai menu. Now answer the following:
    a. Your first task is to find two variables, T (Customer Group Type) and C (Cuisine Type). Find the joint distribution table P(T, C) [3]
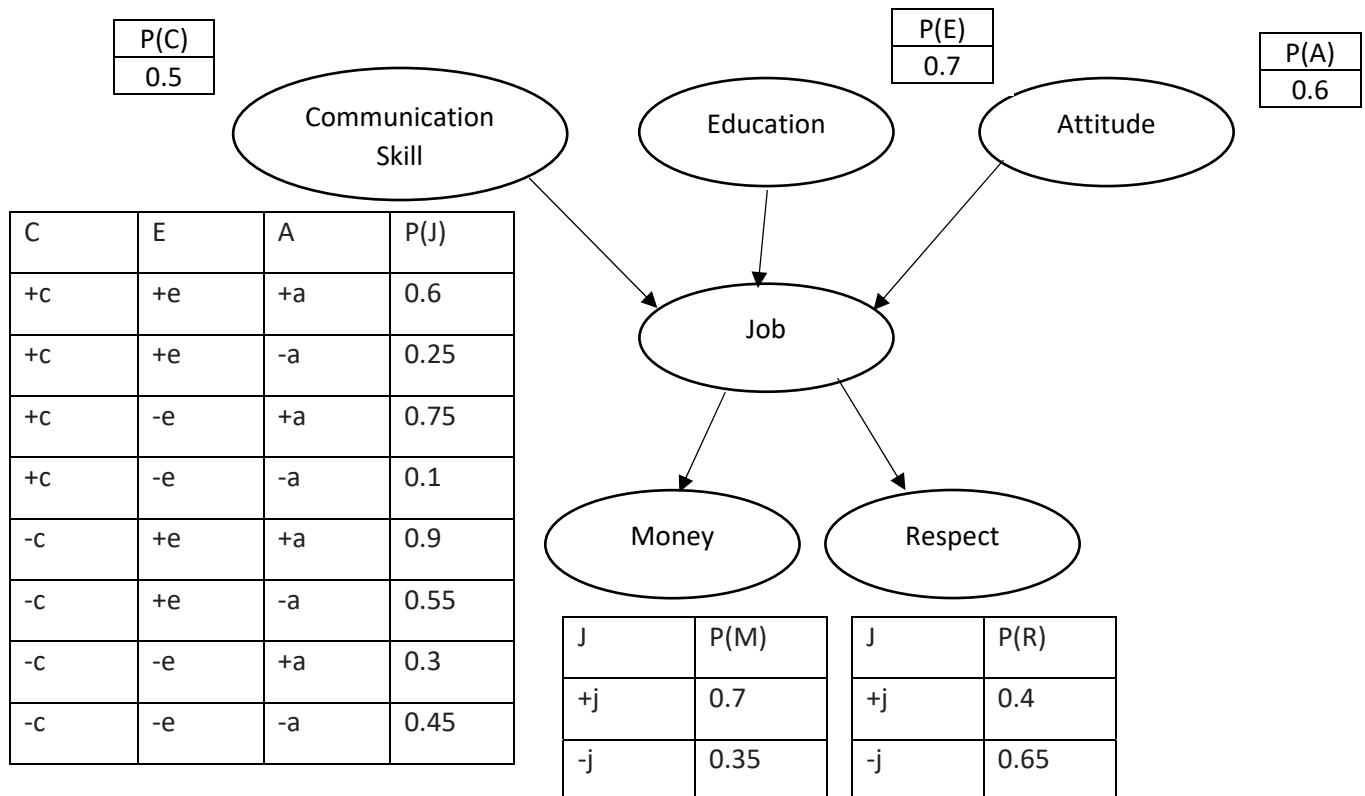
    b. Find P(C|T). [3]

3. You are analyzing the migratory patterns for some rare bird. The birds are found in Asia, Africa and Europe. Currently, the distribution is 30%, 20%, and 50% respectively. The transition matrix for the birds' probabilities of moving between the continents at each year has been estimated in the following table:

Next→ Present↓	Asia	Africa	Europe
Asia	0.75	0.15	0.1
Africa	0.05	0.8	0.15
Europe	0.1	0.2	0.7

    Modeling the scenario as a Markov model, determine the proportion of birds in each continent in the long-run (stationary distribution). [4]

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

P(C)
0.5

P(E)
0.7

P(A)
0.6

Communication Skill

Education

Attitude

Job

Money

Respect

C	E	A	P(J)
+c	+e	+a	0.6
+c	+e	-a	0.25
+c	-e	+a	0.75
+c	-e	-a	0.1
-c	+e	+a	0.9
-c	+e	-a	0.55
-c	-e	+a	0.3
-c	-e	-a	0.45

J	P(M)
+j	0.7
-j	0.35

J	P(R)
+j	0.4
-j	0.65

i)   Calculate P(+c, -e, +a, -j, +m, -r) [1]

ii) Calculate P(-e | +j, -m, -r) [3]

5. Consider the following data collected from covid suspected patients' history in a hospital. The data set consists of three features (Social Distancing, Hand Washing and Wears Mask) and class label Covid Infection. Use Naive bayes classifier with Laplacian smoothing (k=1) to determine whether a person with the features <High, Sometimes, No> is likely to have a covid infection or not. [5]

Social Distancing	Hand Washing	Wears Mask	Covid Infection
High	Frequent	Yes	Negative
Moderate	Rarely	No	Positive
Moderate	Sometimes	Yes	Negative
High	Frequent	No	Negative
Low	Frequent	Yes	Negative
Low	Sometimes	No	Positive
Moderate	Frequent	No	Positive
High	Rarely	No	Negative
Low	Rarely	No	Positive
Moderate	Frequent	Yes	Negative