THE UNIVERSITY OF HONG KONG

FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE

Quiz 2
29 Nov. 2019
**11:30am - 12:30pm**

COMP3270 Artificial Intelligence

This is an open book examination.

Answer ALL questions on a blank sheet of paper. Submit your typed MS Word or scanned handwritten solution to Moodle before 12:30pm on 29 Nov. 2019. Before submission, please ensure that you have written your University No. on every page.

If and only if you have technical difficulties with your submission to Moodle, you may submit it by email to sdirk@cs.hku.hk. Your email will be ignored unless your submission on Moodle is missing.

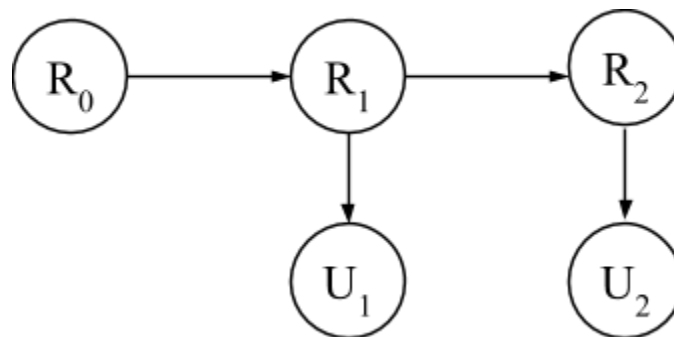| Question	Weight
1	30 %
2	30 %
3	40 %

Q1: We are given a Markov chain for a variable D. The transition of the chain is given by the following transition diagram.
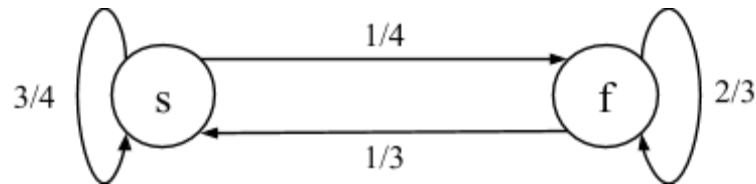
1.1 [20%] Assume that $D_0 = f$, determine $P(D_1)$ and $P(D_2)$.
1.2 [10%] Determine $P(D_\infty)$.

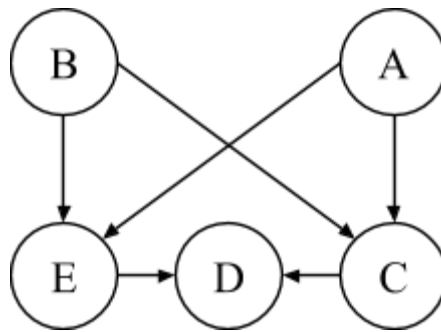Q2: Consider the following probabilistic weather model introduced in the lecture.

R_t	R_{t+1}	$P(R_{t+1}|R_t)$
+r	+r	0.7
+r	-r	0.3
-r	+r	0.3
-r	-r	0.7

R_t	U_t	$P(U_t|R_t)$
+r	+u	0.9
+r	-u	0.1
-r	+u	0.2
-r	-u	0.8

2.1 [30%] Let $B_0(+r) = 0.6$ and $B_0(-r) = 0.4$. Determine $B_1(R)$ and $B_2(R)$ given that we observe $U_1 = +u$ and $U_2 = -u$.
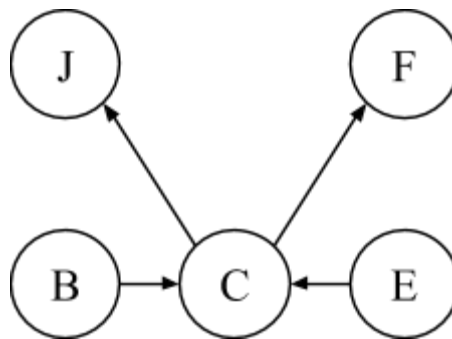
Q3: Consider the following topology of a Bayes Net.

3.1 [10%] Write down an equation for the joint probability distribution of the Bayes Net above.

3.2 [10%] Consider the following joint distribution $P(A)P(B)P(C|A,B)P(D|C)P(E|B,C)$. Draw the corresponding Bayes Net.

3.3 [20%] Consider the following Bayes Net.

E	P(E)
+e	0.1
-e	0.9

B	P(B)
+b	0.2
-b	0.8

F	C	P(F|C)
-f	-c	0.98
-f	+c	0.2
+f	-c	0.02
+f	+c	0.8

J	C	P(J|C)
-j	-c	0.95
-j	+c	0.1
+j	-c	0.05
+j	+c	0.9

C	B	E	P(C|B, E)
-c	-b	-e	0.97
-c	-b	+e	0.71
-c	+b	-e	0.06
-c	+b	+e	0.05
+c	-b	-e	0.03
+c	-b	+e	0.29
+c	+b	-e	0.94
+c	+b	+e	0.95

Calculate the following probability P(+j, -f, -c, -b, +e).

END OF PAPER