6.15 Week 6 Homework Quiz

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Attempt 7

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Submission View

Your quiz has been submitted successfully.

Question 1   **15 / 15 points**

Consider the Bayesian network below. Each variable is a binary-valued variable (e.g., A has values a and ~a, B has values b and ~b, etc). Probability tables are stored at each node. Identify which of the following equivalences are true given assumptions of the Bayesian Network, and where the righthand side of the equality is expressed only in terms of probabilities found directly in the network's probability tables. You can assume that P(~x|...) is explicitly stored, as well as P(x|...) (i.e., there is no need to compute P(~x|...) as 1 - P(x|...)).
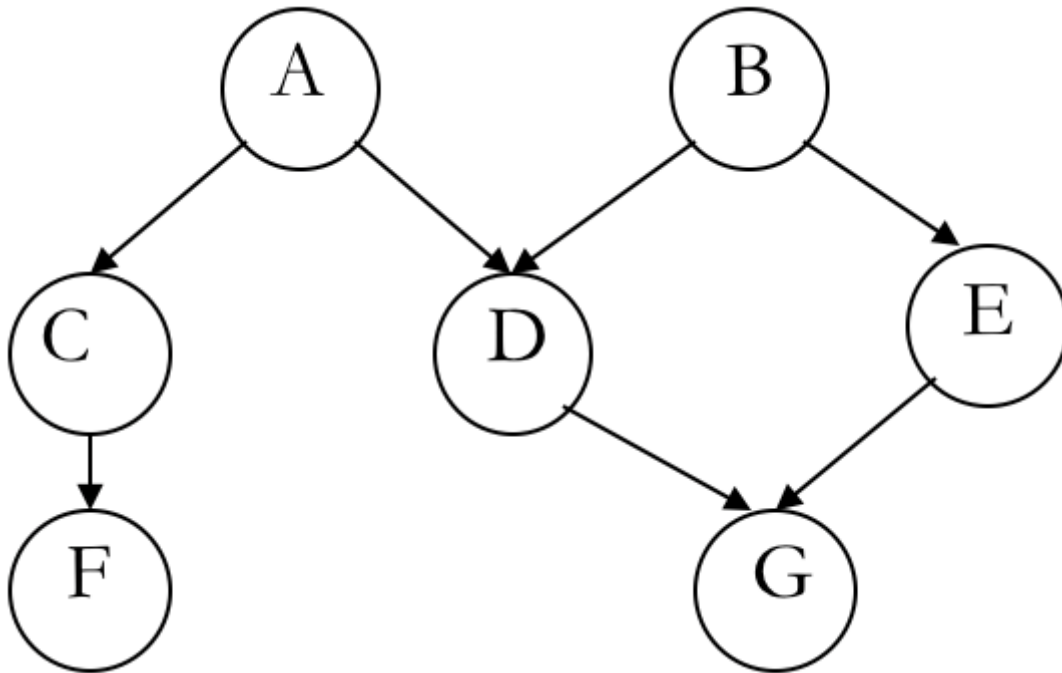
☐ P(a,b,c,d,e,f,g) = P(a)P(b)P(c)P(d)P(e)P(f)P(g)

☐ P(a,b,c,d,e,f,g) = P(a)P(b)P(c|a)P(d|a,b)P(e|b)P(f|c)P(g|d,e)

☐ P(a,b,c,d,e,f,g) = P(g)P(f)P(d|g)P(e|g)P(c|f)P(a|c,d)P(b|d,e)

☐ P(e|b,c) = P(e|b)

☐ P(f|a) = P(f|c)P(c|a) + P(f|~c)P(~c|a)

☐ P(f|a) = P(f,a) / P(a)

☐ P(b,d,e) = P(b)P(d)P(e)

☐ P(b,d,e) = P(a)P(b)P(d|a,b)P(e|b) + P(~a)P(b)P(d|~a,b)P(e|b)

☐ P(b|e) = P(e|b)P(b) / [P(e|b)P(b) + P(e|~b)P(~b)]

☐ P(b|e) = P(e|b)P(b) / P(e)

Question 2   12 / 12 points

Consider the Bayesian network below. Identify all situations below in which knowing the value of *one* variable Y would influence the probability of another variable X. That is, P(X|Y) != P(X). (!= indicates not equals).
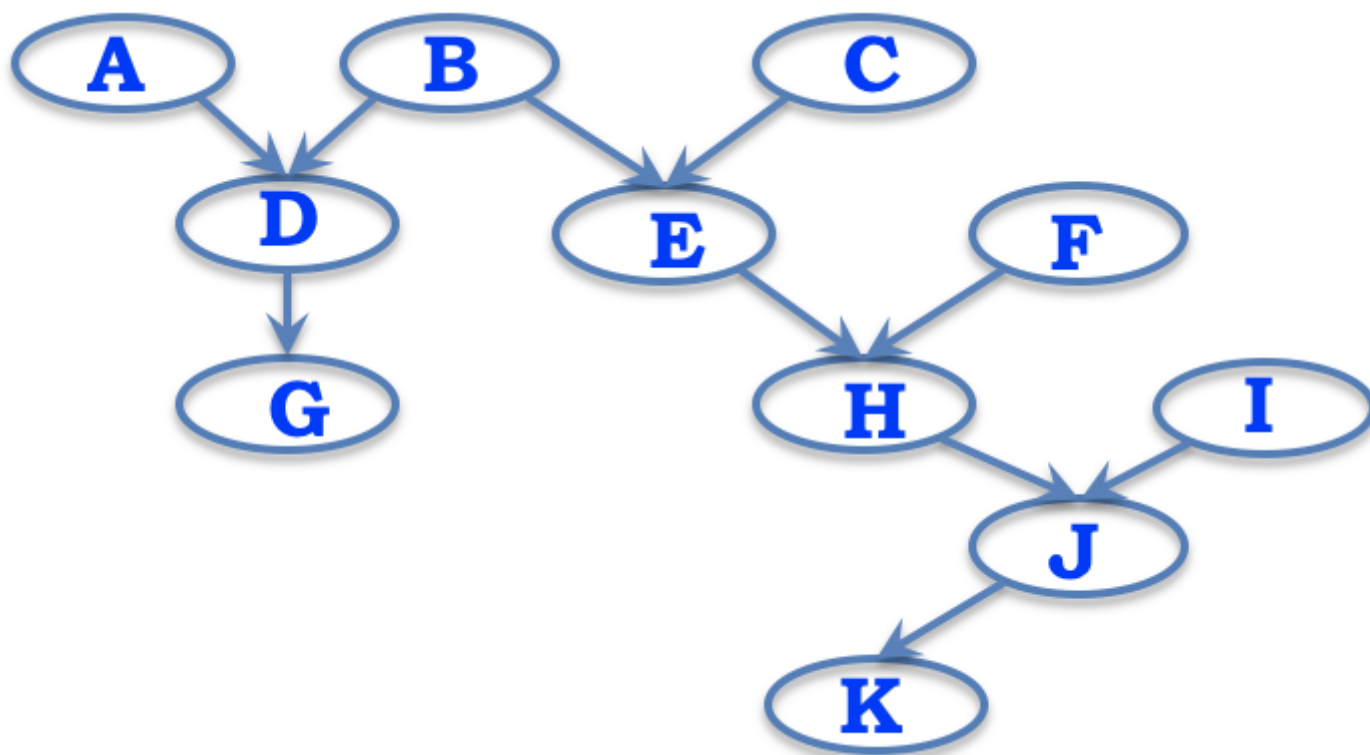
☐ Knowing the value of B would influence the probabilities of values of A

☐ Knowing the value of K would influence the probabilities of the values of B

☐ Knowing the value of B would influence the probabilities of the values of K

☐ Knowing the value of F would influence the probabilities of the values of J

☐ Knowing the value of F would influence the probabilities of the values of G

Question 3   10 / 10 points

Identify all true statements.

☐ The product rule for 'a' and 'b', P(a ∧ b) = P(a|b)P(b) applies only when 'a' and 'b' are statistically independent

☐ The semantics of a Bayesian net are such that each node is conditionally independent of its non-descendants given its parents

☐ Variables X and Y are independent if P(X ∧ Y) = P(X)*P(Y) for all possible values of X and Y

☐ Variables X and Y are independent if P(Y|X) = P(Y) for all possible values of X and Y

☐ Variables X and Y are independent if P(X ∧ Y) = P(X)+P(Y) for all possible values of X and Y for all possible values of X and Y

☐ Variable Z is conditionally independent of X given Y if P(X ∧ Z | Y) = P(X|Y)+P(Z|Y) for all possible values of X, Z, and Y

☐ Variable Z is conditionally independent of X given Y if P(X ∧ Z | Y) = P(X|Y)*P(Z|Y) for all possible values of X, Z, and Y

Done