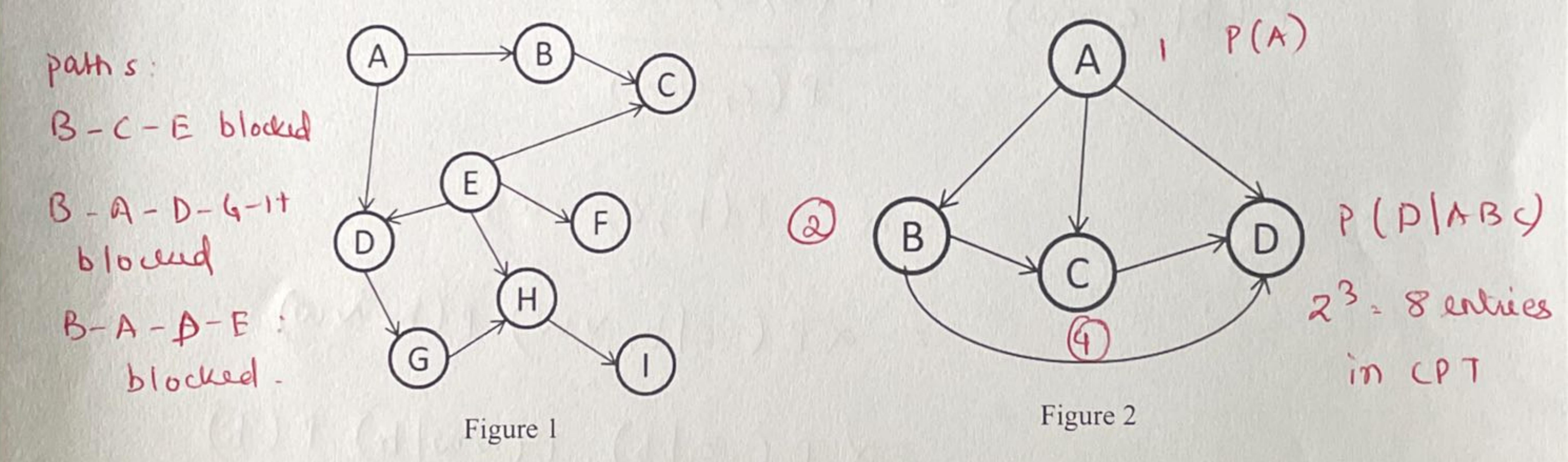
## CS 561 Artificial Intelligence QUIZ I

05 February 2024 (Mone	day) Max. M	arks: 20	Time: 40 mins
Roll No.	N	lame:	
In Questions 1-4 Tick at	ll the correct answers.		
1. Expressions that are independent given 0		assuming that A and B are	conditionally [2 marks]
$\frac{P(C A)P(A B)P(B)}{P(C)}$	$\frac{P(A C)P(B,C)}{P(C)}$	P(A B,C)P(B C)	None None
2. Expressions that are	equivalent to P(A,B C),	given no independence ass	umptions, are [2 marks]
$\frac{P(C A)P(A B)P(B)}{P(C)}$	$\frac{P(B,C A)P(A)}{P(B,C)}$	P(A B,C)P(B C)	None None

- 3. Given the Bayesian Network (Figure 1), which one of the following is a true statement?  $X \perp Y \mid Z$  denotes X and Y are conditionally independent given Z. [4 marks]
  - (a)  $B \perp E|F$  is guaranteed to be true (c)  $D \perp H|G$  is guaranteed to be true
- (b)  $B \perp E \mid F$  is guaranteed to be false
- (d) none



- 4. Assume that each variable in the given Bayesian network (Figure 2) takes on the values {0, 1}. The least number of parameters that would be required to define the Conditional Probability Distribution for this network is:
  - (a) 4
- (b) 11
- (c) 15
- (d) none

- Compared to a full-joint probability table, a Bayesian Network will (Tick the most appropriate answer)
  - (a) always be strictly less accurate, though possibly only by a small amount
  - (b) be able to answer a large subset of possible queries, but not all
  - (c) possibly use significantly less computer memory
- 6. Consider the following Bayesian Network (Figure 3)

[4 marks]

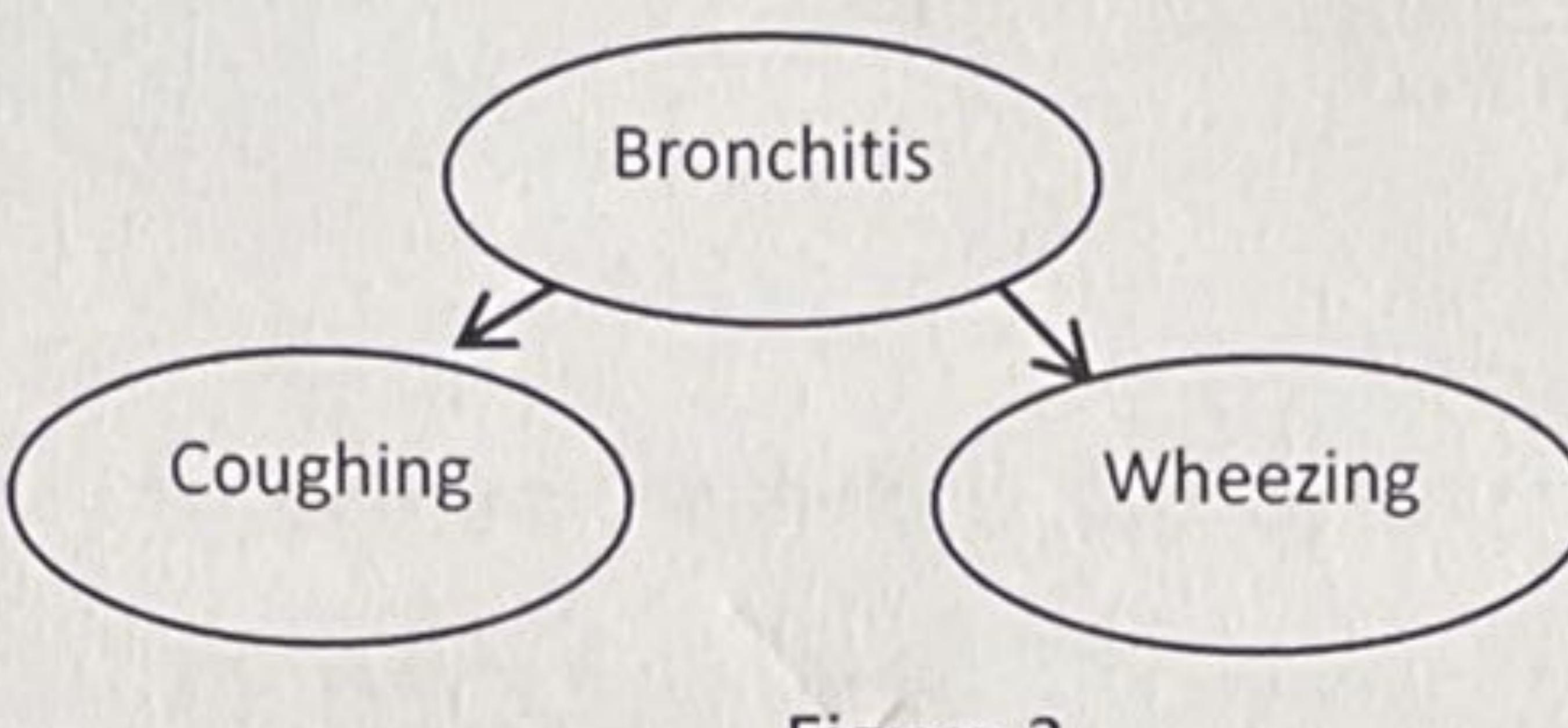


Figure 3

Show how to compute the following expression by expressing it in terms of the conditional probabilities in the Bayesian Network (you do not have to use any actual probabilities values here).  $P(Bronchitis = true \mid Coughing = true, Wheezing = false)$ 

$$P(b|c, n\omega) = \frac{P(b, c, n\omega)}{P(c, n\omega)}$$

$$= \alpha P(b, c, n\omega)$$

$$= \alpha P(c|b, n\omega) P(b, n\omega)$$

$$= \alpha P(c|b) P(n\omega|b) P(b)$$

(i)	One of the main reasons of early AI systems failure on difficult problems during 1970's wa that they were based primarily on careful analysis of the task rather than "informed introspection" as to how humans perform a task. [True/False]
(ii)	The DENDRAL program is an early expert system developed at Stanford for diagnosing blood infections. [True/False]
(iii)	Bayes' Rule allows unknown probabilities to be computed from known conditional probabilities, usually in the causal direction. Applying Bayes' rule with many pieces of evidence runs into the same scaling problems as does the full joint distribution [True/False]
(iv)	Suppose a Bayesian Network have 30 nodes (assume Boolean variables) and each with 5 parents, then the Bayesian network requires 960 numbers, but the full joint distribution requires over a billion. [True/False]

[4 marks]

7. State True or False.