JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

Test 1 Examination-February-2025

B.Tech -VIII Semester (CSE/IT)

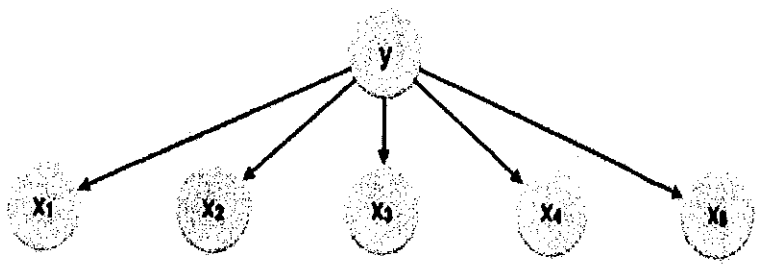
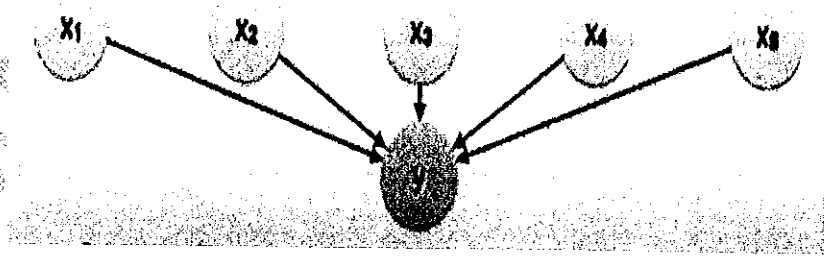
COURSE CODE (CREDITS): 19B1WCI832 (3) MAX. MARKS: 15

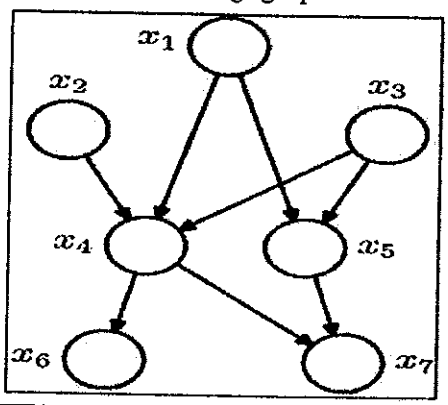
COURSE NAME: Probabilistic Graphical Models

COURSE INSTRUCTORS: Vivek Kumar Sehgal, MAX. TIME: 1 Hr.

Note: *(a) All questions are compulsory.*

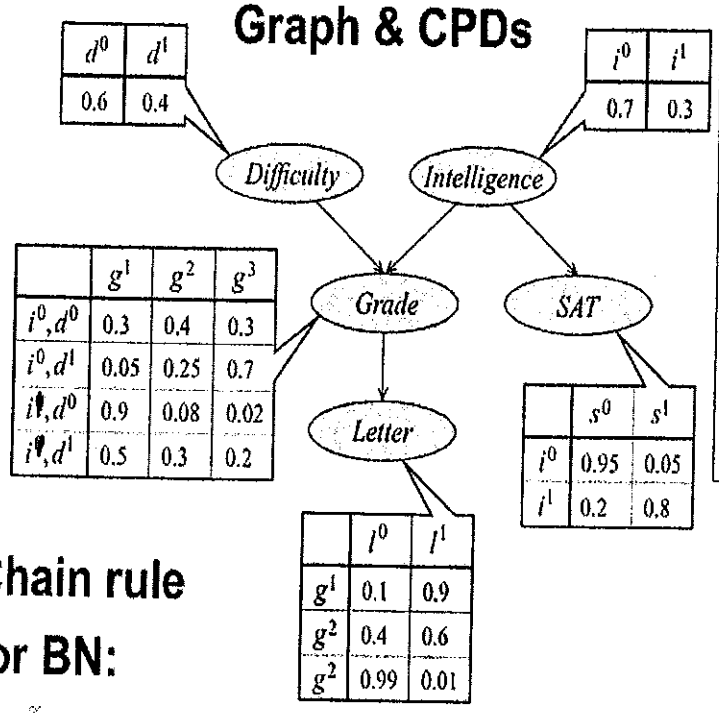
(b) All the parts of a question should be attempted together and in sequence.

Q.No	Question	CO	Marks
Q1	(a) What is a probabilistic graphical model? How can the probabilistic graphical model be widely used throughout machine learning and in many real-world applications?	CO-1	2
	(b) Calculate the joint probability distribution with factors for the following cases: Case 1.  Case 2.  		3
Q2	(a) How will you explain the Graph Directionality in terms of Bayesian networks (BNs) and Markov random fields (MRFs)	CO-1	2

	(b) Calculate the Joint distribution and Product terms are conditional distributions of each node conditioned on variables corresponding to parents of that node in the following graph 		3
Q3	(a) What is the condition for Independent Random Variables $P \models (\alpha \perp \beta)$. What is the condition for a distribution P satisfies $(\alpha \perp \beta)$	CO-2	2

(b)

Graph & CPDs



d^0	d^1
0.6	0.4

i^0	i^1
0.7	0.3

	g^1	g^2	g^3
i^0, d^0	0.3	0.4	0.3
i^0, d^1	0.05	0.25	0.7
i^1, d^0	0.9	0.08	0.02
i^1, d^1	0.5	0.3	0.2

	s^0	s^1
i^0	0.95	0.05
i^1	0.2	0.8

	l^0	l^1
g^1	0.1	0.9
g^2	0.4	0.6
g^2	0.99	0.01

$Val(I)=\{i^0$=low intelligence, i^1= high intelligence$\}$

$Val(D)=\{d^0$=easy, d^1=hard$\}$

$Val(G)=\{g^1=A, g^2=B, g^3=C\}$

$Val(S)=\{s^0$=low, s^1=high$)$

$Val(L)=\{l^0$=weak, l^1=strong$\}$

Chain rule for BN:

Calculate the Probability for:

i. P(high intelligence, easy course, grade=B, high SAT, weak letter)
ii. P(low intelligence, easy course, grade=A, high SAT, strong letter) (3)