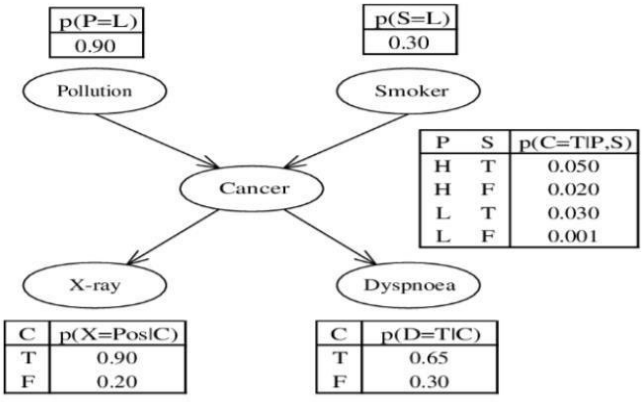
08/05/2025 MCA SEM-II (NEP-2020) AIML QP CODE: 10082224

Time: 2 Hours **Total Marks: 50**

Note: • **Question number Q1 is compulsory** • **Attempt any two questions out of Q2 to Q5**			**Marks**	**Course Outcome**	**Bloom's Level**
				CO	**BL**
Q1	**Answer the following**				
	a.	What is an Agent Environment in the context of AI? Explain its properties.	**[05]**	CO1	1,2
	b.	What are the different types of Gradient Descent algorithms used in training neural networks?	**[05]**	CO3	1,2
	c.	Explain the role of hyper parameters in machine learning. How do they influence the training and performance of a model?	**[05]**	CO 4	2,3
	d.	What is a Random Forest, and how does it improve classification accuracy compared to a single decision tree?	**[05]**	CO 6	2,3
Q2	**a.**	i)What is the difference between propositional logic and first-order predicate logic? ii) Convert following into predicate logic: - 1. Every student who takes Physics also takes Maths. 2. Every elephant is gray 3. All purple mushrooms are poisonous. 4. Every clever student is successful	**[08]**	CO 1	2,3
	b.	What is bagging, and how does it help in improving the performance of machine learning classifiers?	**[07]**	CO 6	2,3
Q3	**a.**	How does the AO* algorithm build and explore the search tree in an AND/OR graph?	**[08]**	CO 2	1,2
	b.	i)What are the components of a Bayesian Belief Network? ii) From the given Bayesian Belief Network, find the probability that the patient has cancer when there is no pollution, the patient is not a smoker, with a positive X-Ray and Dyspnoea  	**[07]**	CO 5	2,3,4

Q4	**a.**	What is Principal Component Analysis (PCA), and how does it work in feature reduction?	**[08]**	CO 4	2
	b.	What is Alpha-Beta algorithm. How does the Alpha-Beta pruning algorithm avoid exploring unnecessary branches of the search tree?	**[07]**	CO 2	2,3
Q5	**a.**	What is the kernel trick in SVM? Provide examples of common kernel functions.	**[08]**	CO 5	2
	b.	Implement OR function using Perceptron network for binary inputs and bipolar targets for one Epoch. (Assume initial weights as zero, threshold= 0.2 and learning rate =1). $x1$ | $x2$ | t 1 | 1 | 1 1 | 0 | 1 0 | 1 | 1 0 | 0 | -1 $f(y_{in}) = \begin{cases} 1 & \text{if } y_{in} > 0.2 \\ 0 & \text{if } -0.2 \le y_{in} \le 0.2 \end{cases}$	**[07]**	CO 3	3,4,5

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