Register Number:……..

KUMARAGURU
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B.TECH DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fifth Semester

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

U18AII5203**:** Reinforcement Learning

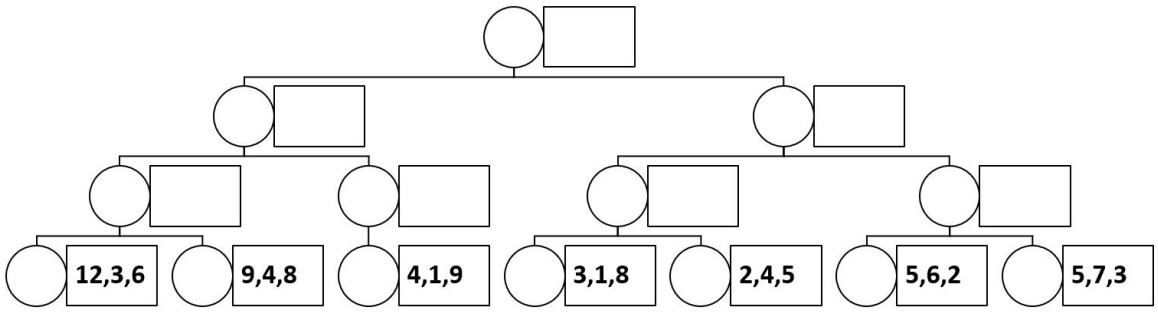
COURSE OUTCOMES

CO1: Understand the underpinnings to structure classical solutions for Reinforcement Learning problem.
CO2: Apply deep learning architectures to train agents navigating from virtual world from sensory data.
CO3: Analyze basic Reinforcement Learning algorithms for simple sequential decision making and control problems in uncertain conditions.
CO4: Build system of agents to demonstrate collaboration or cooperation**.**

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Explain the usage of reinforcement learning in the classic Gym's Taxi environment.	CO1	[K_2]
2.	List any four reinforcement learning frameworks	CO1	[K_1]
3.	Explain the reason behind the overestimation of Q-values by regular Q-learning and DQN.	CO2	[K_2]
4.	Outline the steps in building a neural network model.	CO2	[K_1]
5.	Explain how the robots work on in a given environment.	CO3	[K_2]
6.	Summarize leveraging neural networks to predict machine failures that learns intelligent behaviors from sensory data.	CO2	[K_2]
7.	List the ways in which reinforcement learning problems are approached and solved with examples.	CO3	[K_1]
8.	Apply min-max algorithm for the following 3-player game scenario.	CO4	[K_3]



9.		State the differences in training an agent in collaborative and competitive environment		CO4	[K_1]
10.		Outline Reinforcement Learning in continuous space		CO4	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Explain in detail the Temporal Difference method and the way in which it differs from Monte- Carlo Method.	8	CO2	[K_2]
	b)	Explain Reinforcement Learning, the elements, the components and goal of RL algorithm associated with it.	8	CO1	[K_2]
12.	a)	Interpret how prioritized replay impacts Deep Q- Learning	8	CO2	[K_2]
	b)	Compare and contrast Deep Q-Learning, Deep Q-Network, Double DQN and Dueling DQN with appropriate illustration.	8	CO3	[K_4]
13.	a)	Explain the concept of Dynamic Programming used in reinforcement learning	8	CO1	[K_2]
	b)	Online RL agents incrementally update their parameters while they observe a stream of experiences. In their simplest form, they discard incoming data immediately, after a single update. Analyze and provide solution for the issues associated with the above scenario.	8	CO3	[K_4]
14.	a)	Explain the steps and layers involved in building a convolutional neural network and analyze AlexNet and LeNet architectures	8	CO2	[K_4]
	b)	i) State the key idea behind REINFORCE algorithms.	8	CO3	[K_4]
		ii) Examine mathematically the need for Trajectory and how gradient ascent is going to affect the expected returns in REINFORCE algorithm.			
15.	a)	Compare and Contrast the following Reinforcement Learning Terminologies.	8	CO3	[K_2]
		i) Value-based & Policy-based			
		ii) On-Policy & Off-Policy			
		iii) Model based & Model Free			
	b)	Explain Actor- Critic method and analyze why Optimization is much needed using Deep Deterministic Policy Gradient (DDPG).	8	CO4	[K_4]

16.	a)	i)	Make use of Hierarchical Reinforcement Learning to train smarter agents.	8	CO4	[K_2]
		ii)	Show certain use cases in the field of robotics where various Deep Reinforcement Learning techniques could be applied.			
	b)		Analyze the Multiplayer environment for Markov games and explain how to train an agent in collaborative and competitive environment.	8	CO4	[K_4]

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