CBCS SCHEME

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BMT515C

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Artificial Intelligence for Mechatronics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain intelligence and two important components of intelligence learning and communication.	10	L2	CO1
	b.	With the help of a block diagram, explain Genetic algorithm based on evolution theory.	10	L2	CO1
		OR			
Q.2	a.	Outline the concept of fuzzy logic and fuzzy set mentioning its applications.	10	L2	CO1
	b.	With the help of a block diagram, explain Artificial Neural Network (ANN) with an analogy to Biological Neural Network. Mention the application of ANN.	10	L2	CO1
		Module – 2			
Q.3	a.	With a neat flow diagram, explain ALVINN system for steering an automobile.	10	L2	CO2
	b.	List the region properties in an image and illustrate region finding method in image processing with example.	10	L2	CO2
		OR			
Q.4	a.	Explain the combination of averaging and edge enhancement in image processing with mathematical function.	10	L2	CO2
	b.	Outline the scene analysis with different types of representation for lines at junction.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the role of sensors and their types used in a robot.	10	L2	CO3
	b.	Illustrate the localization method using Extended Kalman Filter (EKF) with a neat diagram.	10	L2	CO3
		OR			
Q.6	a.	What are end effectors? Classify the types of end effectors used in robotic applications.	10	L1	CO3
	b.	With a neat sketch, explain the simplified kinematic model of a robot.	10	L2	CO3

		Module – 4			
Q.7	**a.**	Outline the cell decomposition method used in the path planning with cell classification.	**10**	**L2**	**CO4**
	b.	Explain the modified cost function to estimate the distance to the closest obstacle in a potential field.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the process of workspace and configuration space representation with a neat diagram.	**10**	**L2**	**CO4**
	b.	Illustrate the Voronoi diagram based graph technique to optimize the free space in the path planning.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Derive an expression for PD and PID controller in dynamic state model of the robot.	**10**	**L3**	**CO5**
	b.	List and explain the three layer architecture in robotic software hybrid architecture.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	With a neat block diagram, explain the subsumption robotic architecture with the help of a Augmented Finite State Machine (AFSM).	**10**	**L2**	**CO5**
	b.	With a neat diagram, illustrate the pipleline architecture with the relevant stages involved.	**10**	**L2**	**CO5**

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