Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1710425 Date: 23-06-2014

Subject Name: Robotics and Intelligent Systems

Time: 02:30 pm - 05:00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Derive force and torque equations for robot dynamics. Consider two Degree of Freedom.	**07**
	(b)	What is generalization of neural network? Explain following properties and capabilities offered by neural networks: i) Non linearity ii) adaptivity	**07**
Q.2	**(a)**	Explain importance of sensors in Robotics. Explain in brief following sensors. 1) Ultrasonic sensor 2) Capacitive sensor	**07**
	(b)	Explain rotation matrix about an arbitrary axis and derive necessary equation.	**07**
		OR	
	(b)	Explain the H-bridge and bipolar PWM amplifiers for controlling the DC motor drive system.	**07**
Q.3	**(a)**	Explain with necessary information, common robotics configurations.	**07**
	(b)	Explain in brief details about neural, Fuzzy and GA hybrid systems.	**07**
		OR	
Q.3	**(a)**	What is the importance of Fuzzy inference system (FIS)? Explain in brief following steps for FIS with suitable example. 1) Apply implication method 2) Aggregate all outputs	**07**
	(b)	Give classification chart for various search techniques. Give metaphor/ analogy between Genetic algorithm and nature.	**07**
Q.4	**(a)**	Explain simple genetic algorithm various steps with proper example.	**07**
	(b)	Explain any one reactive robot mobile navigation technique taking help of suitable cases.	**07**
		OR	
Q.4	**(a)**	Explain basics of fuzzy set theory with proper example.	**07**
Q.4	**(b)**	Explain in details comparisons /assumptions in view of wheeled and legged robots.	**07**
Q.5	**(a)**	Give the basic definition for robot Motion planning problem. Draw and explain the basic diagram for robot navigation.	**07**
	(b)	Explain in brief about introduction to Optimization and Numerical Optimization in context of Robotics.	**07**
		OR	
Q.5	**(a)**	Enlist different fuzzy behaviors used in mobile robot navigation problem. Explain them using fuzzy IF then Else rules.	**07**
	(b)	Explain in brief task planning and multi agent systems in robotics.	**07**

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