

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER IV (NEW) – EXAMINATION – SUMMER - 2017

Subject Code: 2740502**Date: 03/05/2017****Subject Name: Robotics and Intelligent Systems****Time: 02:30PM-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) Enlist traditional path planning approaches approach in case of mobile robot path planning. Explain any one approach in details. **07**

(b) Define following terms for fuzzy systems a) member ship function b) fuzzy operators c) fuzzy rule base d) fuzzy inference system, e) defuzzification, taking suitable example. **07**

Q.2 (a) With necessary details, derive an equation of range calculation of mobile robot to the surrounding obstacles. Clearly mention assumptions. **07**

(b) Using concepts of basic vector analysis, derive equation for Homogenous Matrix for a Translation in XY plane, followed by a Rotation around the z-axis. **07**

OR

(b) In context of optimization on robotics answer following: **07**

- i. Challenges for optimization in real robotics application
- ii. List three examples of use of optimization in Robotics, mentioning respective objective functions, variables and constraints

Q.3 (a) Draw and explain architecture diagram for i) MAP based and ii) behavior based navigation of mobile robot. **07**

(b) Enlist and explain in brief any one basic driving mechanism for wheeled robots. **07**

OR

Q.3 (a) In intelligent system, critically evaluate following concepts in terms of computational complexities, speed, accuracy and other related parameters. **07**

- i. Concept of sensors grouping
- ii. Quantization of sensor values

(b) Enlist classification of sensors used in robotics. Define i) Response time and ii) Accuracy iii) Sensitivity iv) Linearity, in context of sensors used for robots. **07**

Q.4 (a) Differentiate multi-layer network and perceptron, in context of neural network. Clearly state advantages and limitations of using perceptron. **07**

(b) What is linear separability problem? Discuss separation in higher dimension. Explain solution using neural network taking example of XOR operation. **07**

OR

Q.4 (a) Describe intelligent system and its important characteristics, taking one example and identify its constituent components. **07**

Q.4 (b) Describe process of weight calculation in back propagation neural network. **07**

- Q.5** (a) Describe process of knowledge representation, how it is archived using predicate calculus. **07**
- (b) "Classification and prediction is different type of problem." justify with explanation with specific example. **07**
- OR**
- Q.5** (a) "Turing machine can implement algorithm". justify with proper explanation. **07**
- (b) Explain Bayesian classification method. **07**
