

Model Question Paper

Eighth Semester B Tech Degree Examinations

(2013 scheme)

13.805.5 Artificial Intelligence and Robotics (T)

(Elective V)

Time 3hrs

Max marks 100

Part A

Answer **all** questions (2 marks each)

1. Define the concept of Agent based Intelligence representation.
2. Translate the sentence “Fast bowlers are tall” in to predicate calculus sentence.
3. List the inference rules used in Predicate calculus
4. For all X and Y, X is the mother of Y if X is a parent of Y and X is a female. Translate this statement to Prolog.
5. State the laws of robotics.
6. Discuss possible applications where redundant manipulators would be useful.
7. Define automation and mention benefits of industrial automation.
8. What are the different types of end effectors and their drive mechanisms?
9. List four applications where machine vision would be useful in robotics.
10. Define path planning in the context of robotics. What is trajectory of a robot?

Part B

Answer any **one** question from each module (20 marks each)

Module 1

11. Compare and contrast different types of uninformed search strategies with examples. (20)

OR

12. a) write down a script for Restaurant scenario. (8)
b) Transform the predicate logic statements given below into equivalent conceptual graphs.

$$\forall x \text{ normal}(x) \wedge \text{grown}(x) \rightarrow \text{walk}(x)$$

$$\forall x, y \text{ married}(x,y) \rightarrow \text{married}(y,x)$$

$$\forall x \text{ haswings}(x) \wedge \text{layseggs}(x) \rightarrow \text{bird}(x) \quad (12)$$

Module 2

13. a) What is planning? (5)
b) Differentiate inductive learning and decision tree learning methods. (15)

OR

14. a) How are robots classified, explain? With neat sketches explain the work envelope of a (i) Cartesian; (ii) Polar/ spherical robot. (15)
b) For a cylindrical coordinate robot with a vertical reach of 480mm and vertical stroke of 300 mm. How far of the floor do parts have to be raised in order to be reachable by the robot. Sketch the configuration indicating dimensions mentioned. (5)

Module 3

15. a) What are the advantages of hydraulic actuation systems over electric motors? Sketch and explain a pneumatic power drive used for robots. (10)
- b) Explain different types of sensors and their implications for robot design. (10)

OR

16. a) Write short notes on (i) Hydraulic Drives (ii) Machine vision (iii) Tactile Sensors (12)
- b) Sketch and explain the functions basic building blocks of automation. (8)

Module 4

17. a) Find the rotational matrix representing a roll of $\pi/4$ followed by a yaw of $\pi/2$ followed by a pitch of $\pi/2$ (12)
- b) Write short notes on Jacobian Work Envelope. (8)

OR

18. a) What are the various inputs of an inverse kinematics algorithm? Explain functioning of an inverse kinematics algorithm. (10)
- b) Explain various industrial robot control schemes (10)