Con. 6299-11. (REVISED COURSE) **MP–5596**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
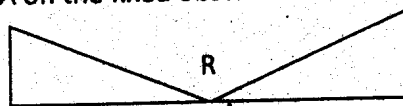(2) Solve any **four** questions.

Q: 1 a) Define Reach & stroke, Degree of Freedom and Accuracy. **[20]**
b) Given that coordinate transformation matrix is a rotation matrix and represents fundamental rotation, what is the axis of rotation (1, 2, or 3) and what is the angle of rotation? i.e. and θ

$$R_k(\theta) = \begin{bmatrix} 0.5 & 0 & -0.866 \\ 0 & 1 & 0 \\ 0.866 & 0 & 0.5 \end{bmatrix}$$

c) What is proximity sensor? Explain SONAR sensor.
d) Explain Heuristic function with example.

Q: 2 a) Yaw 90^0, Pitch -90^0, roll 90^0. Rotations are performed about the fixed axes of F frame. Find coordinates of q w.r.t. fixed axis. i.e. $[p]^F$., $[P]M=\{0,0,0.8\}^T$. **[4]**
b) Explain Goal based agent and Utility based Agent with diagram. State difference between them. **[8]**
c) Explain steps in problem formulation with example. **[8]**

Q: 3 a) Explain steps to convert Logical statements into Causal Normal Form. **[4]**
b) Explain Learning Agent with diagram. Also explain inductive learning. **[8]**
c) What is Uncertainty? Explain Bayesian network with example. **[8]**

Q: 4 a) Explain Direct Kinematics of 4-axis SCARA Robot. **[10]**
b) What is Configuration Space? Draw the Configuration space induced by the translation of the concave mobile part A on the fixed obstacle B. **[10]**

A   B

Q: 5 a) Explain Screw Transformation **[4]**
b) Define rational agent. Explain task set properties of environment. **[8]**
c) Explain steps in designing reactive behavioral system. **[8]**

Q: 6 a) Draw and explain WUMPUS WORLD Environment with their Performance measure, Environment, Actuator, and sensor. **[10]**
b) Explain A* search with example. **[10]**

Q: 7 a) Derive the General lion-Co-ordinate transformation matrix T^* k-1. **[10]**
b) Consider following facts **[10]**
1. If maid stole the jewelry then butler was not guilty.
2. Either maid stole jewelry or she milk the cow
3. If maid milked the cow then butler got the cream.
4. Therefore if butler was guilty then he got the cream.
Prove that the conclusion (step 4) is valid using resolution.