

GANPAT UNIVERSITY
REGULAR EXAMINATION- APRIL-JUNE 2015
M. TECH SEM- II ADVANCE MANUFACTURING TECHNIQUES
3ME205: Robotics and Artificial Intelligence

TIME: 3 HRS

TOTAL MARKS: 60

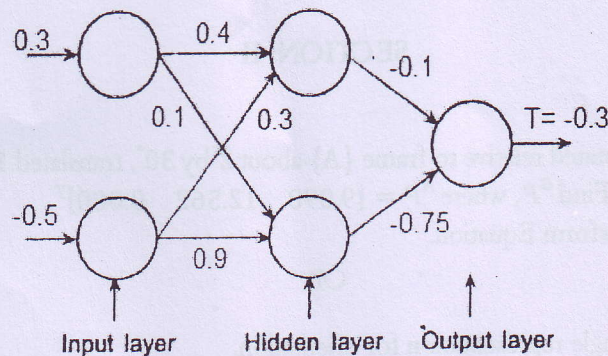
- Instructions:** (1) This Question paper has two sections. Attempt each section in separate answer book.
 (2) Figures on right indicate marks.
 (3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1

[10]

For following network, calculate weights for next iterations using Back propagation algorithm. Assume sigmoidal activation function for neurons in hidden layer and output layer. Input layer contains linear activation function.



OR

Q.1

[10]

- (a) Explain following terms with examples.

(05)

I. Inductive learning

IV. Function fitting

II. Deductive learning

V. Clustering

III. Pattern classification

- (b) Draw and explain architecture of ART1 network.

(05)

Q.2

[10]

- (a) Find the minimum distance cost route between city 1 and city 10 using Nearest neighbor technique.

(05)

	1	2	3	4	5	6	7	8	9	10
1	-	121	-	213	76		142		153	-
2	121	-	73	335	197		235		164	-
3	-	73	-	-	-	-	-	-	-	-
4	213	335	-	-	139	103	-	-	-	-
5	76	197	-	139	-	-	103	-	181	-
6	-	-	-	103	-	-	139	26	272	-
7	142	235	-	-	103	139	-	122	134	-
8	-	-	-	-	-	26	122	-	254	-
9	153	164	-	-	181	272	134	254	-	102
10	-	-	-	-	-	-	-	-	102	-

- (b) Compare breadth first search and depth first search techniques.

(05)

OR

- Q.2 [10]
 (a) Which are the components of production system? Explain each one component of the production system. (05)
 (b) Define state space for following water jug problem. You are given two jugs, a 4 gallon one and a 3 gallon one. Neither has any measuring marker on it. There is a pump that can be used to fill the jugs with water. The water from any of the jug can be poured on floor. Draw Breadth first search to get exactly 1 gallon of water in 4 gallon jug. (05)

- Q.3 [10]
 (a) Given following data (05)

$$\tilde{A} = \{(0.3, x_1), (0.7, x_2), (1, x_3)\}$$

$$\tilde{B} = \{(0.1, x_1), (1, x_2), (0.25, x_3)\}$$

Calculate,

- I. $\tilde{A} \cup \tilde{B}$ IV. $\overline{\tilde{B}}$
 II. $\tilde{A} \cap \tilde{B}$ V. $\tilde{B}_{0.3}$
 III. $\overline{\tilde{A}}$

- (b) Draw the block diagram of mamdani fuzzy inference system and explain each term in detail. (05)

SECTION: II

- Q.4 [10]
 (a) Frame {B}, which is rotated relative to frame {A} about \hat{Z} by 30° , translated 10 units in \hat{X}_A , and translated 5 units in \hat{Y}_A . Find ${}^B P$, where ${}^A P = [9.098 \ 12.562 \ 0.000]^T$. (05)
 (b) Discuss theory of Transform Equation. (05)

OR

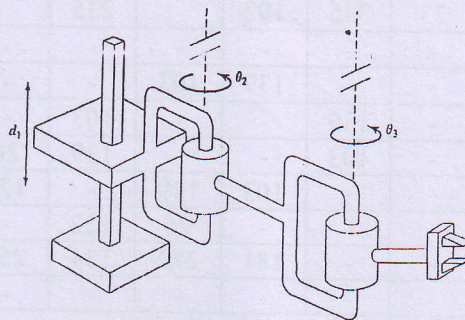
- Q.4 [10]
 (a) Discuss X-Y-Z fixed angle representation for orientation. (05)
 (b) The following frame definitions are known as (05)

$${}^U_A T = \begin{bmatrix} 0.866 & -0.500 & 0.000 & 11.0 \\ 0.500 & 0.866 & 0.000 & -1.0 \\ 0.000 & 0.000 & 1 & 8.0 \\ 0 & 0 & 0 & 1 \end{bmatrix}; \quad {}^B_A T = \begin{bmatrix} 1.000 & 0.000 & 0.000 & 0.0 \\ 0.000 & 0.866 & -0.500 & 10.0 \\ 0.000 & 0.500 & 0.866 & -20.0 \\ 0 & 0 & 0 & 1 \end{bmatrix};$$

$${}^C_U T = \begin{bmatrix} 0.866 & -0.500 & 0.000 & -3.0 \\ 0.433 & 0.750 & -0.500 & -3.0 \\ 0.250 & 0.433 & 0.866 & 3.0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

draw the frame diagram to show their arrangement qualitatively, and solve for ${}^B_C T$.

- Q.5 [10]
 (a) Discuss different types of joints. (05)
 (b) Find the DH parameters and transformation matrices for the figure given below, also find ${}^n_0 T$, where n is the last link. (05)



OR

- Q.5 [10]
(a) Derive the Jacobian matrix for 2R planner manipulator. (05)
(b) Solve the following transcendental equation for θ . (05)

$$a \cos \theta + b \sin \theta = c$$

- Q.6 Do as Directed [10]
(a) A single cubic trajectory is given by (06)
$$\theta(t) = 10 + 90t^2 - 60t^3$$

and is used over the time interval from $t = 0$ to $t = 2$. What are the starting and final positions, velocities and accelerations?
(b) Discuss Singularity. (04)

-----END OF PAPER-----