GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
ARTIFICIAL INTELLIGENCE & ROBOTICS
EC605C

TIME ALLOTTED: 3HR **FULL MARKS:70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No.
1.	(i)	Match the following Robot part functions a. Manipulator arm — 1. For holding a piece or tool b. Controllers — 2. Move the manipulator arm and end effector c. Drives — 3. Number of degrees of freedom of movement d. Gripper — 4. Delivers commands to the actuators a) a-1, b-4, c-2, d-3 b) a-3, b-4, c-2, d-1 c) a-3, b-2, c-4, d-1 d) a-4, b-3, c-2, d-1	1	CO4
	(ii)	A Bayesian network is a a) Tree b) directed graph c) undirected graph d) None of these	1	CO3
	(iii)	Training & testing data distribution for a learning task usually is a) 50% -50% b) 70% -30% c) 30% -70% d) Depends on dataset	1	CO3
	(iv)	Which AI system mimics the structure and functioning of the human brain a) Expert system b) Decision support system c) Neural Network d) Genetic Algorithm	1	CO3
	(v)	Which is not the commonly used programming language for AI a) PROLOG b) Java c) LISP d) Perl	1	CO1

(vi) The number of hidden layers in a 6-3-5-2 multi-layer perceptron is — 1 — CO.
a) 4
b) 3
c) 6
d) 2

(vii) Degrees of Freedom (DOF) of a PUMA robot is — 1 — CO4
a) 1
b) 5
c) 3
d) 6

(viii) An example of an actuator is — 1 — CO5
a) motor
b) load cell
c) strain gauge
d) tachometer

(ix) In which of the following operations Continuous Path System is used — 1 — CO4
a) Pick and Place
b) Loading and Unloading
c) Continuous Welding
d) All of the above

(x) The main objective(s) of Industrial robot is to — 1 — CO4
a) To minimize the labour requirement
b) To increase productivity
c) To enhance the life of production machines
d) All of the above

(xi) The robot designed with cartesian coordinate systems has — 1 — CO4
a) Three linear movements
b) Three rotational movements
c) Two linear and one rotational movement
d) Two rotational and one linear movement

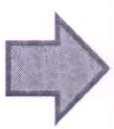
(xii) How many DH parameters exist in robot kinematics? — 1 — CO4
a) 1
b) 2
c) 3
d) 4

GROUP – B
(Short Answer Type Questions)
(Answer any *three* of the following) — **3 x 5 = 15**

		Marks	CO No.
2.	Solve the 8-puzzle problem .	5	CO2

2	8	1
	4	3
7	6	5

Initial State



1	2	3
8		4
7	6	5

Goal State

3.		Explain Turing Test with diagram.	5	CO1
4.		Explain forward kinematics problem of robot with diagram.	5	CO4
5.	a)	What is meant by the degree of freedom of robot?	2	CO4
	b)	State different types of robot joints with their dof value.	3	CO4
6.		What are the various types of sensors used in the robotics?	5	CO5

GROUP – C
(Long Answer Type Questions)

(Answer any *three* of the following) **3 x 15 = 45**

			Marks	CO No.
7.	a)	Explain Breadth-First Search (BFS) algorithms with diagram.	5	CO2
	b)	State the difference between classification and clustering with example.	5	CO3
	c)	You have three jugs, measuring 12 gallons, 8 gallons, and 3 gallons, and a water faucet. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure out exactly one gallon. Show the steps with explanation.	5	CO2
8.	a)	State the difference between supervised and unsupervised learning with example.	5	CO3
	b)	Explain a 3:4:2:3 multilayer feedforward neural network with diagram.	5	CO3
	c)	A two input ANN has inputs 3,4 having weights 1 and 2 respectively. Find the output for i) No bias and no activation function, ii) A bias b= -10 and Threshold (Unit step) activation function, iii) Sigmoid activation function	5	CO3
9.	a)	Explain robotic link representation using D-H parameters.	5	CO4
	b)	State different robot co-ordinate systems.	5	CO4
	c)	State some applications of robots.	5	CO1
10.	a)	Differentiate between a serial robot and a parallel robot with example.	5	CO4
	b)	Explain workspace of a serial manipulator with diagram.	5	CO4
	c)	Explain the use of different actuators used in robotics..	5	CO4
11.		Write short notes on **(any *three*)**	3x5=15	
	a)	Tower of Hanoi Problem	5	CO2
	b)	Proposition and Predicate Logic used in AI	5	CO3
	c)	Intelligent Agents	5	CO1
	d)	Robot Trajectory Planning	5	CO4
	e)	Proximity Sensor	5	CO5