Total No. of Questions : 8]

SEAT No. :

PE2693

[Total No. of Pages : 3

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T.E. (Robotics and Automation)

ARTIFICIAL INTELLIGENCE FOR ROBOTICS

(2019 Pattern) (Semester - VI) (311509-A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of Calculator is allowed.*
5) *Assume Suitable data if necessary.*

Q1) a) Using Greedy search algorithm, determine the minimum number of coins required from a set of coins having values {1, 7, 10, 15} to change for 28. If the solution obtained is not the global best, which other search algorithm would you recommend to obtain the global best solution? **[9]**

b) Explain the steps of ant colony optimization algorithm. Also state its applications. **[8]**

OR

Q2) a) Determine the initial temperature if simulated annealing algorithm is used to minimize the function $z = 2.x_1.x_2 + 6x_2$ such that $1 \le x_1 \le 4$ and $3 \le x_2 \le 7$. **[10]**

b) What is the basic concept of Tabu search? Explain its algorithm. **[7]**

Q3) a) For the image and template shown in Figure, determine the performance index for translation (2, 1) using template matching technique. **[10]**

Template

m0	6	2	7
	7	2	7
	1	5	6

n0

Image

x	7	3	7	3	8
	7	4	3	4	4
	5	2	9	3	5
	4	7	1	7	6
	8	8	1	7	6
	5	1	6	6	6

y → , n, m

P.T.O.

b) Determine the gradient of intensity of a pixel having intensity 8 in the image given below. Use Sobel operator. **[7]**

6	9	3
4	8	6
1	0	5

OR

Q4) a) Using run length encoding determine the compression ratio for the following image. **[9]**

1	2	0	0	1	1
1	1	1	0	0	0
0	0	0	0	0	0
1	1	1	1	1	1
1	1	1	1	1	0
0	0	0	0	0	0

b) For the image shown below, determine the moment of inertia about y axis. **[8]**

1	0	1	0	0
1	0	1	1	1
0	0	1	0	1
1	1	1	0	0
0	1	1	0	1

Q5) a) Explain bubble sort algorithm and its applications in robotics. **[10]**

b) Explain with suitable example the application of real coded genetic algorithm for AGV route optimization. **[8]**

OR

Q6) a) A perceptron having weights corresponding to the three inputs have the following values: w1 = 2.6 ; w2 = -0.56; and w3 = -1.3. The activation of the unit is given by the step-function: **[8]**

$\varphi(v)$ 1 if $v \geq 0$ otherwise 0

b) Calculate the output value y of the given perceptron for each of the following input patterns: **[10]**

Pattern	P1	P2	P3	P4
X1	1	0	1	1
X2	1	1	1	0
X3	0	1	1	1

Q7) a) Use A* algorithm to determine the shortest path for an automated guided vehicle while moving from work station at (4,6) to workstation at (1, 1) shown in Fig. below. The obstacles are in the form of tool storage racks at locations (2, 5), (1, 3) and (4,4). **[9]**

(1,1)	(2,1)	(3,1)	(4,1)
(1,2)	(2,2)	(3,2)	(4,2)
(1,3)	(2,3)	(3,3)	(4,3)
(1,4)	(2, 4)	(3,4)	(4,4)
(1, 5)	(2,5)	(3, 5)	(4,5)
(1,6)	(2,6)	(3,6)	(4,6)

b) Write note on: Flexible manufacturing system. **[9]**

OR

Q8) a) For a scheduling task, the table of activities, their representation in the vertex, and the weights is as shown below. Draw the activity chart and obtain the critical path using depth first search method. **[9]**

No	Activity's Name	Vertex	Weight
1	A	0-1	13
2	B	1-2	13
3	C	2-3	15
4	D	2-4	13
5	E	3-5	14
6	F	4-5	16
7	G	5-6	15

b) Explain route optimization for AS/RS systems. **[9]**

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