2014

(Fifth Semester)

MASTER OF COMPUTER APPLICATIONS

Paper No: MCA 502

(Artificial Intelligence)

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer Question No 1 and **any four** from the rest

a) How do you explain the problem space of AI? (2)

b) Why is the common sense reasoning system very difficult to be designed. (2)

c) Give reasons why alpha-beta cutoffs are needed to be performed in mini-max search procedure. (2)

d) What is AND-OR graph? (2)

e) Mention four properties a good system for the representation of knowledge should possess. (2)

f) What is basic probability assignment in Dempster-Shafer theory? Give one example. (2)

2. Mention different definitions of AI organized into four categories. Mention any four foundation of AI.Mention two important points in which state of the art AI has made an impact in our history. **(8+2+2=12)**

3. a) Give the PEAS description for automated taxi driver and spam filter. **(3+3 = 6)**

   b) Differentiate the following environments with example.
   i) Fully observable vs partially observable
   ii) Deterministic vs stochastic
   iii) Static vs Dynamic **(2x3 = 6)**

4. Consider a modified "missonaries" and "cannibals" problems. There are five (5) numbers of missionaries and cannibals on one side of a river, along with a boat that can hold 1 to 3 people. Find a way to get everyone to the other side as quickly as possible without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place. Draw the complete state space for this problems which leads to the solution in the least number of steps. **(12)**

5. Consider the map of Manipur as shown in the figure. Choose appropriate coloring constraint to color the map. Always use the same color ordering sequence for coloring all region (eg. If BGR is used for one district, use the same assignment in the order of BGR for all other districts) **(6+6 = 12)**

   a) Use normal backtracking search to show the sequence of variables assignment.

   b) Use arc consistency using minimum remaining variables to show the sequence of variables assignment.

2015

(November & December)

(Fifth Semester)

MASTER OF COMPUTER APPLICATIONS

Paper No: MCA 529(OC)

(Pattern Recognition)

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **Question** No. 1 and **Any Four** from the rest.

1. Answer **briefly** the following questions: **(2x6=12)**

   (a) State the Bayes Formula.

   (b) What is unsupervised learning?

   (c) What do you mean by Maximum likelihood estimation?

   (d) What are the uses of Hidden Markov Models (HHM)?

   (e) Write short notes on missing features.

   (f) Define post processing.

2. Write and explain the design cycle of Pattern Recognition System. **(12)**

)) A repairman is to be hired to repair machines which break down at an average rate of 3 per hour. The breakdown follows Poisson distribution. Non- productive time of machine is considered to cost Rs.16/hr. Two repairmen have been invited. One is slow but cheap while the other is fast and expensive. The slow repairman charges Rs.8 per hour and he services machines at rate of 4 per hour. The fast repairman demands Rs.10 per hour and service at the average rate of 6 per hour. Which repair man should be hired? **(4)**

a) A firm owns facilities at six places. It has manufacturing plants at places A, B and C with daily production of 50, 40 and 60 units respectively. At point D, E and F it has three warehouses with daily demands of 20, 95 and 35 units respectively. Per unit shipping costs are given in the following table. If the farm select Vogels Approximation Method to get transportation cost since it gives least transportation cost. Find out the transportation associated with Vogels Approximation Method. **(8)**

		Warehouse		
		D	E	F
Plant	A	6	4	1
	B	3	8	7
	C	4	4	9

(b) Express the following LPP into standard form. **(4)**

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to: $2x_1 - 3x_2 \leq 3$

$X_1 + 2x_2 + 3x_3 \geq 5$

$3x_1 + 2x_3 \leq 2$

Where $x_1, x_2 \geq 0$ and x_3 is unrestricted.

2. (a) Explain with example the inference rules of predicate calculus. (5)

(b) What are the two simple heuristic functions used in n-Puzzle problem? Explain with example. (4)

(c) Represent the following sentences in conceptual dependency. (3)

i) Ram took the book from Sita.

ii) The plants grew.

iii) Rosy is short.

3. (a) Explain how production of water jug problem is made. Write some of the production rules of the general water jug problem. (6)

(b) Represent the following sentences in First Order Logic. (3x2=6)

i) Gold and silver ornaments are precious

ii) No person likes a teacher unless the teacher is smart.

iii) Jack and Jill went up the hill.

3. With the help of an example, write K-Means clustering algorithm. **(12)**

4. What is Normal Density. Explain the two types of normal density with diagram. **(2+10=12)**

5. Explain in details Single linkage algorithm and Complete linkage algorithm.**(12)**

6. Write and explain the difference between parametric and non-parametric estimation. **(12)**

7. What is learning and adaptation? Explain the uses of Pattern Recognition. **(4+8=12)**

8. What is Minimum-Error Rate classification? Explain in details. **(12)**

2. Solve the following Transportation (12)

Model	1	2	3	4	Supply
1	10	2	20	10	15
2	12	7	9	20	25
3	4	14	16	18	10
Demand	5	15	15	15	

3. a) Solve the following LPP by Simplex Method. (8)

Maximize $Z = 5x_1 + 4x_2$

Subject to
$$6x_1 + 4x_2 \leq 24$$
$$x_1 + 2x_2 \leq 6$$
$$-x_1 + x_2 \leq 1$$
$$x_2 \leq 2$$
$$x_1, x_2 \geq 0$$

b) Solve the following Assignment Model. (4)

	A	B	C
I	15	10	9
II	9	15	10
III	10	12	8

4. a) Solve the following game graphically . **(6)**

PLAYER A	PLAYER B B_1	B_2	B_3	B_4
A_1	2	1	0	-2
A_2	1	0	3	2

b) A company operating 50 weeks in a year is concerned about its stocks of copper cable. This costs £ 240 a metre and there is a demand for 8000 metres a week. Each replenishment costs £ 1050 for administration and £ 1650 for delivery, while holding costs are estimated at 25% of value held a year. Assuming no shortages are allowed, what is the optimal inventory policy for the company. **(6)**

5. Solve by two phase method **(12)**

$$\text{Minimize } Z = 4x_1 + x_2$$
$$\text{Subject to } 3x_1 + x_2 = 3$$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 4$$
$$x_1, x_2 \geq 0$$

6. a) Explain in brief the Evolution of digital mobile system. (6)

b) Explain Long- distance path loss mechanism. (6)

7. a) Explain in brief GSM (Global System for Mobile Communications) (6)

b) Explain the Brewster angle with illustrate diagram. Calculate the Brewster angle QB for a wave impinging on poor ground, having a permittivity of Er = 4 at the frequency of 100 MHZ. Also calculate the same for typical ground with permittivity of Er = 15 (6)

8. a) Differentiate knife-edge and multiple knife-edge diffraction model. (4)

b) Mention in brief the different Multiple access techniques. (8)

**********V/MCA/532/3**********

6. (a) Construct the dual to the primal problem (4)

Maximize $Z = 3x_1 + 5x_2$

Subject to :

$2x_1 + 6x_2 \leq 50$

$3x_1 + 2x_2 \leq 35$

$5x_1 - 3x_2 \leq 10$

$x_2 \leq 20$

$X_1, X_2 \geq 0$

(b) A building firm possesses four cranes each of which has a distance(km) from four different construction sites as shown in the table:

		Construction Site			
		S_1	S_2	S_3	S_4
Crane	C_1	5	7	11	6
	C_2	8	5	9	6
	C_3	4	7	10	7
	C_4	10	4	8	3

Place the cranes (one for each construction sites) in such a way that the overall distance required for the transfer is as small as possible. (8)

7. (a) Consider the inventory system with the following data in usual notations: R=1,000 units/year, I = 0.30, P = Re. 0.50 per unit, C_3 = Rs. 10, L = 2 years (lead time) and C_1 = IP. Determine (3)

(i) Optimal order Quantity,

(ii) Re-order point,

(iii) Minimum average cost.