This question paper contains 5 printed pages.]

1807 *Your Roll No. .....*

B.Sc. (H) Computer Science / VI Sem. A

Paper – 605 (i) : ARTIFICIAL INTELLIGENCE

(Admissions of 2001 and onwards)

Time : 3 Hours *Maximum Marks : 75*

(Write your Roll No. on the top immediately on receipt of this question paper.)

*Attempt **all** questions.*

All parts of a question must be answered together.

1. (a) What do you understand by heuristic search? How heuristics search is used in AI problem solving. 3

(b) Give an example where Best First search is better than Breadth search. 4

(c) Why is it important that an expert system be able to explain the why and how questions related to a problem solving session? 4

(d) What is unsupervised learning? Describe how supervised learning can be used for pattern recognition. 4

[P.T.O.

2. (a) Find the errors in the following LISP statements and give the output in case there is no error.

(i) -> (listp 'e a)

(ii) ->(lessp 6 7 2 9 3)

(iii) ->(append 'a '(e g)) 3

(b) Write an iterative function in LISP name SUM–ALL using 'do' statement that takes an integer N as argument and returns the sum of the integers from 1 to N. 4

(c) Prove that if A and B are two independent events then P(A) (B) = P(A). 3

3. (a) Determine whether each of the following sentence is : 4

(i) Satisfiable

(ii) Contradictory

(iii) Valid

S1: $P \rightarrow Q \rightarrow \sim P$

S2: $(p\&q)V\sim (P\&Q)$

S3: $(pVq) \rightarrow (P\&Q)$

S4: $pVq \& \sim pV\sim Q \& P$

(b) Comment on the following statements giving justifications for your answers: 3+3

(i) A* always guarantee an optimal solution for a minimization problem.

(ii) AO* algorithm ensures that it does not get stuck into an infinite loop while generating successors in a graph.

4. (a) Solve the given crypt-arithmetic problem using constraint satisfaction. 5

$$\begin{array}{r} \text{TWO} \\ +\,\text{TWO} \\ \hline \text{FOUR} \end{array}$$

(b) Explain any two situations where a Hill climbing algorithm may fail to find a solution. How can we deal with these situations? 5

5. (a) Transform the following formula to clausal form:

$\forall \times \forall y\,(\exists\, z\, P(x, z)\ \&\ P(y, z)) \rightarrow \exists\, u\, Q(x, y, u)$ 3

(b) Translate the following sentences into clausal form and use resolution technique to draw the required inference. 5

S1: Some patients like all doctors.

S2: No patient likes any quack.

Conclusion: Therefore, no doctor is a quack.

(c) Given the joint distribution of x_1, x_2, x_3, x_4, x_5, and x_6 as a product of the chain conditional probabilities as:

$P(x_1, \ldots x_6) = p(x_5 \mid x_1, x_2, x_3)\ p(x_6 \mid x_1, x_4)$ $P(x_4 \mid x_1) p(x_2 \mid x_1)\ p(x_3) p(x_1)$

Provide the causal network to represent the above joint distribution. 2

6. (a) Transform the following sentences into conceptual graph: 2+2

(i) Sam gave Mary a box of candy.

(ii) Charlie drove the pickup fast.

(b) Create a movie script using the script syntax. The script must be named and specify the track, roles, entry conditions, props, different scenes and the results. The script should describe the scenes for movie ticket purchase and entry of the buyer in the movie hall. 6

7. (a) Consider the following assertions written in Modal logic for the given knowledge base : 4

S1 : (Sam is a man)

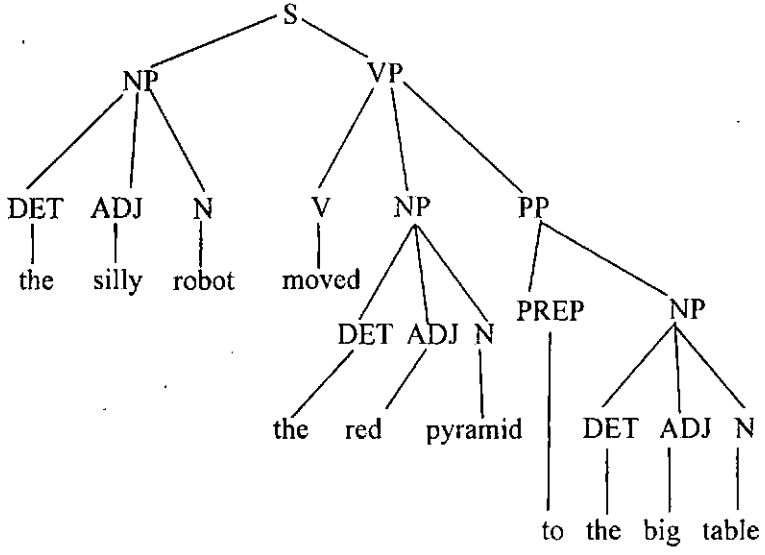
S2 : M(Sam is a child)

S3 : L[(Sam is a child)$\rightarrow$L ~ (Sam is a child)]

S4 : L[(Sam is a man) $\rightarrow$ (Sam is a child)]

Use Modal logic axioms and prove that : ~ (Sam is a child).

(b) Given the following parse tree, write down the corresponding context free grammar. 2+4



Also draw an Augmented Transition Network to implement the grammar for the parse tree.