Visva-Bharati
B.Sc. Examination, 2022
Semester–VI
Computer Science
Course: CC-13T (Artificial Intelligence)

Time: 3 hours **Full Marks: 40**

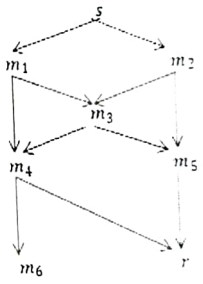
Questions are of values indicated in the margin
Answer question 1 and any four from the rest

1 a) Distinguish between procedural and logical programming.
b) Distinguish between well formed formula (wff) in propositional logic and in first order predicate logic.
c) Define validity and inconsistency of a wff.
d) Find the minimum possible number of static evaluations required to solve a game tree. [2×4]

2 a) What are the advantages and limitations of using formal logic as a language of AI?
b) Obtain the DNF of $(P \vee \sim Q) \rightarrow R$.
c) Obtain the CNF of $(P \wedge (Q \rightarrow R)) \rightarrow S$. [4+2+2]

3 a) Write A* algorithm and discuss its limitations .
b) Distinguish between α-cuts and β-cuts. [5+3]

4 a) For the following graph find the path from s to r using an algorithm. Write down the algorithm that you have used.



[4+4]

b) Compare and contrast DFS and BFS.

5 a) Given that if the Convention refuses to enact new laws, then the strike will not be over unless it lasts for more than one year and the President of the firm resigns. Will the strike be not over if the Convention refuses to act and the strike just starts?
b) Show that for the following statement F_2 is a logical consequence of F_1.
$F_1 \triangleq$ Jim cannot be a good student unless he is smart or his father supports him
$F_2 \triangleq$ Jim is a good student if and only if his father supports him [4+4]

6 a) A farmer has a wolf, a goat and a cabbage on the left bank of a river. He also has a boat that can carry at most one of the three and he must transport this trio to the right bank. The problem is that he cannot leave the wolf with the goat or the goat with the cabbage. Draw a state-space graph to show how can he do the transportation.
b) Using α-β pruning find the value at the root of the complete binary tree whose leaves are 15, 16, 14, 17, 19, 20, 18, 19, 10, 7, 9, 6, 8, 27, 25, 26. [3+5]

7 Write short notes on *any two* of the following
i) Red and green cuts
ii) Turing test
iii) Uniform cost algorithm [4×2]

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Answer question 1 and any four from the rest

1 (a) Distinguish between green and red cuts. 2×4=8
(b) Which is more suitable for decision tree, BFS or DFS? Justify.
(c) What is parallel corpora?
(d) What do you mean by anaphora resolution?

2 Explain with the help of an example how the declarative and procedural meanings of a Prolog program show the effects its efficiency. 8

3 (a) Draw the state space graph for the following problem: 4+4=8
Two jugs of capacities eight and five litres with no marking are given. The problem is to measure out exactly four litres from a vat containing enough water. The possible operations are filling up a jar from the vat, emptying a jar into the vat, transferring the contents of a jar into the other until the pouring jar is completely empty or the other jar is completely filled to its capacity.

(b) Suppose, each internal node of a tree having depth 3, has three children (i.e, at depth 1, the number of nodes is 3^1=3; at depth 2, the number of nodes is 3^2=9; and so on). What is the worst case scenario (i.e. no cut - off) with respect to the alpha-beta procedure?

4 Represent the following facts in first order logic 1×8=8
(i) Lucy is a professor
(ii) All professors are people.
(iii) John is the Dean.
(iv) Deans are professors.
(v) All professors consider the Dean a friend or don't know him.
(vi) Everyone is a friend of someone.
(vii) People only criticize people that are not their friends.
(viii) Lucy criticized John.

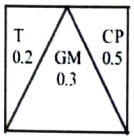
5 (a) Obtain the clausal form of the following: 4+4=8
(i) $\forall x((\forall y\ P(x,y))\rightarrow\sim(\forall y\ Q(x,y)\rightarrow R(x,y)))$
(ii) $\sim\forall x\ \forall y\ (P(x,y)\rightarrow\wedge Q(x,y))$
(b) What are the methodologies for reasoning in an expert system in the presence of inexactness of data and knowledge?

6 (a) Draw the semantic net that represents the following: 4+4=8
Animals can eat, breath and can move. All birds are animals that can fly

and have wings and feathers. Fish are animals that can swim and have gills and fins. Canary is a yellow bird that can sing. Penguin is a bird that cannot fly but can swim. Salomon is a pink fish and is edible. Shark is also a fish that has big fins and eats meat.

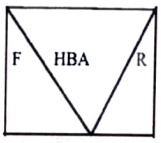
(b) If every AI student is intelligent and Jim is not intelligent, show that Jim is not AI student.

7 (a) Consider the hypothesis space and the evidence space for a medical diagnosis problem. The rules, representing the cause-effect relationship between the evidence space and the hypothesis space, are also given along with the conditional probabilities. Determine the probable disease that the patient bears. 4+4=8



T = Typhoid
GM = German Measles
CP = Chicken Pox

Hypothesis space



F = Fever
R = Rash
HBA = High Body Ache

Evidence Space

(b) Write a program in Prolog to place n queens on a $n \times n$ chess board so that no queen attack each other.
