

SUBJECT: ED549 INTRODUCTION TO ARTIFICIAL INTELLIGENCE

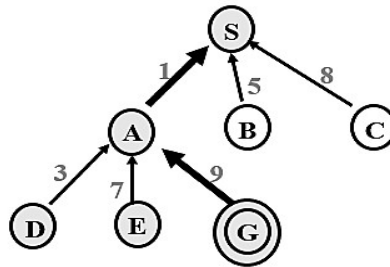
TIME: 3 Hours

FULL MARKS: 50

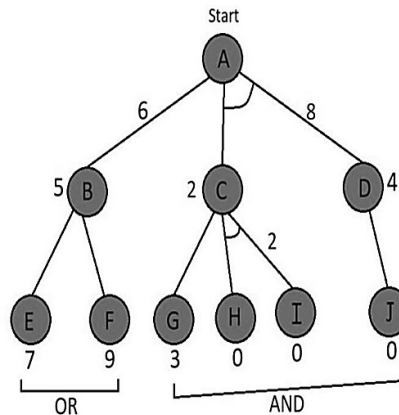
INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q.1(a) Traverse the following network using Depth-First Iterative Deepening (DFID) search technique. Discuss the result in terms of optimality, admissibility and the solution being complete. [5] CO BL
CO1



- Q.1(b) Apply AO* algorithm on the given network. [5] CO1



- Q.2(a) Apply Forward Chaining and Backward chaining from the proposition logic given below. [5] CO2

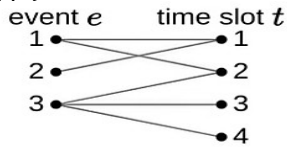
$P \Rightarrow Q$
 $L \wedge M \Rightarrow P$
 $B \wedge L \Rightarrow M$
 $A \wedge P \Rightarrow L$
 $A \wedge B \Rightarrow L$
 A
 B

- Q.2(b) Perform Resolution Refutation on following statement [5] CO2

Tony, Harry and Allen belong to the hoofers club. Every member of the club is either a skier or a mountain climber or both. No Mountain climber likes rain and skiers like snow. Allen dislikes whatever Tony likes and likes whatever Tony dislikes. Tony likes rain and snow. Is there a member in the club who is a mountain climber but not a skier??

Q.3(a) Describe n-Queens Problem. For an Input: $n = 4$ and Output: $[2, 4, 1, 3], [3, 1, 4, 2]$, [5] CO3
create a schematic of the solution of 4-Queens Problem.

Q.3(b) Apply constraint satisfaction algorithm on the following event scheduling [5] CO3



Have E events and T time slots
(C1) Each event e must be put in **exactly one** time slot
(C2) Each time slot t can have **at most one** event
(C3) Event e allowed in time slot t only if $(e, t) \in A$

Q.4(a) A speech recognition system uses the HMM States: T = Talking, S = Silence with following [5] CO4
details.

Initial Probabilities are $P(T) = 0.7, P(S) = 0.3$.		
Transition Probabilities		
From/To	T	S
T	0.9	0.1
S	0.4	0.6
Emission (audio readings):		
State	high	low
T	0.8	0.2
S	0.3	0.7

The observation sequence is given as (high, low, high, high).

Compute the complete Viterbi DP table. Perform backtracking to find the best speech/silence pattern. Explain the result in words.

Q.4(b) Create Language Models (till perplexity of the trigrams) for the following Mini corpus and [5] CO4
describe the significance of each of the models.

<s> I am Sam </s>
<s> Sam I am </s>
<s> I do not like green eggs and ham </s>

Q.5 (a) A sentiment classifier gives the following probability for text: [5] CO5
“The movie was absolutely fantastic and beautifully directed.”

Probability of positive sentiment: 0.93

LIME extracts and perturbs the following words with model predictions:

Sample	Removed Words	Model Prediction	Distance
z_1	fantastic	0.65	0.2
z_2	fantastic, beautifully	0.40	0.35
z_3	absolutely, fantastic	0.55	0.25

Using kernel: $w_i = e^{-d_i}$, Compute weights w_1, w_2, w_3 . Find out which word is most influential and fit a linear model to estimate contributions of the words

- o absolutely
- o fantastic
- o beautifully

Q.5 (b) For the Sentence: “the man saw the man with the telescope”, Apply Following grammar [5] CO5
to Construct the CYK table, identify all possible parses (ambiguous prepositional phrase)
and indicate if parses produce S.

1. $S \rightarrow NP VP$
2. $NP \rightarrow Det N \mid NP PP$
3. $VP \rightarrow V NP \mid V PP$
4. $PP \rightarrow P NP$
5. $Det \rightarrow "a" \mid "the"$
6. $N \rightarrow "man" \mid "telescope"$
7. $V \rightarrow "saw"$
8. $P \rightarrow "with"$