

Birla Institute of Technology & Science, Pilani
Work-Integrated Learning Programmes Division
Second Semester 2019-2020

Mid-Semester Test

(EC-2 Regular)

IS ZC444

Course No.: **IS ZC444**

Course Title: **Artificial Intelligence**

Nature of Exam: **Closed Book**

Weightage: **30%**

Duration: **2 Hours**

No. of Pages = 1

Date of Exam: **06/03/2020 (AN) 2 PM – 4 PM** No. of Questions = 3

Note:

1. Please follow all the Instructions to Candidates given on the cover page of the answer book.
2. All parts of a question should be answered consecutively. Each answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

1. Fill-up the following table (on your answer-sheet):

[marks 10]

Environment or Task	Observable?	Deterministic?	Episodic?	Discrete?	Single-agent?
Robot Maze					
Red Bus web-client					
Mars Rover					
nCoV Spread Prediction					
Aircraft Flight					

2. Suppose an 8-puzzle instance (with a particular initial state) has the optimal solution of 10 moves, and other sub-optimal solutions of 14, 18, 22, 26, and 30 moves as well. Estimate the minimum and maximum number of nodes generated in applying BFS and applying DLS with depth limit $m = 23$. Assume the branching factor b to be 2.5. **[marks 5+5=10]**

3. We model the N-QUEENS problem as a logic programming problem as follows. $Q(i, j)$ means there is a queen in row i , column j . One condition for safety is that a cell (i, j) is safe only if:

$$Safe(i, j) \Rightarrow (\neg \exists k : Q(i, k)) \wedge (\neg \exists k : Q(k, j)) \wedge (\neg \exists k : Q(i+k, j+k) \vee Q(i-k, j+k) \vee Q(i+k, j-k) \vee Q(i-k, j-k))$$

wherein \neg means “there does not exist one”. Write this safety condition in plain english and calculate how many propositions it encodes, if we instantiate the condition to every possible value for k , given $i = j = \frac{n}{2}$. Give the calculation in terms of n . **[marks 5+5=10]**

END.