RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Information and Communication Technology
Third Year - Semester I Examination – June/July 2018

ICT 3212 – INTRODUCTION TO INTELLIGENT SYSTEMS

Time: Two (2) hours

Answer All Questions.

1. Question 01 (30 marks)

   a) Briefly explain the **four** major capabilities a computer should possess to pass the Turing test. (4 marks)

   b) An agent with a table-driven agent program has **10** possible percepts and it receives new percepts once in every **1 second**. If the lifetime of the agent is **4 seconds**, how many entries will there be in the lookup table? (8 marks)

   c) Anti-lock Brake System (ABS) is an intelligent technique which utilizes the static friction to stop a moving car within the shortest possible distance. If the driver pumps the brake pedal, then ABS agent locks the brake and senses the speed of the car. If the speed is greater than 6 km/h then it unlocks the brake. This process is repeated until the pedal is released or the speed becomes below 6 km/h. If the speed gets below the limit while holding the pedal down, the agent will keep the brake locked until the pedal is released.

   Assuming that ABS is performed by a simple reflex agent,

       i.   Find the set of percepts of the agent. (4 marks)

       ii. List down the set of actions that the agent can perform. (4 marks)

       iii. Design a *simple reflex agent function* for the ABS agent. (10 marks)

2. Question 02   **(30 marks)**

    a) Name **one** advantage and one disadvantage of **greedy best first** search algorithm. (6 marks)

    b) Compare and contrast between **uniform cost search** and **A-star (A*) search**
       algorithms.   **(6 marks)**

    c) A robot uses A* search algorithm to find its way to a predefined destination. The
       robot is placed on a grid as shown in *Figure 1*. The robot can move to its **left**,
       right, top or **bottom** neighbor cells which do not contain obstacles (i.e. non-
       shaded cells). The robot can sense the straight-line distance from any of the
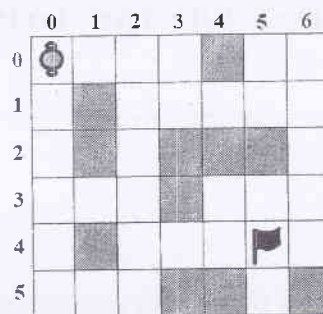   neighbor cells to the destination, which is then used as the **heuristic** of A*.

Figure 1

      i. Show that the heuristic is admissible.   **(8 marks)**

      ii. Draw the search tree to find the path from the current location (0,0) to
           the destined cell (5,4) which contains the flag, using A* algorithm. (10 marks)

3. Question 03   **(20 marks)**

    a) Name **two** limitations of formal logics.   (4 marks)

    b) Distinguish between **propositional** and **first order** logic systems.   (4 marks)

    c) A medical diagnostic system can classify a disease between cardio related and
       non-cardio related disease. The knowledge base contains the following facts about
       the symptoms and the diseases.

         • If there is a *chest pain* and *sweating excessively* then it is a *cardio
           related disease.*

         • If there is a *chest pain* then the person will be *sweating excessively.*

       Given that a patient suffers from a *chest pain*, check whether the query **"is it a
       cardio related disease?"** is **entailed** by the **knowledge base** by using the truth
       table.   (12 marks)

4. Question 04   **(20 marks)**

a) A **biological neuron** consists of four major components namely, *dendrite*, *synapse*, *soma* (cell body) and *axon*. Show the corresponding components of an **artificial neuron** using a suitable illustration.   (4 marks)

b) Compare and contrast between **convolutional neural networks (CNN)** and **conventional neural networks** (ex: multi-layer perceptron).   (4 marks)

c) You are given the following options to solve a set of problems.   (12 marks)

- Artificial Neural Network
- Genetic algorithm
- Formal logic
- Informed search strategies

Suggest the most appropriate method from the **above options**, with a **justification**, to solve each of the following problems.

i. Prepare a timetable to schedule lecture sessions of 100 subjects, which are to be conducted within 25 time slots over a week, at 4 lecture halls without any clashes.

ii. Diagnose the disease based on the intensity of 100 different symptoms found in a patient.

iii. Prevent car theft by providing sound and light alerts on satisfying some conditions namely, door opening without the key and sensing body vibration when the engine is in stopped state.

iv. Find the optimal path based on the travel distance and traffic congestion between two locations for a car GPS system to provide turn-by-turn navigation.

END