UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018

COURSE NAME	:	ARTIFICIAL INTELLIGENCE
COURSE CODE	:	BEC41503
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	DECEMBER 2017/JANUARY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

SECTION A (OBJECTIVE QUESTIONS)
Q1 – Q15 (2 mark each = 30 marks)

Q1 Which search strategy is simulated by the A* search algorithm during h(n) = 0 if one assumes no further restrictions on the cost function g?
a) Depth first
b) Breadth first
c) Uniform cost search
d) None of the above

(2 marks)

Q2 Some essential components of problem solving are problem statement, _____, solution space and operators.
a) complex states
b) intermediate states
c) initial states
d) goal states

(2 marks)

Q3 Which were built in such a way that humans had to supply the inputs and interpret the outputs?
a) Agents
b) AI system
c) Sensor
d) Actuators

(2 marks)

Q4 What is the expansion of PEAS in task environment?
a) Peer, Environment, Actuators, Sense
b) Perceiving, Environment, Actuators, Sensors
c) Performance, Environment, Actuators, Sensors
d) None of the mentioned above

(2 marks)

Q5 What kind of observing environments are present in artificial intelligence?
a) Partial
b) Fully
c) Learning
d) Both a & b

(2 marks)

Q6 Depth-first search is _____ efficient and Breath-first Search is _____ efficient.
a) space, time.
b) time, space
c) time, time
d) space, space

(2 marks)

Q7 Which search uses the problem specific knowledge beyond the definition of the problem?
a) Informed search
b) Depth-first search
c) Breadth-first search
d) Uninformed search

(2 marks)

Q8 Which search uses only the linear space for searching?
a) Best-first search
b) Recursive best-first search
c) Depth-first search
d) None of the above

(2 marks)

Q9 Which of the following problems can be modeled as Constraints Satisfaction Problems?
a) 8-Puzzle problem
b) 8-Queen problem
c) Sudoku
d) All of the mentioned above

(2 marks)

Q10 Consider a problem of preparing a schedule for a class of student. This problem is a type of
a) Search Problem
b) Backtrack Problem
c) Constraints Satisfaction Problems
d) Planning Problem

(2 marks)

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Q11 From which rule does the modus ponens are derived?
  a) Inference rule
  b) Module rule
  c) Both a & b
  d) None of the mentioned above

<div align="right">(2 marks)</div>

Q12 The adjective "first-order" distinguishes first-order logic from _____ in which there are predicates having predicates or functions as arguments, or in which one or both of predicate quantifiers or function quantifiers are permitted.
  a) Representational Verification
  b) Representational Adequacy
  c) Higher Order Logic
  d) Inferential Efficiency

<div align="right">(2 marks)</div>

Q13 Inference algorithm is complete only if,
  a) It can derive any sentence
  b) It can derive any sentence that is an entailed version
  c) It is truth preserving
  d) Both b & c

<div align="right">(2 marks)</div>

Q14 A 3-input neuron is trained to output a zero when the input is 110 and a one when the input is 111. After generalization, the output will be zero when and only when the input is:
  a) 000 or 110 or 011 or 101
  b) 010 or 100 or 110 or 101
  c) 000 or 010 or 110 or 100
  d) 100 or 111 or 101 or 001

<div align="right">(2 marks)</div>

Q15 A 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 10, 5 and 20 respectively. The output will be:
  a) 238
  b) 76
  c) 119
  d) 123

<div align="right">(2 marks)</div>

SECTION B (SUBJECTIVE QUESTIONS)

Q16 Consider the 3-puzzle problem as shown in **Figure Q16**, which is a simpler version of the 8-puzzle where the board is 2 x 2 and there are three tiles, numbered 1, 2, and 3, and one blank. There are four operators, which move the blank up, down, left, and right. The start and goal states are given below. Produce the path to the goal can be found using

Figure Q16: 3 puzzle problem

(a) Breath first search

(10 marks)

(b) Depth first search.

(5 marks)

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(c) A* search

(10 marks)

Q17 Consider the following game tree in which the root corresponds to a MAX node, children are visited left to right, and the values of a static evaluation function are given at the leaves.
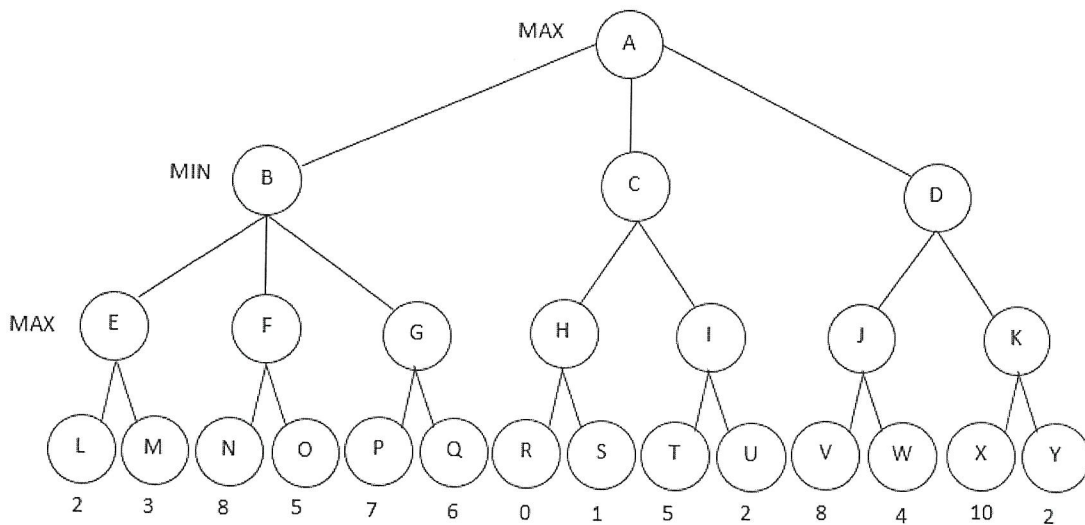

Figure Q17 : Game tree

(a) What are the minimax values computed at each node in this game tree? Produce your answers to the LEFT of each node in the tree of **Figure Q17**

(5 marks)

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(b) If the values at all the leaf nodes in the above tree were changed so as to achieve the maximum possible pruning by Alpha-Beta Pruning algorithm, which nodes would not be examined in this best case scenario? Cross out the nodes not examined in the tree of **Figure Q17**.

(5 marks)

Q18 Express the following sentences in first-order logic

(a) A friend of a friend is a friend

(2 marks)

(b) An enemy's enemy is a friend

(2 marks)

(c) If two people are friends, then they are not enemies

(2 marks)

(d) Any two people are either enemies or friends

(2 marks)

(e) John has a friend.

(2 marks)

Q19 Consider a Perceptron with 3 inputs, x1, x2, x3, and one output unit that uses a linear threshold unit (LTU) as its activation function as shown in **Figure Q19**. The initial weights are w1 = 0.2, w2 = 0.7, w3 = 0.9, and bias w4 = − 0.7 (the LTU uses a fixed threshold value of 0). Hence we have:
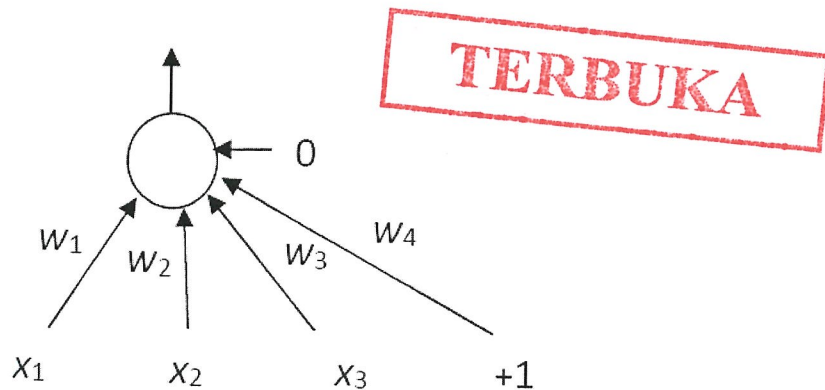

Figure Q19: Perceptron with 3 inputs

Given the inputs $x1 = 0$, $x2 = 0$, $x3 = 1$ and the above weights, this perceptron outputs = 1. Calculate the four (4) updated weights' values after applying the *Perceptron Learning Rule* with this input, actual output = 1, teacher (aka target) output = 0, and learning rate = 0.2.

(5 marks)

Q20   The monkey-and-bananas problem is faced by a monkey in a laboratory with some bananas hanging out of reach from the ceiling. A box is available that will enable the monkey to reach the bananas if he climbs on it. Initially, the monkey is at *A*, the bananas at *B*, and the box at *C*. The monkey and box have height *Low*, but if the monkey climbs onto the box its will have height *High*, the same as the bananas. The actions available to the monkey include *Go* from one place to another, *Push* an object from one place to another, *ClimbUp* onto or *ClimbDown* from an object, and *Grasp* or *Ungrasp* an object. The result of a *Grasp* is that the monkey holds the object if the monkey and object are in the same place at the same height. the following sentences in first-order logic

(a)   Produce the initial state description.

(4 marks)

(b)   Produce the six action schemas.

(16 marks)

- **END OF QUESTIONS** –