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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES
B. Sc (General) Degree
Third Year – Semester I Examination – Sep/Oct 2014
COM 3303 – ARTIFICIAL INTLLIGENCE

Answer Four questions. **Time allowed: three hours.**

1.

(a)Name three inference methods for Proposition Logic.

[12 marks]

(b) Briefly explain followings regarding inference methods:

(i) Soundness

(ii) Completeness.

[18 marks]

(c) Explain inefficiency of truth table enumeration using a suitable example.

[10 marks]

(d) Consider following as a Knowledge Base (KB):

P: if the cigarette production increases then the health statuses of the people in contrary will decrease.

Q:if health statuses of the people in contrary decrease then more health services will be provided.

R:if more health services are provided then economic growth will happen.

(i) Represent above KB using proposition logic.

(ii) Convert above sentences into conjunctive normal form (CNF).

(iii) Using resolution method, prove that 'if the cigarette production increases then economic growth will happen'.

[60 marks]

2.

(a)

(i) Briefly explain 'Turing Test'.

(ii) Consider following question that interrogator may ask from both machine and human in the Turing Test:

Simplify $2345611986546799^{12}*8990346789999900368990456773467889 9$.

What is the difficulty may arise with the above question?

(iii) Propose two methods to overcome the above drawback from the Turing Test.

[30 marks]

(b) Explain advantages of First Order Logic (FOL) over Proposition Logic.

[20 marks]

(c) Consider following as Knowledge Base (KB):

P: Papi is a dog.
Q: Papi eats mango.
R: Every dog is an animal
S: Mango is a fruit.

Prove that 'some animals like some fruits' based on above KB.

[50 marks]

3.

(a) Briefly describe followings:

(i) Artificial Neuron
(ii) Artificial Neural Network (ANN)
(iii) Training data set for feed forward ANN

[15 marks]

(b)Provide training algorithm for single layer ANN.

[20 marks]

(c) Mention two problems with inputs and outputs that cannot be solved using single layer ANN.

[20 marks]

(d) Provide equations for following regarding back-propagation algorithm. Clearly mention meaning of symbols.

(i) For weight updating
(ii) Calculation of delta values for the output layer.
(iii) Calculation of delta values for hidden layers.

[20 marks]

(e) Statistical investigation identified that monthly income of a household can be predicted by following information:

Amount of monthly electricity bill, water bill and telephone bill, Number of members in the household, valve of motor vehicles, valve of the television, flow area of the house.

You need to provide structure of ANN to predict the monthly income of the household using above information. Mention inputs, outputs, layers, neurons for ANN with one hidden layer consist of five hidden neurons.

[25 marks]

4.

(a) Name two inform searching methods and two uninformed searching methods.

[12 marks]

(b)

(i) Compare and contrast Breath First Search (BFS) and Depth First Search (DFS).
(ii) Explain why Prolog uses DFS over other searching methods when find solution to a query.

[20 marks]

(c)

(i) Provide Hill Climbing Search algorithm.

(ii) Mention one advantage and one disadvantage of Hill Climbing Search.

[30 marks]

(d)

(i) Provide two Admissible Heuristic function that might be used with A* search for a selected example.

(ii) Explain how you would identify better Admissible Heuristic function from above two functions.

[28 marks]

5.

(a) Explain the differences between Fuzzy Logic and Binary Logic using a suitable example.

[15 marks]

(b) Explain following with examples.

(i) T-norms

(ii) S-norms

[20 marks]

(c) Figure of Inverted Pendulum is given (**Figure 1**). Angle of the pendulum with the vertical is α .F and v are force applied to the cart and velocity of the pendulum with respect to the cart respectively. Propose is to maintain pendulum vertically by applying suitable force value (F) based on v and α.. F ,v and α may have negative values for opposite direction.

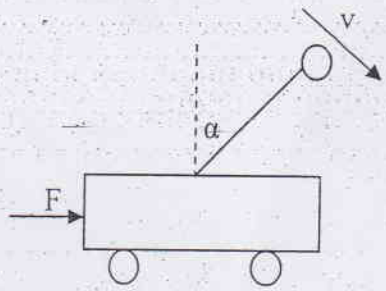

Figure 1

(i) Draw fuzzy membership functions for inputs and outputs. You can select suitable ranges for variables. You need to consider both positive and negative values for variables when you select the range.

(ii) Provide set of fuzzy inference rules to determine F. Mention reasonable assumptions that you made.

[65 marks]