

Name :

Roll No. :

Invigilator's Signature :

**CS/M.Tech (BME)/SEM-3/MBMI-301A/2012-13
2012**

ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer any five of the following. 5 × 14 = 70

1. a) What is supervised learning in Neural Network ? 5
b) What are the shortcomings of Back Propagation Algorithm ? How it can be overcome by Kohonen self-organizing Neural Network ? 2 + 7
2. a) Given the fuzzy rules for an armature controlled D.C. motor :

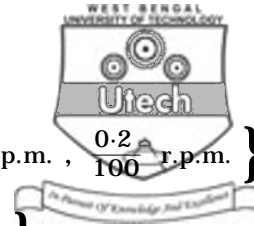
Rule 1 : If armature voltage (aV) is HIGH
then speed is HIGH

Rule 2 : If speed is HIGH
then back emf (b-emf) is HIGH

Rule 3 : If back emf (b-emf) is HIGH
the speed is LOW

For the given motor problem, the following membership distributions are given :

$$\mu_{\text{HIGH}} (aV) = \left\{ \frac{0.2}{2} V, \frac{0.6}{4} V, \frac{0.7}{10} V, \frac{0.9}{12} V \right\}$$



$$\mu_{\text{HIGH}}(\text{speed}) = \left\{ \frac{0.3}{40} \text{ r.p.m.}, \frac{0.6}{60} \text{ r.p.m.}, \frac{0.9}{90} \text{ r.p.m.}, \frac{0.2}{100} \text{ r.p.m.} \right\}$$

$$\mu_{\text{HIGH}}(\text{b-emf}) = \left\{ \frac{0.2}{0.5} \text{ V}, \frac{0.4}{1} \text{ V}, \frac{0.6}{1.5} \text{ V}, \frac{0.9}{2} \text{ V} \right\}$$

$$\mu_{\text{LOW}}(\text{speed}) = \left\{ \frac{0.9}{40} \text{ r.p.m.}, \frac{0.8}{60} \text{ r.p.m.}, \frac{0.4}{90} \text{ r.p.m.}, \frac{0.2}{100} \text{ r.p.m.} \right\}$$

Evaluate implication relational matrices R1 (aV, speed),
R2 (Speed, b-emf), and R3 (b-emf, speed). 3 + 3 + 3

b) Given the membership distribution of armature voltage to be MORE-OR-LESS-HIGH. What would be the distribution of speed to be MORE-OR-LESS-HIGH by using rules 1 and 2 ? 5

3. a) What is fuzzy singleton ? 4

b) What is defuzzifier ? State the significance of centre of area defuzzifier and centre average defuzzifier. 3 + 7

4. a) Give a schematic of evaluation of $\mu_B(y)$ from $\mu_A(x)$, where x denotes age ; y denotes speed ; A_i is fuzzy subset like young, old, very old ; B_i is fuzzy set like slow runner, medium-fast runner, fast runner. 8

b) Develop a continuous membership function for a fuzzy set A = “about 30 years”, B = “about 25 years” from a universal set of possible ages for people. 6



5. What is fuzzy base controller ? Tabulate all the properties of fuzzy set. What are the significance of turing test ? 5 + 6 + 3
6. Describe breadth-first search with an example. How is it different from uniform cost search ? Define fuzzy quantizer. 8 + 3 + 3
7. a) Define back tracking search with a search tree representation. 5
- b) How depth limited search is different from depth first search ? 5
- c) What are the common non-linear functions used for synaptic inhibition ? 4
8. a) Metion all the rule-based methods for uncertain reasoning. 5
- b) Draw a schematic of artificial neural network. Explain how this network balances the threshold of output signal, keeping input features at constant amplitude. 5
- c) Consider 2 universes : $U = \{ 1, 2, 3 \}$ and $V = \{ 2, 3, 4 \}$. Construct $\mu_{\text{EQUAL}} (u, v)$ for $U \in v$ and $v \in V$ and hence determine $R (u, v)$ in matrix form. 4
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