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INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

Date _____ FN/AN, Time: 3 Hrs., Full Marks _____, Department: Agricultural and Food Engineering, No. of Students: 54, End Spring Semester Examination 2011-12, Sub No.: AG60098, Subject Name: Food Process Modeling, IVth Year B. Tech. (H) and DD, Vth Year DD and Ist Year M. Tech. in FPE and R/S

Instruction: Answer any FIVE questions. All questions carry equal marks.

1. In a multilayer feedforward ANN with backpropagation learning there are one input, two hidden and one output nodes in three layers respectively. The magnitudes of input, weight fractions to the hidden layer and the same to the output layer are 0.5, (-0.2 and 0.3) and (0.1 and 0.2) respectively. If learning rate is -0.5, the target output is 0.12 and the transfer functions for the hidden and output layers are sigmoidal and tan sigmoidal respectively then obtain the output after the first cycle of iteration.

2. (a) $A(x) = \{(x_1, 0.2), (x_2, 0.5), (x_3, 0.7)\}$ and $B(x) = \{(x_1, 0.5), (x_2, 0.2), (x_3, 0.6)\}$ then obtain $A \cup B$, $A \cap B$, $A + B$, $A \theta B$ and $A \times B$.

(b) Obtain $C_{ik} = A_{ij} \circ B_{jk}$ where $A_{ij} = \begin{matrix} 0.2 & 0.3 & 0.1 \\ 0.1 & 0.2 & 0.2 \end{matrix}$ and $B_{jk} = \begin{matrix} 0.1 & 0.2 \\ 0.3 & 0.1 \\ 0.2 & 0.1 \end{matrix}$

3. If peaks of normal fuzzy sets for FAR and VERY Far are at 2 and 3m respectively with support of 2 m and the same for AHEAD LEFT and AHEAD are at -45° and 0° respectively with support of 90° then (a) obtain α_i cut for the position of 2.2 m and -5° to the left; (b) draw the firing rule diagram and (c) identify the angular displacement of the robot based on centre of sums method.

2+4+4

4. For pineapple custard the triplet for overall sensory score was (57 32 18). Using similarity values identify the subjective quality (ie. poor/fair/medium/good/very good/excellent) of the custard sample on the standard six – point fuzzy scale.

5. Two similar foods were prepared keeping all the conditions same except the processing techniques. A particular property of these foods was measured. The data observed was as follows –

Process – I	32	31	28	24	44	53	9	35	33	31
Process - II	22	17	34	24	12	29	23	37	21	11

Find –

- Whether these two processes are same
- Reason for so much variation in the numerical values

[2x5 = 10]

6. Derive an equation to find out $Cov(x,y)$. What will be the effect on covariance if –

- the origin is changed,
- ii. Scale is changed.

[4+3+3 = 10]