

**2016**

**M.Sc. 4th Seme. Examination**

**APPLIED MATHEMATICS WITH OCEANOLOGY  
AND COMPUTER PROGRAMMING**

**PAPER—MTM-403**

*Full Marks : 50*

*Time : 2 Hours*

*The figures in the margin indicate full marks.*

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

*Illustrate the answers wherever necessary.*

**( Magneto Hydro-dynamics & Soft Computing )**

**Unit—I**

**( Magneto Hydro-dynamics )**

[ Marks : 25 ]

Answer Q. No. 1 and any two from the rest.

1. Answer any two questions : 2×2
- (a) Define the term magnetic viscosity.
  - (b) What do you mean by Lorentz force?
  - (c) Define magnetic Reynolds number and explain its significance.

*(Turn Over)*

2. (a) State and prove of the Ferrard's law of isorotation.  
 (b) Find the rate of change of magnetic energy in magneto-hydrodynamic. 5+3
3. A viscous, incompressible conducting fluid of uniform density are confined between a channel made by an infinitely conducting horizontal plate  $y = -L$  (lower) and a horizontal infinitely long non-conducting plate  $y = L$  (upper). Assume that a uniform magnetic field  $H_0$  acts perpendicular to the plates. Both the plates are in rest. Find the velocity of the fluid and the magnetic field. 8
4. (a) State and prove Alfv'e's theorem.  
 (b) Find the equations of motion of a conducting fluid. 4+4

**[Internal Assesment : 05 Marks]**

**Unit—II**

**(Soft Computing)**

[ Marks : 25 ]

Answer Q. No. 5 and any *two* from the rest.

5. Answer any *two* questions : 2×2
- (i) Write short note on the "Multi-points cross-over".

- (ii) In which situation fuzzy logic is most suitable.
- (iii) Write some applications of artificial neural network.
- (iv) Distinguish between supervised and unsupervised learning.

6. (i) Explain four fuzzy logical connectives and their truth values with example. 5
- (ii) Let the universe  $X = \{1, 2, 3, 4, 5\}$  and "small integers" be defined as  $\tilde{A} = \{(1,1), (2,0.5), (3,0.4), (4,0.2)\}$ . Let the fuzzy relation  $R$  : "almost equal" is defined as follows :

$$\tilde{R} = \begin{matrix} & \begin{matrix} 1 & 2 & 3 & 4 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix} & \begin{pmatrix} 1 & 0.8 & 0 & 0 \\ 0.8 & 1 & 0.8 & 0 \\ 0 & 0.8 & 1 & 0.8 \\ 0 & 0 & 0.8 & 1 \end{pmatrix} \end{matrix}$$

What is the membership function of fuzzy set  $\tilde{B}$  = "rather small integers", if it is interpreted as the composition  $\tilde{A} \circ \tilde{R}$  ? 3

7. (i) Explain a Single layer neural network and Multi layer neural network. 4
- (ii) Determine the weights of a single layer perceptron network for implementing the logical or by considering bias  $b = 1$ . 4

8. Maximize  $f(x) = 6x - x^2$  in  $[0, 4]$  using real coded GA (one iteration only) given that the population size  $N = 5$ , cross-over probability ( $P_c$ ) = 0.4 and mutation probability ( $P_m$ ) = 0.2.

Initial population :

1.776, 1.380, 2.852, 3.282, 2.132.

Random numbers for selections :

0.56, 0.90, 0.12, 0.46, 0.79

Random numbers for Cross-over :

0.12, 0.45, 0.91, 0.37, 0.49

Random numbers for mutation :

0.13, 0.85, 0.45, 0.96, 0.72

For arithmetic cross-over, parameter ( $\lambda$ ) = 0.37 and for random mutation parameters values permutation ( $\Delta$ ) = 1.11 and random number ( $r$ ) = 0.5.

**[Internal Assessment : 05 Marks]**

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