RNLKWC/P.G./CBCS/IVS/403/22

2022

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

[P.G.]

(M.Sc. Fourth Semester End Examination-2022)

PAPER-MTM 403

Full Marks: 50 ***Time: 02 Hrs***

The figures in the right hand margin indicate marks

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

Illustrate the answers wherever necessary

Unit - I

[Magneto Hydro-Dynamics]

Full Marks: 25

Answer question no 1 and two from the rest

1. **Answer any two questions.** **2x2= 4**

   a) Magnetic pressure.

   b) Magnetic Reynolds number

   c) Laverty force

   d) Hall wrrents

2. A viscous incompressible conducting fluid of uniform density are confined between a channel made by an infinitely conducting horizontal plate $z = -L$ (lower) and a horizontal infinitely long non-

conducting plate $z = L$ (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

3. Show that the magnetic flux having any loop moving with a perfect conducting fluid is constant. 8

4. What is meant by iso-rotation? State and prove Feraro's law of iso-rotation. 8

Internal Assessment - 5

Unit - II

[Stochastic Process and Regression]

Full Marks: 25

1. Answer any two questions : **2x2= 4**

a) Define Markov chain with example. Also, define its order.

b) Define multiple correlation and partial correlation, and indicate how they differ from simple correlation.

c) Define the following states: closed, persistent and transient.

Answer any two questions : **8x2= 16**

2. a) Considering appropriate assumptions derive the probability distribution $\{p_n(t)\}$ for pure birth process when birth rate $n\lambda, n$ be the population size at time t and initial population 1

b) Consider Markov Chain and show that the state 4 is ergodic and what nature will be the other states 4+4

$$\begin{array}{c} \begin{array}{cccc} 1 & 2 & 2 & 4 \end{array} \\ \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ \frac{1}{4} & \frac{1}{8} & \frac{1}{8} & \frac{1}{2} \end{bmatrix} \end{array}$$

3. a) Write transition matrix for the problem of random walk between reflecting barriers.

b) State and prove Chapman-Kolmogorow equation

c) Prove that the state j is persistent iff

$$\sum_{n=0}^{\infty} p_{jj}^{(n)} = \infty$$

2+3+3

4. (a) Deduce the forward diffusion equation for the Wiener process.

(b) Describe Gauss-Markov model for linear estimation.

4+4

Internal Assessment –5
