# M.Sc. 2nd Semester Examination, 2010

## APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

(*Stochastic Process and Regression*)

PAPER—MA-1206

*Full Marks* : 25

*Time* : 1 hour

**Q. No. 1** is compulsory and any **two** questions from the rest

*The figures in the right-hand margin indicate marks*

**1.** Answer any *two* from the following: $2 \times 2$

(*a*) Define order of a Markov chain.

(*b*) What do you mean by periodicity?

(*c*) State Chapman - Kolmogrov equation.

**2.** (*a*) Prove that the state $j$ is persistant or transient according as

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

where $p_{ij}^{(n)}$ is the probability that if reaches from state $i$ to $j$ not necessarily for the first time, after $n$ transitions.

(*b*) Explain the concepts of multiple and partial correlation coefficients. Show that the multiple correlation coefficient $R_{1\cdot 23}$ is, in the usual notations given by

$$R_{1\cdot 23}^2 = 1 - \frac{w}{w_{11}} \qquad 5 + 3$$

**3.** (*a*) Deduce the equation of the plane of regression of $X_1$ on $X_2, X_3, \ldots, X_n$.

(*b*) Suppose that the probability of a dry day (state 0) following a rainy day (state 1) is 1/3 and that the probability of rainy day following a dry day

is 1/2. Find the transition probability matrix and find the probability that May 5 is a dry day if given May 1 is a dry day. 4 + 4

4. (*a*) Define closed set of state.

(*b*) Describe a linear birth and death process. Find the mean population size under this process. 1 + 7

[*Internal Assessment* : 5 Marks]