

2016

**M.Sc. 2nd Seme. Examination**  
**APPLIED MATHEMATICS WITH OCEANOLOGY AND**  
**COMPUTER PROGRAMMING**

**PAPER—MTM-206 (Unit-I)**

*Full Marks : 25*

*Time : 1 Hour*

*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.*

**( Stochastic Process and Regression )**

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

1. Answer any two questions : 2×2
  - (a) Define "Transient" and "ergodic" state.
  - (b) What do you mean by extinction probability ?
  - (c) When is a state of a Markov chain said to be essential ?
  
2. (a) Using an appropriate subscript notation, derive the regression equation of  $x_1$  on  $x_2$  and  $x_3$ .  
(b) State and prove the First Entrance theorem. Hence deduce the expression of  $f_{jk}^{(n)}$ , the probability that it reaches from the state  $j$  to the state  $k$  at  $n^{\text{th}}$  step.

4+4

*(Turn Over)*

3. (a) Show that a state  $i \in s$  of a Markov chain is recurrent if

$$\text{and only if } \sum_{n=0}^{\infty} p_{ii}^{(n)} = \infty.$$

- (b) A system having three states  $U_1, U_2, U_3$  changes its state at times  $t = 0, 1, 2, \dots$ , the matrix of transition probabilities being

$$\begin{bmatrix} 1 & 0 & 0 \\ \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \\ 0 & \frac{1}{2} & \frac{1}{2} \end{bmatrix}$$

If it is certain that the initial state of the system is  $U_1$ , find the probability of (i) the event that the state of the system is  $U_1$  at  $t = 0$ ,  $U_2$  at  $t = 2$  and  $U_3$  at  $t = 3$ ,  
(ii) transition from state  $U_3$  at  $t = 2$  to state  $U_1$  at  $t = h$ .

4+4

4. Considering appropriate assumptions, derive the probability generating function for birth and death process when birth and death rates are respectively  $n\lambda$  and  $n\mu$ ,  $n$  being the population size at time  $t$  and  $\lambda$  and  $\mu$  are the constants. Assume the initial population size is  $i$ . 8

**[ Internal Assessment — 05 ]**

series

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \dots$$

Write a program in C to find out the number of terms which have to be used before first getting the value 3.1415 using a user defined function.

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(Turn Over)

Total Pages—4

C/16/M.Sc./2nd Seme./MTM-206(U-2)

**2016**

**M.Sc. 2nd Seme. Examination**

**APPLIED MATHEMATICS WITH OCEANOLOGY AND  
COMPUTER PROGRAMMING**

**PAPER—MTM-206 (Unit-II)**

**(Practical)**

**Full Marks : 25**

**Time : 1  $\frac{1}{2}$  Hours**

*The figures in the margin indicate full marks.*

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*Illustrate the answers wherever necessary.*

**Lab 2 : ( Language : C Programming )**

**Answer any one question from each group.**

**Group—A**

**8**

- 1. Write a program in C to find the standard deviation of n numbers using dynamic memory allocation.**
- 2. Write a program in C to copy a text file into another destination file after changing the cases of text.**

(Turn Over)

3. Write a program in C to arrange some names in alphabetical order.
4. Write a program in C to find the product of two polynomials.
5. Write a program in C to find out the correlation coefficient for a set of points  $(X_i, y_i)$ ,  $i = 1, 2, \dots, n$ .
6. Write a program in C for printing all triplets  $(a, b, c)$  which satisfies the Pythagoras condition lies between 1 and 50.
7. A file named DATA contains a series of integer numbers. Write a program in C to read these numbers and then write all odd numbers to a file called ODD and all even numbers to a file called EVEN.
8. Write a program in C that will generate a table of first  $n$  integers and identify each as perfect, abundant and deficient.
9. Write a program in C to find the first  $n$  Fibonacci numbers.
10. Write a program in C to find the nature of palindrome of a string.