This question paper contains 4 printed pages.]

Your Roll No. ....

5230

B.A. (Hons.) Programme B

Discipline Centred Concurrent Course

MATHEMATICS – Mathematical Methods

(Other than Economics)

(Admission of 2005 and onwards)

Time : 2 Hours **Maximum Marks : 38**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Note : Question No. 1 is compulsory and carries twelve marks. Attempt **three** more questions selecting **one** question from each of Section I, II, III. Marks are indicated against each part. Use of scientific calculator is allowed.

1. (i) Find the linearization L(x) of function $f(x) = (1 + x)^b$ at x=0 and using the linear approximation $f(x)=L(x)$ estimate $\sqrt[3]{1.009}$. 3

(ii) Find the mean and variance of the probability distribution of the number of heads obtained in four flips of a balanced coin. 3

(iii) Suppose that we want to test, on the basis of a random sample of size n=5, whether or not the fat content of a certain kind of ice cream exceeds 12 percent. What can we conclude about the null hypothesis $\mu=12$ percent at 0.01 level of significance, if the sample has the mean $\overline{x}=12.7$ percent and the standard deviation $\tau = 0.38$ percent ? 3

[t 0.01 for 4 degree of freedom = 3.747]

(iv) Solve the following Linear Programming Problem by graphical method.

Minimize $Z = 2x_1 + x_2$

s.t $5x_1 + 10x_2 \leq 50$

$x_1 + x_2 \geq 1$

$x_2 \leq 4$

$x_1, x_2 \geq 0.$ 3

SECTION-I

2. (i) Apply Newton Raphson method to find the smallest positive root of the equation.

$f(x) = x^4 - x - 10 = 0.$

Perform three iterations. 5

(ii) Solve the following system of equations by using Gauss – elimination method :

$x_1 + x_2 + x_3 = 1$

$4x_1 + 3x_2 - x_3 = 6$

$3x_1 + 5x_2 + 3x_3 = 4$

Use partial pivoting wherever necessary. 5

3. (i) Perform four iterations of the Bisection method to find the smallest positive root of the equation.

$f(x) = x^3 - x - 4 = 0.$ **5**

(ii) Solve the following system of equations.

$5x_1 + x_2 + 2x_3 = 2$

$3x_1 + 4x_2 - x_3 = -2$

$2x_1 + 3x_2 + 5x_3 = 10.$

by using Gauss – Seidel method. Perform two iterations and take the initial approximation as $x^{(o)}=0$. **5**

SECTION-II

4. (i) The following sample data show the demand for a product (in thousands of units) and its price (in ₹) charged in six different market areas :

Price	Demand
18	9
10	125
14	57
11	90
16	22
13	79

Fit a least square line and estimate the demand for the product in a market area where it is priced at ₹ 15. **9**

(ii) If a service club sells 4,000 raffle tickets for a cash prize of ₹ 800. What is the mathematical expectation of a person who buys one of the tickets ? **2**

5\. (i) The actual amount of instant coffee which a filling machine puts into "6 – ounce" jars varies from jar to jar, and it may be looked upon as a random variable having a normal distribution with a standard deviation of 0.04 ounce. If only 2 percent of jars are to contain less than 6 ounces of coffee, what must be the mean fill of these jars ? 9

(ii) If the probability that a research project will be well planned is 0.60 and the probability that it will be well planned and well executed is 0.54, what is the probability that a well planned research project will be well executed ? 2

SECTION-III

6\. Solve the following linear programming problem by simplex method :

Maximize : $x_1 + 1.5\,x_2$

Subject to : $2x_1 + 3x_2 \leq 6$

$x_1 + 4x_2 \leq 4,$

$x_1, x_2 \geq 0$ 5

7\. Solve the following two – person zero – sum game graphically :

		Player II		
		1	2	3
Player I	1	1	3	11
	2	6	5	2

5