This question paper contains 4 printed pages.]

Your Roll No. ....

5284

B.A. (Hons.) Programme　　J

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 Sections I, II, III. Marks are indicated against each part. Use of scientific calculator is allowed.

1. (i) Evaluate $\int_0^3 (2x - x^2)dx$, taking 6 intervals by Trapezoidal Rule. 3

   (ii) If $\lambda = 5.6$ imperfections can be expected per roll of a certain kind of cloth, what is the probability that a roll will have three imperfections ? 3

(iii) The dean of a college wants to use the mean of a random sample to estimate the average amount of time students take to get from one class to the next, and she wants to be able to assert with 95 percent confidence that the error is at most 0.25 minute. If it can be presumed from experience that $\sigma = 1.50$ minutes, how large a sample will she have to take ? 3

(iv) Consider two different types of food stuffs, say F_1 and F_2. Assume that these food stuffs contain vitamins V_1, V_2 and V_3 respectively. Minimum daily requirements of these vitamins are 1 mg of V_1, 50 mg of V_2 and 10 mg of V_3. Suppose that the food stuff F_1 contain 1 mg of V_1, 100 mg of V_2 and 10 mg of V_3 whereas food stuff F_2 contain 1 mg of V_1, 10 mg of V_2 and 100 mg of V_3. Cost of one unit of food stuff F_1 is Re 1 and that of F_2 is Rs. 1.5. Formulate a Linear Programming Problem for the minimum cost diet that would supply the body at least minimum requirements of each vitamin. 3

Section – I

2. (i) Find the iterative method based on the Newton-Raphson method for finding $\sqrt{N}$, where N is a positive real number. 4

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

$$x_1 + x_2 + x_3 = 6$$
$$3x_1 + 3x_2 + 4x_3 = 20$$
$$2x_1 + x_2 + 3x_3 = 13$$

Use partial pivoting wherever necessary. 6

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

$f(x) = x^3 - 5x + 1 = 0$ **5**

(ii) Solve the following system of equations using the Gauss-Seidel method :

$$4x_1 + x_2 + x_3 = 2$$
$$x_1 + 5x_2 + 2x_3 = -6$$
$$x_1 + 2x_2 + 3x_3 = -4$$

Perform two iterations and take the initial approximation as $x^{(0)} = 0$. **5**

Section – II

4. (i) The following sample data show the demand for a product (in thousands of units) and its price (in cents) 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 it 15 cents. **9**

(ii) If the probabilities are 0.06, 0.21, 0.24, 0.18, 0.14, 0.10, 0.04, 0.02 and 0.01 that an airlines office at a certain airport will receive 0, 1, 2, 3, 4, 5, 6, 7 or 8 complaints per day about its luggage handling how much such complaints can it expect per day ? **2**

5. (i) In a study designed to test whether or not there is a difference between the average heights of adult females born in two different countries, random sample yielded the following results :

$n_1 = 120 \quad \bar{x}_1 = 62.7 \quad \sigma_1 = 2.50$

$n_2 = 150 \quad \bar{x}_2 = 61.8 \quad \sigma_2 = 2.62$

Where the measurement are in inches. Use the 0.05 level of significance to test the null hypothesis that the corresponding population means are equal against the alternative hypothesis that they are not equal. **9**

(ii) Express symbolically what general rule is violated in the following assertions :
The probably that a student will get a passing grade in English is 0.72 and the probability that she will get a passing grade in English and French is 0.85. **2**

Section – III

6. Solve the following Linear Programming Problem by Simplex Method :

Maximize : $5x_1 + 3x_2$

Subject to : $3x_1 + 5x_2 \le 15$

$5x_1 + 2x_2 \le 10$

$x_1, x_2 \ge 0$ **5**

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

		Player II		
		1	2	3
Player I	1	2	3	11
	2	7	5	2

5