

[This question paper contains 4 printed pages.]

1133

Your Roll No. ....

**B.A. (Hons.) – II**

**C**

Discipline Centred Concurrent Course

**MATHEMATICS – Mathematical Methods**

(Other than Economics)

(Admissions of 2005 and onwards)

Time : 2 Hours

Maximum Marks : 38

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

*Question No. 1 is compulsory and carries **fifteen** marks.*

*Attempt **three** more questions selecting **one** question  
from each of Sections **I, II** and **III**. Marks are indicated  
against each part. Use of scientific calculator is allowed.*

1. (a) Find the Maclaurin series for the function  
 $f(x) = e^{-x}$ . (3)

(b) If  $X$  is a Poisson variate such that

$$P(X = 2) = 9 P(X = 4) - 90 P(X = 6)$$

Find the mean of  $X$ . (3)

(c) A variate  $X$  has the probability distribution :

$x :$	3	6	9
$P(X = x) :$	$1/6$	$1/2$	$1/3$

Find  $E(X)$  and  $E(X^2)$  and using the law of  
expectation, evaluate  $E((2X + 1)^2)$ . (3)

P.T.O.

- (d) From the data given below, estimate the most likely height of a son whose father's height is 72.6".

	Mean height	S.D. of the heights
Father	67"	3.5"
Son	65"	2.5"

Coefficient of correlation between the heights of father and sons is 0.8. (3)

- (e) The payoff matrix of a two person zero-sum game is

		Player B		
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>
Player A	A <sub>1</sub>	1	2	1
	A <sub>2</sub>	0	-4	-1
	A <sub>3</sub>	1	3	-2

Determine the number of saddle point and the corresponding optimal solutions. Find also the best strategy for each player. (3)

### SECTION - I

2. (a) Evaluate  $\int_0^1 \frac{dx}{1-x}$  using Weddle's rule with seven ordinates. (6)
- (b) Find the iterative method based on the Newton-Raphson method for finding  $1/N$ , where  $N$  is a positive real number. (4)
3. (a) Use Gauss elimination method to solve the following system of equations :

$$\begin{aligned} 2x + 2y + z &= 1 \\ 4x + 2y + 3z &= 2 \\ x + y + z &= 3 \end{aligned} \quad (5)$$

- (b) Perform four iterations of the bisection method to find the root of the equation

$$f(x) = x^3 - x - 1 = 0$$

which lies in the interval (1,2). (5)

### SECTION - II

4. (a) Hearing levels in two groups of school children with normal hearing in frequency of 500 cycles per second was found as follows :

	No. of children	Hearing threshold	S.D.
Group I	62	15.5 dB	6.5 dB
Group II	76	20 dB	7.1 dB

Test if there is any difference between hearing levels recorded in two groups. (5)

- (b) Two cards are drawn from a well-shuffled pack. find the probability that : (i) both are kings, (ii) one king and one queen, (iii) both are spades. (3)
5. (a) Three variables have in pairs simple correlation coefficients given by

$$r_{12} = -0.8, r_{13} = 0.7, r_{23} = -0.9$$

Find the multiple correlation coefficient

$$R_{1,23} \text{ and } X_1 \text{ on } X_2 \text{ and } X_3. \quad (5)$$

- (b) Assume the mean height of soldiers in a normal distribution to be 68.22 inches and S.D. 3.28 inches. How many soldiers in a regiment of 10,000 soldiers would you expect to be over six feet tall.

(Area under the standard normal curve from 0 to 1.15 = 0.3746) (3)

### SECTION – III

6. (a) Solve the following linear programming problem by simplex method :

$$\text{Maximize } z = x_1 + x_2 + 3x_3$$

Subject to the constraints :

$$3x_1 + 2x_2 - x_3 \leq 3$$

$$2x_1 - x_2 + 2x_3 \leq 2$$

$$x_1, x_2, x_3 \geq 0 \quad (5)$$

7. Solve the following game using the dominance principal :

		Player B		
		1	2	3
Player A	1	6	4	5
	2	4	5	4
	3	4	3	1

(5)  
(1200)