2020

MATHEMATICS(HONOURS)

Paper: 3

Full Marks: 50

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
Notations and symbols have their usual meaning.

(Module-V)

Group-A

(Modern Algebra-II)

(Marks 7)

1. Answer any one of the following 7
   (a) Prove that every group of order less than 6 is commutative.
   (b) Prove that a finite integral domain is a field.

Group-B

(Linear Programming and Game Theory)

(Marks 18)

2. Answer any two questions
   (a) Solve the balanced transportation problem 9

	D_1	D_2	D_3	a_i
O_1	8	7	3	60
O_2	3	8	9	70
O_3	11	3	5	80
b_j	50	80	80	

(b) Find basic feasible solution of the system of equations 9

$$x_1 + x_2 + x_3 = 8$$
$$3x_1 + 2x_2 = 18$$
$$x_1, x_2, x_3 \geq 0$$

(c) Use dominance to reduce the pay-off matrix and solve the game with the following pay-off matrix: 9

	B_1	B_2	B_3	B_4
A_1	-5	3	1	20
A_2	5	5	4	6
A_3	-4	-2	0	-5

(Module-VI)

Group-A

(Marks 7)

3. Answer any one of the following 7
   (a) State and prove the Rolle's theorem for differentiation.
   (b) Let $\{x_n\}$ be a monotone decreasing sequence of positive terms such that $\lim_{n\to\infty} x_n = 0$. Then prove that $\sum(-1)^{n-1}x_n$ is convergent.

Group-B

(Marks 18)

4. Answer any two questions
   (a) Find the eigenvalues and corresponding eigenfunctions for the problem 9
   $\frac{d^2y}{dx^2} + \lambda y = 0, (\lambda > 0)$, y'(0)=0, y'($\pi$)=0.
   (b) Solve the following simultaneous equations 9
   $$\frac{d^2y}{dx^2} - 3x - 4y = 0$$
   $$\frac{d^2y}{dx^2} + x + y = 0$$
   (c) Apply the method of variation of parameter to solve the following equation 9
   $$\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} - \frac{1}{x^2}y = logx, (x > 0)$$