PG/IS/ECO/103/23

M.A./M.Sc. 1st Semester Examination, 2023

ECONOMICS

PAPER—ECO-103

Full Marks : 50

Time : 2 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

GROUP – A

I. Answer any **two** of the following questions : 2×2

1. Is non-linear programming technique an improvement over linear programming ? Justify.

2. Consider the following non-linear programming problem and write the Kuhn-Tucker condition for this problem

$$\text{Max } Z = xy$$
$$\text{subject to } P_x x + P_y y \leq m$$
$$x \leq 40$$
$$\text{and } x_1, x_2 \geq 0$$

3. Distinguish linear programming from that of classical optimization technique with the help of an example.

4. Write the Kuhn-Tucker conditions for n choice variables and m constraints' maximization and minimization problems ?

II. Answer any **two** of the following questions : 4×2

5. What is constraint qualification ? What are its requirements ?

6. Give suitable examples of the prevalence of non-linearity in economics.

7. Which method do you think is more advantageous than the others for solving constrained optimization problem and why ?

8. Define injective and surjective functions.

III. Answer any **one** of the following question : 8×1

9. Derive the Kuhn-Tucker condition for a non-linear programming problem of maximization type.

10. Distinguish between Kuhn-Tucker sufficiency theorem and Arrow-Enthoven sufficiency theorem for a maximization problem.

GROUP – B

I. Answer any **two** of the following questions : 2×2

11. Show that the steady state solution of a system of two linear differential equations is asymptotically unstable if the characteristic roots are positive.

12. Define saddle point in a two-person zero-sum game.

13. Distinguish between dynamic game and static game with examples.

14. Explain assurance game with an example.

II. Answer any **two** of the following questions : 4×2

15. Define Nash equilibrium of a game problem. Discuss the problems of Nash equilibrium. $1 + 3$

16. Present a game-theoretic illustration of 'Tragedy of Commons'.

17. Find pure strategy and mixed strategy equilibria for the following game

		Bimal	
		Left	Right
Amal	Top	(1, 2)	(0, 0)
	Bottom	(0, 0)	(2, 1)

18. Explain extensive-form game with suitable example. How can you find subgame perfect equilibrium in this game ? 2 + 2

III. Answer any **one** of the following questions : 8×1

19. Write the necessary conditions for optimisation in optimal control theory. Solve the following optimal control problem : 3 + 5

$$\text{Max} \int_0^2 (2x - 3u)\,dt$$

subject to $\dot{x} = x + u$

$x(0) = 4$ and $x(2)$ is free

20. How can you classify steady states in a system of two linear differential equations on the basis of coefficient matrix and the value of characteristic roots ? Solve and

graph the phase diagram for the following differential equation system : 6 + 2

$$\dot{x}_1 = 2x_1 - 4$$
$$\dot{x}_2 = 3x_2 - 9$$

[Internal Assessment — 10 Marks]
