



Date: 30-04-2025

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 PM

SECTION A – K1 (CO1)

Answer ALL the questions

(5 x 1 = 5)

1 Match the following

- | | | |
|----|--------------------------|--|
| a) | Constrained optimization | - depends on values of exogenous variables |
| b) | Differential equation | - non-singular |
| c) | Difference equation | - Bordered Hessian |
| d) | Matrix inverse | - involving derivatives |
| e) | Comparative Statics | - changes in variables over time |

SECTION A – K2 (CO1)

Answer ALL the questions

(5 x 1 = 5)

2 Answer the following

- | | |
|----|---|
| a) | State the order and degree of the following differential equation
$\frac{d^4y}{dx^4} + x \left(\frac{dy}{dx}\right)^2 - y \frac{dy}{dx} = 0$ |
| b) | Add a slack variable 's' to the following equation at the appropriate place to equalize L.H.S to R.H.S:
$x_1 + x_2 \leq 12$ |
| c) | Write the first order difference equation. |
| d) | What is a Dominated strategy? |
| e) | What is an endogenous variable? |

SECTION B – K3 (CO2)

Answer any THREE of the following in 100 words each.

(3 x 10 = 30)

- | | |
|---|---|
| 3 | Niki holds two part-time jobs, Job I and Job II. She never wants to work more than a total of 12 hours a week. She has determined that for every hour she works at Job I, she needs 2 hours of preparation time, and for every hour she works at Job II, she needs one hour of preparation time, and she cannot spend more than 16 hours for preparation. If she makes \$40 an hour at Job I, and \$30 an hour at Job II,

i. Fit the above information in a table in the correct format.
ii. Formulate a LPP to maximize her income |
| 4 | Examine the following function for maximum or minimum using the Hessian Determinant:
$f(x) = 3x^2 + 2y^2 + 3x - 1$ |
| 5 | Given $S(t) = \alpha y(t)$ and $I(t) = \beta \frac{dy}{dt}$, derive the solution for the Domar Macro model. |
| 6 | If $y = 3x + 5$, find $\Delta^3 y_x$ |
| 7 | Derive the comparative-static equilibrium for the simple Keynesian model of income determination. |

SECTION C – K4 (CO3)

Answer any TWO of the following in 200 words each.

(2 x 12.5 = 25)

8 Prove that $\frac{\delta^2 z}{\delta x \delta y} = \frac{\delta^2 z}{\delta y \delta x}$ for $Z = 8x^3 - 6x^3y^2 + 3xy^3 - 7y^2 + 10$.

9 Find the optimal plan for both the players

		Player B			
Player A	Strategies	I	II	III	IV
	I	-2	0	0	5
	II	4	2	1	3
	III	-4	-3	0	-2
	IV	5	3	-4	2

10 Verify that $y = x^3 + c_1x^2 + c_2$ is a solution of $\frac{d^2y}{dx^2} - \frac{1}{x} \frac{dy}{dx} - 3x = 0$

11 Explain the procedure for general comparative static analysis in case of one endogenous variable(x) and one exogenous variable (α).

SECTION D – K5 (CO4)

Answer any ONE of the following in 500 words

(1 x 15 = 15)

12 Illustrate the concepts of border and interior solutions with relevant diagrams. (Diagram & explanation)

13 Derive the equilibrium solution for the general Cobweb model:

$$q_t = \alpha + \beta p_{t-1}$$

$$p_t = \gamma + \delta q_t$$

SECTION E – K6 (CO5)

Answer any ONE of the following in 1000 words

(1 x 20 = 20)

14 Find the optimum of the function $f(x, y) = 5x^2 + 6y^2 - xy$ under the condition that $x + 2y = 24$.

15 Solve using simplex method:

$$\text{Maximize } z = 30x + 40y$$

subject to

$$2x + y \leq 10$$

$$x + y \leq 7$$

$$x + 2y \leq 12$$

$$x_1, x_2 \geq 0$$
