QP CODE: 22001409

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Reg No : .....

Name : .....

M A DEGREE (CSS) EXAMINATION, JULY 2022

First Semester

CORE - EC010105 - MATHEMATICAL METHODS FOR ECONOMIC ANALYSIS

M A Economics, MA Business Economics

2019 ADMISSION ONWARDS

ABD78733

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Define a unit matrix. Write the unit matrix of order 4.
2. State the conditions for equality of two matrices.
3. Solve the following linear equations using Cramer's rule
   $x + 2y = 3$
   $3x + y = 4$
4. Find the value of $\lim_{x \to 2} \frac{x-2}{x^2-4}$ using L'Hospital rule.
5. Show that $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$ for the function $z = 6xy - 12$
6. Find $\int 3e^x dx$.
7. Write any three properties of definite integral.
8. Solve the differential equation $3\frac{dy}{dx} - 3x = 0$.
9. Define objective function of an LPP.
10. Define slack variable.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Find the determinant of the matrix $A = \begin{bmatrix} 2 & 5 & -3 \\ 0 & 1 & 9 \\ 9 & -5 & 8 \end{bmatrix}$.

12. Define adjoint of a matrix. Find the adjoint of the matrix $A = \begin{bmatrix} 3 & -8 \\ 2 & 9 \end{bmatrix}$

13. Find the second order derivative of (i) $y = 5x^3 - 2x^2 + 6$ (ii)$y = \dfrac{x}{x^2 - 1}$

14. Verify Euler's theorem for the function $z = x^3 + 5y^3 - 2x^2y + 3xy^2$

15. Define price elasticity of demand. Find the price elasticity of demad for the function $Q = 14 - 5P$.

16. Find (i) $\int xlog(x)dx$ (ii) $\int (x^2 - 2)(3x + 5)dx$

17. If the demand and supply function of a commodity are given as $P = 60 - 0.6Q$ and $P = 20 + 0.2Q$, calculate the equilibrium price and quantity. Also calculate the consumer surplus at equilibrium.

18. Explain the concept of shadow price.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Describe Input-Output analysis and derive the formula for calculating output.

20. (i) Define Maxima and Minima of a function. Explain the the methd of finding it for a function of the form $y = f(x)$.
    (ii) FInd the optimum values of the following functions
    (a) $f(x) = x^3 - 15x^2 + 63x + 10$ (b) $f(x) = x^3 - 27x + 10$

21. (i) Derive the difference equation of Cobweb economic model.
    (ii) The demand and supply functions for a good at time t are given as $Q_{d,t} = 120 - 3P_t$ and $Q_{s,t} = -45 + 1.3P_{t-1}$.
    (a) State the equilibrium condition and hence deduce a difference equation in P.
    (b) Solve the difference equation to find the equilibrium price and quantity.

22. Solve the following LPP using graphical method.
    Maximise $3x_1 + 4x_2$
    Subject to $3x_1 + 2x_2 \leq 6$
    $x_1 + 4x_2 \leq 4$
    $x_1 \geq 0, \quad x_2 \geq 0$

(2×5=10 weightage)