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D5BEC2202 **Reg. No.....**

Name: .....

FIFTH SEMESTER BA DEGREE EXAMINATION, NOVEMBER 2024
(Regular/Improvement/Supplementary)

ECONOMICS
GECO5B08T: MATHEMATICS FOR ECONOMICS

Time: 2 ½ Hours **Maximum Marks: 80**

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 25 marks)

1. Explain how a parameter differs from a variable with suitable examples.
2. A company finds that its profit (P) is related to the number of units sold X by the equation P=5x−20. Interpret the slope and intercept in this context.
3. Explain the relationship between exponential and logarithmic functions. How are these functions inverses of each other?
4. Evaluate the $limit_{x\to 3}\ 3(2x+5)$.
5. Define a skew symmetric matrix with suitable example.
6. Given the matrix $A = \begin{bmatrix} 2 & 3 & -1 \\ 4 & -2 & -1 \\ 0 & 5 & 2 \end{bmatrix}$, calculate its determinant.
7. Define the adjoint of a matrix. Find the adjoint of $D = \begin{bmatrix} 3 & 2 \\ 5 & 4 \end{bmatrix}$.
8. Explain what is meant by a function being continuous at a point x = a.
9. Determine the derivative of the exponential function $f(x)=a^x$, where a is a positive constant, and discuss the significance of this derivative.
10. Identify the point of inflection for the function $f(x) = x^3 - 3x$.
11. Determine whether the following function is homogeneous and find its degree:
$$f(x,y) = 3x^2y - 2xy^3$$
12. Compute the Jacobian determinant of the transformation, $F(x,y) = (xy, x^2 + y^2)$ at the point (2,3).
13. What is cross partial derivatives? Find the cross of the function partial derivative of the function $Z = f(x,y) = x^2y + 2xy^2$.
14. Compute the indefinite integral of $\int 3x^2 + 5x + 2$.
15. Apply the integration by parts rule to find $\int xe^x\, dx$.

(PTO)

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 35 marks)

16. Compare and contrast quadratic and cubic functions. Provide examples of each type of function. Also explain how their respective graphs differ.
17. Evaluate 5A − 3B when $A = \begin{bmatrix} 1 & -3 \\ 4 & 7 \end{bmatrix}$, and B= $\begin{bmatrix} 1 & -3 \\ 4 & 7 \end{bmatrix}$.
18. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, and determine whether its columns are linearly independent.
19. Differentiate the following function:

$$y = \frac{3x^2 + 4x + 5}{x(x^2 - 1)}$$

20. Determine the local maxima, minima, and points of inflection for $y = x^3 - 3x^2 + 4$.
21. Verify Euler's theorem for the function $f(x, y) = x^3 + 2x^2y + y^3$.
22. Given the function $Z = f(x, y) = x^2y + y^3x$, find the first and second-order total differentials of Z.
23. Determine the producer surplus if the supply function is $P = 5 + 2Q$ and the market price is $P = 25$.

SECTION C: Answer any *two* questions. Each question carries *ten* marks.

24. Find the local extrema of the function $Z = f(x, y) = x^2 + y^2 + 4x - 6y + 9$.
25. Solve the following system of equations using Cramer's Rule:

$$2x+3y-z=7$$
$$4x+y+2z=43$$
$$x+2y+z=5$$

26. State and prove properties of determinants with suitable example.
27. Use Lagrange multipliers to find the maximum and minimum values of $f(x, y) = x^2 + y^2$ subject to the constraint $x + y = 1$.

(2 × 10 = 20 Marks)