

FIFTH SEMESTER BA DEGREE EXAMINATION, NOVEMBER 2022
(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. What are exponential function? Draw the graph of an exponential function
2. A firm manufactures a commodity that costs Rs20 per unit to produce. In addition, the firm has fixed costs of Rs2000. Each unit is sold for Rs75. How many units must be sold if the firm is to meet a profit target of Rs14500?
3. What is the relevance of the intercept and slope coefficient in the equation $Y = 1000 + 0.7X$
4. What is meant by transpose of a matrix? State any two properties of transpose of a matrix
5. What is an Idempotent matrix? Prove the feature of Idempotent matrix with an identity matrix of order 2
6. Distinguish between minor and cofactor of element of a matrix.
7. Evaluate the limit $\lim_{x \rightarrow 4} \frac{x^2 - 5x + 6}{x^2 + 4}$
8. Differentiate $e^{2x-1} + \log(1 - x^2)$
9. Explain how convexity and concavity of functions are checked.
10. What is homogenous function? Also check the homogeneity of the function $Z = \frac{a^2}{b^2} + \frac{b^2}{a^2}$
11. What is Jacobian determinant? Under which circumstance it is used?
12. Write down the conditions of optimality under Hessian determinant.
13. Write a note on Euler's Theorem
14. Integrate the function $y = \frac{3q^3}{2} - 10q^{-2} + \frac{10}{q}$
15. Evaluate the definite integrals $\int_{-2}^2 (x - x^3 - x^5) dx$

SECTION B: Answer the following questions. Each carries five marks.
(Ceiling 35 Marks)

16. Solve the equation

$$\left[X - \frac{1}{X}\right]^2 + 7\left[X - \frac{1}{X}\right] = \frac{51}{4}$$

17. What is an Idempotent matrix? Check whether the following matrix is Idempotent or not

$$A = \begin{bmatrix} -6 & 2 & -3 \\ 4 & -8 & 2 \\ 5 & -6 & 8 \end{bmatrix}$$

18. What are partial derivatives? Examine the maximum and minimum values of the function $Z = -16x^3 + 2x^2y^{-2} - 12x^{-2} + 5y^2 + 10$
19. Find the inverse of the following matrix

$$A = \begin{bmatrix} -6 & 2 & -3 \\ 4 & -8 & 2 \\ 5 & -6 & 8 \end{bmatrix}$$

20. Find the maxima of the function $y = 4e^x + e^{-x}$

(PTO)

21. Determine whether the function $F = -3x^3 + 3xz + 2y - y^2 - 3z^2$ possess either maximum or minimum value using Hessian determinant
22. Find the total differential of the function $z = (x + 2y)(2x - 2y)$
23. Suppose that the equation of demand curve $P = 50 - 0.1Q$ and the supply curve is $P = 0.2Q + 20$. Find the equilibrium price and also compute the consumer and producer surplus

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

24. What is meant by determinant of a matrix? Explain and prove major properties of determinants with suitable example
25. Solve the following system of equations using Cramer's rule

$$\frac{2}{X} + \frac{1}{Y} + \frac{4}{Z} = 16$$

$$\frac{4}{X} - \frac{5}{Y} + \frac{3}{Z} = 7$$

$$\frac{1}{X} - \frac{3}{Y} + \frac{2}{Z} = 14$$

26. A firm has the cost and demand functions as $C = \frac{1}{3}Q^3 - 7Q^2 + 111Q + 50$ and $Q = 100 - P$ respectively. Find profit maximising output and maximum profit at this level of output
27. Find the optimum value of the utility function $U = 10x + 20y - x^3 - y^2$ subject to the conditions that $2x - 3y = 10$

(2 × 10 = 20 Marks)