Reg. No………………………………………. Name…………………………………………………………

B A, B SC, B COM DEGREE END SEMESTER EXAMINATION - APRIL 2025

UGP (HONS.) SEMESTER - 2: DISCIPLINE SPECIFIC COURSE

COURSE: 24UEMSDSC105: DIFFERENTIAL CALCULUS AND APPLICATIONS

(For Regular 2024 Admission)

Time: 2 Hours Max. Marks - 70

(Use of non-programmable scientific calculator is permitted)

PART A

Maximum mark from this part is 10. Each question carries 2 marks.

1. Distinguish between open interval and closed interval. (CO1, U)
2. Define continuity of a function f(x) at a point x= a. (CO1, R)
3. What is meant by price elasticity of supply? (CO2, A)
4. Find $\frac{dy}{dx}$ if $y = 4x^{\frac{3}{4}}$. (CO2, A)
5. State Leibnitz's Theorem. (CO3, R)
6. Find $\frac{\partial u}{\partial x}$ if u = f(x,y) = $x^2 + y^2 - 3xy$. (CO3, E)
7. Write the conditions for maxima of a function y = f(x) (CO4, A)
8. What are the conditions for minima of a function u= f(x,y) (CO4, A)

PART B

Maximum mark from this part is 30. Each question carries 5 marks.

9. Prove that $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n$ = e. (CO1, A)
10. Evaluate $\operatorname{Lim}_{x\to 0}(1-ax)^{\frac{1}{bx}} = e^{\frac{-a}{b}}$. (CO1, A)
11. Differentiate using first principles, $y = x^n$. (CO2, A)
12. Find $\frac{dy}{dx}$ if $y = t^2 - 3t + 2, t = x^2 - 5$. (CO2, E)
13. Find $\frac{dy}{dx}$ if a$x^2 + 2hxy + by^2 = 1$ (CO2, E)
14. Find the total derivative $\frac{du}{dt}$ if u = $x^2 + 2x + y^2$, x = t and y = $\frac{1}{x} = \frac{1}{t}$ (CO3, A)
15. Find the extreme values of the function y = $x^3 - 12x$. (CO4, E)
16. Find all the second order partial derivatives of the function u = f(x,y) = x^2e^y and show that $f_{xy} = f_{yx}$ (CO4, E)

PART C

Maximum mark from this part is 30. Each question carries 15 marks

17. The demand curve for a monopolist is given by $p = f(x) = 100 - x - x^2$ (CO2,A)

    i. Find MR for any level of output.

    ii. What is MR when x = 0 and x = 2

18. Verify Euler's Theorem, if $\mathrm{u} = \mathrm{f(x,y)} = x^2 - xy + 2y^2$. (CO3, An)

19. If $y\sqrt{x^2+1} = \log(x + \sqrt{x^2+1})$, show that (CO3, An)

    i. $(x^2+1)\frac{dy}{dx} + xy - 1 = 0$

    ii. $(x^2+1)\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = 0$

20. Show that y = x + $\frac{1}{x}$ has one maximum and one minimum value and the minimum value is more than the maximum value. (CO4, E)