Reg. No…… Name……

B A, B SC, B COM DEGREE END SEMESTER EXAMINATION - APRIL 2026

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

COURSE: 24UEMSDSC105: DIFFERENTIAL CALCULUS AND APPLICATIONS

(For Regular 2025 and Improvement/Supplementary 2024 Admission)

Time: 2 Hours Max. Marks - 70

(Use of non-programmable scientific calculator is permitted)

PART A

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

1. Define the limit of a function. (CO1 R)
2. Define discontinuity of a function f(x) at a point x= a. (CO1 R)
3. What is meant by income elasticity of demand? (CO2 A)
4. Find $\frac{dy}{dx}$ if $y = \sqrt{(3+2x)}$ (CO2 A)
5. State Euler's Theorem (CO2 R)
6. Find $\frac{\partial u}{\partial x}$ if u = f(x,y) = x^2e^y. (CO2 R)
7. What are the conditions for minima of a function y= f(x,y)? (CO3 An)
8. Find the minimum value of the function y = x^2 – 2x . (CO4 E)

PART B

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

9. Prove that $\lim_{x\to 0} \frac{\log(1+x)}{x}$ = 1. (CO1 A)
10. Prove that $\lim_{x\to 0} \frac{2^{7x}-1}{x} = 7log_e 2$. (CO1 A)
11. Differentiate using first principles, $y = e^x$. (CO2 R)
12. Find $\frac{dy}{dx}$ if $x = \frac{2t}{1-t^2}$ and $y = \frac{2t}{1+t^2}$. (CO2 A)
13. If u = $ax^2 + 2hxy + by^2$, show that $f_{xy} = f_{yx}$. (CO2 A)
14. Show that $xf_x + yf_y = 2, if\ u = f(x,y) = \log(x^2+y^2)$. (CO3 A)

15. Show that y = f(x) = xe^{-x} has no maximum and no minimum at x = 2. (CO4 A)

16. Find the total derivative $\frac{du}{dt}$ of the function u = f(x,y) = $4x^3 + 3x^2y - 2y^3$ if x = $\frac{-1}{t}$

and y = 5 + t. (CO4 E)

PART C

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

17. If η is the price elasticity of demand show that

η = $\frac{AR}{AR-MR}$ at p = 20 (or x =16) for the demand function p = 100 - 5x. (CO2 A)

18. Verify Euler's Theorem, if u = $Ax^{\alpha}y^{1-\alpha}$. (CO3 An)

19. Find all the first and second order partial derivatives of u = $\sqrt{(x^2 + y^2)}$ and show that

i. $f_{xy} = f_{yx}$

ii. $xf_x + yf_y = ku$, Also find k. (CO3 E)

20. Find the maximum and minimum values of the function,

$y = 2x^3 - 15x^2 + 36x + 20$. (CO4 E)