

**B A, B SC, B COM DEGREE END SEMESTER EXAMINATION - APRIL 2026****UGP (HONS.) SEMESTER - 2: DISCIPLINE SPECIFIC COURSE****COURSE: 24UMATDSC102 – GATEWAY TO MATHEMATICS***(For Regular 2025 Admission and Improvement/Supplementary 2024 Admission)*

Time: 2 Hours

Max. Marks - 70

**PART A****(Each question carries 2 marks. A maximum of 10 marks can be scored from this part)**

1. Evaluate  $\int_1^9 \sqrt{x} \, dx$ . (CO 1)
2. State the fundamental theorem of calculus. (CO 1)
3. Write the formula for area between the 2 curves. (CO 2)
4. Evaluate  $\int_1^3 \int_{-1}^1 (4x + 6y) \, dy \, dx$ . (CO 2)
5. Find the first order partial derivatives of  $f(x, y) = 2x^3y^2 + 2y + 4x$ . (CO 3)
6. Find  $\frac{dy}{dx}$ , if  $x^2y^3 + \sin y = 0$ . (CO 3)
7. Define directional derivative. (CO 4)
8. Find the critical points of  $f(x, y) = x^3 + xy + y^2$ . (CO 4)

**PART B****(Each question carries 5 marks. A maximum of 30 marks can be scored from this part)**

9. Evaluate  $\int_{-2}^1 (x^2 - 6x + 12) \, dx$ . (CO 1)
10. Find the area under the curve  $y = x^4$  over the interval  $[-1, 1]$ . (CO 1)
11. Find the arc length of the curve  $y = 3x^{3/2} - 1$  from  $x = 0$  to  $x = 1$ . (CO 2)
12. Find the area of the region enclosed by  $x = y^2$  and  $y = x - 2$  integrating with respect to  $y$ . (CO 2)
13. If  $f(x, y) = y^2e^{x+y}$ , then find  $f_{xyy}$ . (CO 3)
14. Find an equation for the tangent plane and the parametric equation for the normal line to the ellipsoid  $x^2 + 4y^2 + z^2 = 18$  at the point  $(1, 2, 1)$ . (CO 4)
15. If  $f(x, y) = xy$ , then find and interpret  $D_u f(1, 2)$  for the unit vector  $u = \frac{\sqrt{3}}{2}i + \frac{1}{2}j$ . (CO 4)

16. If  $w = xy + yz$ ,  $y = \sin x$ ,  $z = e^x$ , use an appropriate form of the chain rule to find  $\frac{dw}{dx}$ .  
(CO 3)

**PART C**

**(Each question carries 15 marks. A maximum of 30 marks can be scored from this part).**

17. Sketch the region whose area is represented by the definite integral, and evaluate the integral using an appropriate formula from geometry  $\int_0^2 (2 - x) dx$ . (CO 1)
18. Evaluate the double integral  $\iint_R y^2 x dA$  over the rectangle  
 $R = \{(x, y): -3 \leq x \leq 2, 0 \leq y \leq 1\}$ . (CO 2)
19. Locate all relative extrema and saddle points of  $f(x, y) = 3x^2 - 2xy + y^2 - 8y$ . (CO 4)
20. If  $w = \sqrt{x^2 + y^2 + z^2}$ ,  $x = \cos \theta$ ,  $y = \sin \theta$ ,  $z = \tan \theta$ , then use the chain rule to find  $\frac{dw}{d\theta}$   
when  $\theta = \frac{\pi}{4}$ . (CO 3)