

BACHELOR'S DEGREE EXAMINATION, OCTOBER 2025
2025 ADMISSIONS REGULAR
SEMESTER I - MINOR - C (MATHEMATICS)
MT1DSCB101B24 - Ground Roots of Mathematics

Time : 1.5 Hours

Maximum Marks : 50

Part A

Answer all questions. Each question carries 1 mark. (1x10=10)

1. Express the set relation $A \cap B$ using a Venn Diagram. [CO1,Understand]
2. Express the power set of the set $A = \{a, b\}$. [CO1,Understand]
3. Calculate $f(g(0))$ where $f(x) = x + 5$ and $g(x) = x$. [CO1,Understand]
4. Compute $f \circ g(x)$, where $f(x) = x$ and $g(x) = x^2 + 1$. [CO2,Apply]
5. Calculate $\frac{dy}{dx}$, if $y = x + \cos x$. [CO3,Understand]
6. If $y = \frac{2}{x^2}$, then $\frac{dy}{dx} =$ _____.
 a) $\frac{4}{x}$ b) $\frac{-4}{x^2}$ c) $\frac{-4}{x^3}$ d) $\frac{4}{x^3}$ [CO3,Apply]
7. Determine $f'(x)$ where $f(x) = \sqrt{6}x$.
 (a) x (b) 6 (c) 1 (d) $\sqrt{6}$ [CO3,Understand]
8. Identify which critical points of the function $f(x) = 3x^4 + 12x$ are stationary points. [CO4,Understand]
9. Identify the intervals on which the function $f(x) = x^3$ is increasing and the intervals on which it is decreasing. [CO4,Understand]
10. Compare increasing and decreasing functions. [CO4,Understand]

Part B

Answer any 2 questions from the bunch of CO1. Each question carries 5 mark. (5x2=10)

11. Let $A = \{1, 2, 3, 4\}$, $B = \{0, 3, 6\}$ and $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$
 Estimate \overline{A} , \overline{B} , $A \cup B$, $A \cap B$, $A - B$. [CO1,Understand]
12. Estimate A^2 if $A = \{1, 2, a, b\}$. [CO1,Understand]
13. Illustrate using a Venn Diagram the set of vowels V in the English alphabet. [CO1,Understand]

Part B

Answer any 2 questions from the bunch of CO3. Each question carries 5 mark. (5x2=10)

14. Compute $\frac{dy}{dx}$ using implicit differentiation, $3y^2 - \sin y = x^2$. [CO3,Understand]
15. If $xy + y = 1$. Determine $\frac{dy}{dx}$ by implicit differentiation. [CO3,Understand]
16. $f(x) = (x-1)$, $g(x) = \frac{1}{x-1}$. Determine $(f \circ g)(x)$ and $(f \circ g)'(x)$. [CO3,Understand]

Part B

Answer any 2 questions from the bunch of CO4. Each question carries 5 mark. (5x2=10)

17. Illustrate that $f(x) = x^2$ has a relative minimum at $x = 0$. [CO4,Analyse]

18. Deduce the absolute maximum and minimum values of the function $f(x) = 8x - x^2$ on the interval $[0, 6]$.
[CO4,Analyse]
19. Deduce the absolute maximum and minimum values of the function $f(x) = 2x^3 - 15x^2 + 36x$ on the interval $[1, 5]$.
[CO4,Analyse]

Part C

Answer any 1 question from the bunch of CO2. Each question carries 10 mark. (10x1=10)

20. Write the equation of the following shifted graphs.

1. $y = 2x$ shifted 4 units right and 3 units up
2. $x^2 + y^2 = 16$ shifted 2 units down and 4 units left
3. $y = 3x - 5$ shifted 8 units upwards

[CO2,Apply]

21. Let $f(x) = 2x^2 - 1$ and $g(x) = 2x$. Compute the following :

1. $f(x) - g(x)$
2. $f(x) + g(x)$
3. $f(x) \cdot g(x)$
4. $f(x) \circ g(x)$
5. $g(x) \circ f(x)$

[CO2,Apply]