TB25111359H

Reg. No .....

Name .....

BACHELOR'S DEGREE EXAMINATION, OCTOBER 2025

2025 ADMISSIONS REGULAR

SEMESTER I - MINOR - B (MATHEMATICS)

MT1DSCB101B24 - Ground Rocks of Mathematics

Time : 1.5 hours

Maximum Marks : 50

Part A

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

1. Estimate the cardinality of the set { 2,4,6,8,10} [CO1,Understand]
2. Define a singleton set. [CO1,Remember]
3. List the members of the set A = { x| x is a real number such that $x^2 = 1$}. [CO1,Remember]
4. Illustrate $y = x^{-5}$ is an odd function. [CO2,Understand]
5. Estimate $(f - g)(x)$, given $f(x) = 5x + 3$ and $g(x) = x + 3$. [CO2,Understand]
6. Calculate $f(g(0))$ where $f(x) = x + 5$ and $g(x) = x$. [CO2,Apply]
7. If f(x) = $\tan^2 x$, Determine f '(x). [CO3,Apply]
8. Calculate $\frac{dy}{dx}$, if $y = x^2 + sinx$. [CO3,Apply]
9. $y = x \sin x$. Determine $\frac{dy}{dx}$. [CO3,Apply]
10. Identify which critical points of the function $f(x) = 3x^4 + 12x$ are stationary points. [CO4,Understand]

Part B

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

11. Illustrate using a Venn Diagram the set of vowels V in the English alphabet. [CO1,Understand]
12. Estimate the cardinality of the following sets

$A = \{1, 3, 5, 7, 9\}$

$B = \{a, b, c\}$

$A \cup B$

$A \cap B$

$A - B$

[CO1,Understand]

13. Let A ={1,2,3}, B = { x, y}, C = { a , b}. Express as a set a) A x B b) B x C c) A x C d) A x B x C Describe how many elements does A x B x C have if A has m elements, B has n elements and C has p elements.

[CO1,Understand]

Part B

Answer any 2 questions from the bunch of CO2. Each question carries 5 mark. (2x5=10)

14. Determine the domain and range of the function $f(x) = 1 + x^2$. [CO2,Apply]
15. Determine $f(g(2))$ and $g(g(1))$ where $f(x) = 3x + 4$ and $g(x) = 2x - 1$. [CO2,Apply]
16. Compute $f \circ g$ and $g \circ f$ if $f(x) = x - 6$ and $g(x) = 5x$. [CO2,Apply]

Part B

Answer any 2 questions from the bunch of CO3. Each question carries 5 mark. (2x5=10)

17. Illustrate that if $x \neq 0$ then $y = 1/x$ satisfies the equation $x^2y'' + x^2y' - xy = 0$. [CO3,Apply]

18. Determine $\frac{d}{dx}(2x^6 + x^{-9})$ [CO3,Apply]

19. Calculate $\frac{d}{dx}[\sin(1 + \cos x)]$ [CO3,Apply]

Part C

Answer any 1 question from the bunch of CO4. Each question carries 10 mark. **(10x1=10)**

20. (a)Determine the intervals on which $f(x) = x^2 - 3x + 8$ is concave up and concave down.

    (b) Calculate the relative extrema of the function $f(x) = 3x^5 - 5x^3$. [CO4,Analyse]

21. (a)Determine the intervals where the function $f(x) = x^2 + 2x + 1$ is increasing or decreasing.

    (b)Deduce the absolute maximum and minimum values of the function $f(x) = 6x^{4/3} - 3x^{1/3}$ on the interval [-1, 1].

    [CO4,Analyse]