QP CODE: 23104788

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Reg No : ....

Name : ....

B.Sc DEGREE (CBCS) REGULAR/IMPROVEMENT/REAPPEARANCE EXAMINATIONS, FEBRUARY 2023

First Semester

B.Sc Statistics Model I

Complementary Course - MM1CMT05 - MATHEMATICS - DIFFERENTIAL CALCULUS, LOGIC AND BOOLEAN ALGEBRA

2017 Admission Onwards

C8A55058

Time: 3 Hours   Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Find $\lim_{t \to 0} \tan(1 - \frac{sint}{t})$

2. Find the slope of the tangent of the curve $y = x^3 - x^2$ at x = -1

3. Find parameterization for the line segment with end points (-2 ,1) and (3 , 5)

4. Define absolute maximum and absolute minimum of function f(x).

5. Find absolute maximum and minimum values of f (x) = x$^{2/3}$ on the interval [-2 3]

6. Find the function f(x) whose derivative is sinx and whose graph passes through the point (0 ,2)

7. Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ if $f(x, y) = x^2 - xy + y^2$

8. State Mixed derivative theorem for functions

9. Find f_{xx} and f_{yy} for $f(x, y) = x + y + xy$

10. Rewrite the statements without using conditional , 'if it is cold , he wears a hat '

11. Negate $\exists y \exists x \forall z, p(x, y, z)$

12. Define Boundedness laws in Boolean Algebra

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Evaluate   1) $\lim_{v \to 3} \frac{v^3 - 27}{v - 3}$ 2) $\lim_{v \to 2} \frac{v^3 - 8}{v^4 - 16}$

14. If $f(x) = \begin{cases} x^2 & \text{if } x \neq 2 \\ 1 & \text{if } x = 2 \end{cases}$ Prove that $\lim_{x \to -2} f(x) = 4$ using definition of limit

15. Find $\frac{d^2 y}{dx^2}$ at (2, 2) if $x^3 + y^3 = 16$

16. 1)State Rolle' theorem for a function

2) Verify Rolle's theorem for $f(x) = \frac{x^3}{3} - 3x$ on [-3, 3]

17. State the Meanvalue theorem for f(x) and find the point 'c' using it for the function $f(x) = x + \frac{1}{x}$ in [$\frac{1}{2}$, 2]

18. Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ using formulas for $z^3 - xy + yz + y^3 - 2 = 0$ at (1,1,1)

19. Evaluate $\frac{dw}{dt}$ at   t = 1   if w = z- sinxy , x = t , y = ln t , z = e^{t-1}

20. Construct the truth table of $\neg(p \lor q) \to (\neg p \land q)$

21. Check the validity of the argument $p \to q, \neg q \vdash \neg p$

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. 1) By definition prove that derivative of sinx is cosx

2) Find $\frac{dy}{dx}$ if $y = sinxcosx$

3) Find $\frac{d^4 y}{dx^4}$ if y = 9 cosx

23. a) Define increasing and decreasing functions

b)For the function $g(t) = -t^2 - 3t + 3$

1)Find the intervals on which function is increasing and decreasing

2) Identify the function's local extreme values if any, if so where it is

3) Which (if any) extreme values are absolute.

24. If $f(x, y, z) = x^2 + y^2 + 2z^2$

1) Find $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$, $\frac{\partial f}{\partial z}$

2) Find $\frac{\partial f}{\partial t}$ if x = sint , $y = t^2 e^t$, $z = \frac{1}{t}$

3) Find f_{xx}, f_{yy}, f_{zz}

25. Draw the logic circuit of $Y = A'BC' + A'C' + B'C'$ where A,B,C are inputs and write the truth table

(2×15=30)