QP CODE: 24801166

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Reg No : ....

Name : ....

INTEGRATED MSC DEGREE EXAMINATION, FEBRUARY 2024

First Semester

INTEGRATED MSC BASIC SCIENCE-CHEMISTRY

Complementary - ICH1CM05 - MATHEMATICS I -PARTIAL DIFFERENTIATION,MATRICES,TRIGONOMETRY AND PROBABILITY

2020 Admission Onwards

219F9227

Time: 3 Hours | Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Find $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$ and $\frac{\partial f}{\partial z}$ if $f(x,y,z)=ln(x+2y+3z)$.
2. Find $\frac{\partial^2 f}{\partial y^2}$ for the function $f(x,y)=xe^y+y+1$.
3. Draw a tree diagram for $w=f(x,y)$ and $y=\phi(x)$.
4. Define consistent and inconsistent system of linear equations with example
5. Differentiate homogeneous and non homogeneous system of equations with examples
6. Verify Cayley Hamilton theorem for the matrix $A=\begin{bmatrix} 2 & \sqrt{2} \\ \sqrt{2} & 1 \end{bmatrix}$.
7. Prove that $(2i\sin\,\theta)^2(2\cos\,\theta)^3=(x-\frac{1}{x})^2(x+\frac{1}{x})^3$.
8. Show that sin (ix) = i sinh x.
9. Find the real and imaginary parts of $\cos\,(\alpha+i\beta)$.
10. Describe independent events with suitable example.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Find the derivative of $w=2ye^x-ln\,z$ with respect to t along the path $x=ln(t^2+1), y=tan^{-1}t$ and $z=e^t$. Find the derivative at t=1.

12. Find $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial \theta}$ if $w = tan^{-1}\left(\frac{y}{x}\right), x = r\,cos\,\theta, y = r\,sin\,\theta$. Also evaluate $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial \theta}$ at the point $(1, \frac{\pi}{6})$.

13. Find the characteristic roots of the matrix
$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

14. Find any one characteristic vector of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

15. Prove that $\sin^6 \theta = -\frac{1}{32}[\cos 6\theta - 6\cos 4\theta + 15\cos 2\theta - 10]$.

16. Prove that $cosh^{-1}x = log[x + \sqrt{x^2 - 1}]$

17. Show that the sum of the infinite series $\frac{c\,sin\,\theta}{1!} + \frac{c^3 sin\,3\theta}{3!} + \frac{c^5 sin\,5\theta}{5!} + \ldots = sin(c\,sin\,\theta)cosh\,(c\,cos\,\theta)$

18. Explain the difference between deterministic and probabilistic phenomena with real-life examples.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. a) Draw a tree diagram and write chain rule formula for $\frac{dw}{dt}$, if w=f(x,y), x=g(t) and y=h(t).
b) Find the derivative of $w = sin(xy + \pi)$ with respect to t if $x = e^t, y = ln(t+1)$. Also evaluate at t=0.

20. Reduce the matrix into normal form
$$\begin{bmatrix} 3 & -2 & 0 & -1 & -7 \\ 0 & 2 & 2 & 1 & -5 \\ 1 & -2 & -3 & -2 & 1 \\ 0 & 1 & 2 & 1 & -6 \end{bmatrix}$$ into
a. Row reduced form
b. Normal form

21. Find A^{-1}, A^3 and A^4 using Cayley Hamilton Theorem where $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

22. a) Sum the series $cos\alpha + nC_1 cos(\alpha+\beta) + nC_2\,cos(\alpha + 2\beta) + \ldots + cos(\alpha + n\beta)$.
b) Sum the series $sin\,x + \frac{1}{2}sin\,2x + \frac{1}{2^2}sin\,3x + \ldots to\,\infty$

(2×5=10 weightage)