19101021

QP CODE: 19101021

Reg No : .....

Name : .....

B.Sc.DEGREE (CBCS) EXAMINATION, DECEMBER 2018

First Semester

Complementary Course - MM1CMT01 - MATHEMATICS - PARTIAL DIFFERENTIATION, MATRICES, TRIGONOMETRY AND NUMERICAL METHODS

(Common to B.Sc Chemistry Model I, B.Sc Chemistry Model II Industrial Chemistry, B.Sc Chemistry Model III Petrochemicals, B.Sc Electronics and Computer Maintenance Model III, B.Sc Food Science & Quality Control Model III , B.Sc Geology and Water Management Model III, B.Sc Geology Model I, B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications, B.Sc Physics Model III Electronic Equipment Maintenance)

2017 Admission (Reappearance)

E6E89B6C

Maximum Marks: 80 **Time: 3 Hours**

Part A

Answer any **ten** questions.

Each question carries **2** marks.

1. Find an equation for the level surface of the function $f(x,y,z) = \ln(x^2+y+z^2)$ that passes through the point $(-1,2,1)$.
2. If $f(x,y) = x^2 + 5xy + \sin x + 7e^x$, evaluate $\frac{\partial^6 f}{\partial x^3 y^3}$.
3. Find $\frac{dw}{dt}$ at $t=0$ if $w = xy + z,\ x = \cos t,\ y = \sin t,\ z = t$.
4. Find the rank of the matrix $\begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{bmatrix}$
5. Define characteristic root of a square matrix. Give examples.
6. If A is a non-singular matrix with characteristic values 1,3,and 4 then what are the characteristic values of A^{-1}.
7. Prove that $\cos 4\theta = \cos^4\theta - 6\cos^2\theta\sin^2\theta + \sin^4\theta$.
8. Prove that $\tanh(2\theta) = \frac{2\tanh\theta}{1+\tanh^2\theta}$.
9. If x is real, show that $\sinh^{-1} x = \log(x + \sqrt{x^2+1})$.
10. Write the binomial expansion of $(1+x)^n$, when n is a positive integer and when n is a rational number.
11. Find the next two approximations to a real root of the equation $\cos x = 3x - 1$ using the iteration method, if the first approximation is $x_0 = 0.5000$.

12. Give the generalized Newton's formula to find a root of $f(x) = 0$ with multiplicity p.

(10×2=20)

Part B

Answer any **six** questions.

Each question carries **5** marks.

13. Resistors of R_1, R_2 and R_3 ohms are connected in parallel to make an $R-$ohm resistor. Find the value of $\frac{\partial R}{\partial R_2}$ when $R_1 = 30, R_2 = 45$ and $R_3 = 90$ ohms.
14. Find all the second-order partial derivatives of $s(x, y) = x^2 \tan(xy)$.
15. Find the values of $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ at $(2, 3, 6)$ if $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} - 1 = 0$.
16. Obtain the row equivalent matrix of $\begin{bmatrix} 2 & 2 & 2 & 2 \\ 1 & 2 & 3 & 4 \\ 4 & 3 & 2 & 1 \end{bmatrix}$
17. Show that the equations $x - 4y + 7z = 14, 3x + 8y - 2z = 13, 7x - 8y + 26z = 5$ are inconsistent.
18. Expand $\sin^6\theta$ in a series of cosines of multiples of θ.
19. Sum to infinity the series $a\sin\alpha + a^2\sin 2\alpha + a^3\sin 3\alpha + \ldots$ where $|a| < 1$.
20. Find a real root of the equation $x^3 - 2x - 5 = 0$ using the bisection method.
21. Use Newton - Raphson method to obtain a root , correct to four decimal places, of the equation $x^3 + 3x^2 - 3 = 0$, by taking the initial approximation to the root as $x_0 = 1$.

(6×5=30)

Part C

Answer any **two** questions.

Each question carries **15** marks.

22. Solve the system of equations $4x + 2y + z + 3u = 0, 4x + 2y + 4z + 7u = 0, 2x + y + u = 0$
23. 1. Determine the characteristic equation of the matrix $A = \begin{pmatrix} 0 & 1 & 2 \\ 0 & -3 & 0 \\ 1 & 1 & -1 \end{pmatrix}$. Also verify whether this equation is satisfied by A, or not. Hence find A^{-1}.
24. (a) If $\sin(A + iB) = x + iy$ show that $\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1$ and $\frac{x^2}{\sin^2 A} - \frac{y^2}{\cos^2 A} = 1$

    (b) Sum to infinity the series $\frac{c\sin\theta}{1!} + \frac{c^2\sin 2\theta}{2!} + \frac{c^3\sin 3\theta}{3!} + \ldots$
25. Using regula-falsi method, find a real root of the equation $f(x) = x^3 + x - 1 = 0$, near $x = 1$.

(2×15=30)