K22U 3421

Reg. No. : MG22CS.HR17.....

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I Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, November 2022
(2019 Admission Onwards)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
1C 01 MAT-CH : Mathematics for Chemistry – I

Time : 3 Hours

Max. Marks : 40

SECTION – A

Questions **1-5**, answer **any four** questions. **Each** question carries **one** mark.

1. If $x = \cos t$, $y = \sin t$. Find $\frac{d^2y}{dt^2}$.
2. State Rolle's Theorem.
3. Find the rank of the matrix $\begin{pmatrix} 1 & 2 \\ 2 & 4 \end{pmatrix}$.
4. Give an example of an elementary operation.
5. Show that A′ is orthogonal if A is orthogonal.

SECTION – B

Questions **6-15**, answer **any seven** questions. **Each** question carries **two** marks.

6. Find the third derivative of $\frac{x}{(x-1)(2x+3)}$.
7. Given that $y = 2\sin x + 3\cos x$. Prove that $y_2 - y = 0$.
8. Show that $\lim_{x\to 0}\left(\frac{1}{\sin x} - \frac{1}{x}\right) = 0$.
9. Prove that $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \ldots$

P.T.O.

10. Show that the vectors (1, 1), (1, 2) are linearly independent.

11. Find the normal form of the matrix $\begin{pmatrix} 1 & -2 \\ 2 & 1 \end{pmatrix}$.

12. Using Gauss-Jordan method, find the inverse of the matrix $\begin{pmatrix} 1 & 0 \\ -8 & 7 \end{pmatrix}$.

13. Write the curve $y = 3x^4$ in to the linear form.

14. Define the term Scatter diagram.

15. Explain briefly on the method of least squares to fit the straight line $y = a + bx$.

SECTION – C

Questions **16-22**, answer **any four** questions. **Each** question carries **three** marks.

16. If $x = 2\cos t - \cos 2t$, $y = 2\sin t - \sin 2t$, find the value of d^2y/dx^2 when $t = \pi/2$.

17. If $y = \dfrac{ax+b}{x+d}$, show that $\dfrac{y_1 y_3}{y_2^2} = \dfrac{3}{2}$.

18. Verify Cauchy's mean value theorem for the function e^{-x} and e^x in the interval (a, b).

19. Prove that $x \operatorname{cosec} x = 1 + \dfrac{x^2}{6} + \dfrac{7x^4}{360} + \ldots$

20. Using the partition method, find the inverse of $\begin{pmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{pmatrix}$.

21. Solve the system of equations $x + y + z = 3$, $x - y + z = 1$, $-x + y + z = 1$ using Crammer's rule.

22. If P is the pull required to lift a load W by means of a pully block, find a linear law of the form $P = mW + c$ connecting P and W, using the following data.

P = 12	W = 50
15	70
21	100
25	120

SECTION – D

Questions **23-26**, answer **any two** questions. **Each** question carries **five** marks.

23. If $y = e^{m \cos^{-1} x}$, prove that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - (n^2 + m^2)y_n = 0$.

24. Find the value of a and b such that $\lim_{x \to 0} \frac{x(a + b\cos x) - e \sin x}{x^5} = 1$.

25. Test for consistency of the system of linear equations and solve them if consistent :

$x - 2y + 3t = 2$, $2x + y + z + t = -4$, $4x - 3y + z + 7t = 8$.

26. Fit a parabola of the following data :

x	y
0	1
1	1.8
2	1.3
3	2.5
4	6.3