K21U 6803

Reg. No. : ....

Name : ....

I Semester B.Sc. Degree (CBCSS-OBE – Regular/Supplementary/ Improvement) Examination, November 2021
(2019 Admission Onwards)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
1C01 MAT – CS : Mathematics for Computer Science – I

Time : 3 Hours　　　　Max. Marks : 40

PART – A

Questions **1 – 5**. Answer **any 4** questions. **Each** question carries **1** mark.

1. Find the n^{th} derivative of $a_nx^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} +...+a_1x + a_0$.
2. Find the Maclaurin's series expansion of the function sin x.
3. Evaluate $\lim_{x\to 0} \frac{a^x - b^x}{x}$.
4. If the rank of the matrix $\begin{bmatrix} \lambda & 6 \\ 5 & 3 \end{bmatrix}$ is 1, then find λ.
5. Define elementary matrices.

PART – B

Questions **6 – 15**. Answer **any 7** questions. **Each** question carries **2** marks.

6. If x = a (cos t + t sin t) and y = a (sin t – t cos t), find $\frac{d^2y}{dx^2}$.
7. Find the n^{th} derivative of e^{5x} cos x cos 3x.
8. If $y = e^{a \sin^{-1} x}$, prove that $(1 - x^2)y_2 - xy_1 - a^2y = 0$.
9. By Rolle's theorem, show that the equation $12x^5 - 3x^2 - 1 = 0$ has at least one solution in the interval (0, 1).

P.T.O.

10. Expand $\tan^{-1} x$ in powers of $(x - 1)$ upto the term containing $(x - 1)^2$.

11. Evaluate $\lim\limits_{x \to 0}\left(\frac{1}{x} - \frac{1}{e^x - 1}\right)$.

12. Find the inverse of the matrix $\begin{bmatrix} 2 & 4 \\ 3 & -1 \end{bmatrix}$ by Gauss-Jordan method.

13. Are the vectors $x_1 = (1, 2, -1)$, $x_2 = (2, 0, -1)$ and $x_3 = (1, -2, 0)$ linearly dependent ? Justify.

14. Find the values of a, b, c if $A = \begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ is orthogonal.

15. Reduce the law $y = ax^n + b \log x$ into a linear law.

PART – C

Questions **16 – 22**. Answer **any 4** questions. **Each** question carries **3** marks.

16. If $x^3 + y^3 - 3axy = 0$, prove that $\frac{d^2y}{dx^2} = \frac{-2a^2xy}{(y^2 - ax)^3}$.

17. Find the n^{th} derivative of $\frac{x + 3}{(x - 1)(x + 2)}$.

18. Evaluate $\lim\limits_{x \to \frac{\pi}{2}} (\tan x)^{\tan 2x}$.

19. Verify Lagrange's mean value theorem and find the value of c for the function $f(x) = \sqrt{25 - x^2}$ in $[-5, 3]$.

20. Show that the equations $x - y + 4z = a$, $2x - 3y + 8z = b$, $x - 2y + 4z = c$ are consistent only when $b = a + c$.

21. Find the inverse transformation of $y_1 = x_1 + 2x_2 + 5x_3$, $y_2 = 2x_1 + 4x_2 + 11x_3$, $y_3 = -x_2 + 2x_3$.

22. Write the working procedure to fit the parabola $y = a + bx + cx^2$ to a given data.

PART – D

Questions **23 – 26**. Answer **any 2** questions. **Each** question carries **5** marks.

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

24. Find a, b, c so that $\lim_{x \to 0} \frac{ae^x - b\cos x + ce^{-x}}{x \sin x} = 2$

25. Test for consistency and solve : $x - 2y + 3t = 2$, $2x + y + z + t = -4$, $4x - 3y + z + 7t = 8$.

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

P	12	15	21	25
W	50	70	100	120