



K23U 4077

Reg. No. :

Name :

I Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/
Improvement) Examination, November 2023
(2019 Admission Onwards)

COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
1C01 MAT – BCA : Mathematics for BCA – I

Time : 3 Hours

Max. Marks : 40

SECTION – A

Questions 1-5 : Answer **any 4** questions. Each question carries 1 mark. (4×1=4)

1. What is the derivative of $y = x^5 - x^3 + x$?
2. What is the derivative of $y = a^x$?
3. What do you mean by dual of a statement in Boolean Algebra ?
4. What do you mean by rank of a matrix ?
5. State Rouche's theorem in matrices.

SECTION – B

Questions 6-15 : Answer **any 7** questions. Each question carries 2 marks. (7×2=14)

6. Find the derivative of $y = \sec^{-1} x$.
7. If $y = e^{ax} \sin bx$, prove that $y_2 - 2ay_1 + (a^2 + b^2)y = 0$.
8. Find the n^{th} derivative of $y = \cos(ax + b)$.
9. State Leibnitz theorem to find the n^{th} derivative of product of two functions.
10. State any four basic theorems in Boolean Algebra.
11. Let $a, b \in B$, a Boolean Algebra. Prove that $a + b$ is an upper bound for the set $\{a, b\}$.
12. Define normal form of a matrix. Give an example.

13. Find the rank of the matrix $\begin{bmatrix} 1 & 4 & 5 \\ 2 & 6 & 8 \\ 3 & 7 & 22 \end{bmatrix}$.

14. Define an orthogonal matrix. Give an example.
15. Define linear dependence and independence of vectors.

P.T.O.



SECTION – C

Questions 16-22 : Answer **any 4** questions. **Each** question carries **3** marks. (4×3=12)

16. Find $\frac{dy}{dx}$ when $x = 2 \cos t - \cos 2t$, $y = 2 \sin t - \sin 2t$.

17. Find $\frac{dy}{dx}$ when $x^3 + y^3 = 3axy$.

18. Find the n^{th} derivative of $y = e^x \cos^2 x \sin x$.

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

20. Define Boolean Algebra. Give an example.

21. Using Cramer's rule solve the system of equations :

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

22. Find the values of k for which the system of equations

$$(3k - 8)x + 3y + 3z = 0, 3x + (3k - 8)y + 3z = 0, 3x + 3y + (3k - 8)z = 0$$

has a non-trivial solution.

SECTION – D

Questions 23-26 : Answer **any 2** questions. **Each** question carries **5** marks. (2×5=10)

23. If $y^{\cot x} + (\tan^{-1} x)^y = 1$, find $\frac{dy}{dx}$.

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

25. State and prove DeMorgan's Law.

26. Reduce the matrix $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ into normal form and hence find its rank.