

**Third Semester B.C.A. Degree Examination,
October/November 2019**

(CBCS Scheme)

Computer Science

COMPUTATIONAL NUMERICAL TECHNIQUES

Time : 3 Hours]

[Max. Marks : 90

Instructions to Candidates : Answers ALL the Sections.

SECTION - A

Answer any **TEN** of the following :

(10 × 1 = 10)

1. What do you mean by identity matrix?
2. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 4 \\ -6 & 8 \end{bmatrix}$ find $A+B$?
3. Define adjoint of a matrix.
4. State Caley Hamilton Theorem.
5. Define Algebraic structure.
6. Define Tautology.
7. $P = I$ am hungry and $Q = I$ will eat pizza. Write $P \rightarrow Q$.
8. Mention any two rules of negation.
9. Write the nth derivative of e^{7x} .
10. Define interpolation.
11. Write the formula for Newton's Forward Interpolation.
12. Write the formula for trapezoidal rule.



SECTION - B

Answer any **FIVE** questions :

(5 × 3 = 15)

13. Find inverse of the matrix $A = \begin{bmatrix} 1 & -1 & 3 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$.

14. Show that the cube root of unity is a group under multiplication modulo.

15. Construct truth table for $(\sim p \leftrightarrow \sim q) \leftrightarrow (p \leftrightarrow q)$.

16. Write truth table for conjunction and disjunction.

17. Find 'y' value if $x = 4$ using Lagrange's interpolation.

$$x: \quad 1 \quad 3 \quad 5$$

$$y: \quad 11 \quad 13 \quad 16$$

18. Evaluate $f(4)$ using NDDI.

$$x: \quad 0 \quad 2 \quad 3 \quad 6$$

$$f(x) : -4 \quad 2 \quad 14 \quad 158$$

19. Evaluate $\int_0^{\pi/2} \cos x dx$ using Simpson's 1/3 rd rule by taking 6 sub intervals.

SECTION - C

Answer any **SIX** questions :

(6 × 5 = 30)

20. Find Eigen values and Eigen vectors of a matrix $A = \begin{bmatrix} 3 & -2 \\ -1 & 2 \end{bmatrix}$.

21. Solve these equations using Cramer's rule $x - y + 2z = 7$, $3x + 4y - 5z = -5$, $2x - y + 3z = 12$.

22. Show that (z_6, \oplus_6) where $z_6 = \{0, 1, 2, 3, 4, 5\}$ is an Abelian group.

23. Prove that the two compound statements are equivalent $p \rightarrow (q \wedge r) \Leftrightarrow (p \rightarrow q) \wedge (p \rightarrow r)$.

24. Find the n th derivative of $\sin(ax+b)$.
25. Write a program to find roots of an equation using bisection method.
26. Find the roots of an equation $f(x) = xe^x - 2$ using Newton Raphson method in 3 stages.
27. Construct the finite difference table for the function $f(x) = x^3 + x + 1$ where x takes value from 0, 1, 2, 3, 4, 5, 6. Identify the leading forward and backward difference variables.

SECTION D

Answer any **FIVE** questions :

(5 × 7 = 35)

28. Verify Caley Hamilton theorem for matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and find inverse of A .
29. Show that the set $H = \{0, 2, 4\}$ is a subgroup of $G = \{0, 1, 2, 3, 4, 5\}$ under addition modulo 6.
30. (a) Find n th derivative of $y = e^x x^4$. (3)
- (b) If $y = \tan^{-1} x$ then show that $(1+x^2)y_{n+2} + 2xy_{n+1} + (n+1)ny_n = 0$. (4)
31. Find the root of an equation $x^3 - 4x - 9 = 0$ using Secant method in 4 stages.
32. Solve the system of Non linear equations using Newton's method.
 $x^2 - y^2 = 4$, $x^2 + y^2 = 16$ where $x_0 = 1$ & $y_0 = 1$
33. Find the cubic polynomial (2, 4) (4, 56) (9, 711) and (10, 980). Find $f(3)$ and $f(7)$.
34. Evaluate $\int_0^6 \frac{1}{1+x} dx$ using Trapezoidal and Simpson's 3/8th rule by taking 6 strips.

