K20U 0887

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree (CBCSS – Reg./Supple./Imp.) Examination, April 2020
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
4C04 MAT – BCA : Mathematics for BCA – IV

Time : 3 Hours Max. Marks : 40

SECTION – A

All the **4** questions are **compulsory**. They carry **1** mark **each**.

1. A random variable X has the density function $f(x) = \frac{c}{1+x^2}$ $-\infty < x < \infty$. Find the value of the constant c.

2. What is an unbalanced transportation problem ?

3. Define interpolation.

4. Give Euler's iteration formula to solve the differential equation $y' = f(x, y)$ $y(x_0) = y_0$. **(4×1=4)**

SECTION – B

Answer **any 7** questions from among the questions **5** to **13**. These questions carry **2** marks **each**.

5. Find the expectation of the sum of points in tossing a pair of fair dice.

6. Prove that Var(X + Y) = Var(X) + Var(Y).

7. A random variable X has density function given by $f(x) = \begin{cases} 2e^{-2x} & x \geq 0 \\ 0 & x < 0 \end{cases}$.
Use Chebyshev's inequality to obtain an upper bound on $P(|X - \mu| > 1)$.

8. Solve the following linear programming problem graphically,
Minimize $z = 4x_1 + 2x_2$ subject to the constraints $x_1 + 2x_2 \geq 2$, $3x_1 + x_2 \geq 3$, $4x_1 + 3x_2 \geq 6$, $x_1 \geq 0$, $x_2 \geq 0$.

P.T.O.

9. Explain the characteristics of a standard linear programming problem.

10. Find an initial basic feasible solution to the following transportation problem using Matrix minima method.

Market		D_1	D_2	D_3	D_4	Supply
	O_1	1	2	3	4	6
Origin	O_2	4	3	2	0	8
	O_3	0	2	2	1	10
Demand		4	6	8	6	

11. Find a cubic polynomial which takes the following values $y(0) = 1$ $y(1) = 0$ $y(2) = 1$ $y(3) = 10$.

12. Using the data $\sin(0.1) = 0.09983$ and $\sin(0.2) = 0.19867$, find an approximate value of $\sin(0.15)$ by Lagrange interpolation.

13. Solve by Picard's method $y' = x + y^2$ subject to the condition $y = 1$ when $x = 0$.

(7×2=14)

SECTION – C

Answer **any 4** questions from among the questions **14** to **19**. These questions carry **3** marks **each**.

14. The joint density function of two continuous random variables X and Y is $f(x, y) = \begin{cases} cxy & 0 < x < 4; \quad 1 < y < 5 \\ 0 & \text{otherwise} \end{cases}$. Find the value of C and $P(1 < x < 2, 2 < y < 3)$.

15. A basic feasible solution to the following transportation problem is given as $x_{11} = 1$, $x_{12} = 10$, $x_{13} = 3$, $x_{23} = 12$ and $x_{31} = 5$. Is it an optimal solution, if not find an optimal solution.

Destination →		D_1	D_2	D_3	Supply
	O_1	6	8	4	14
Origin	O_2	4	9	3	12
	O_3	1	2	6	5
Demand		6	10	15	

16. Show that $f(x) = x^3 + 4x^2 - 10$ has a root in [1, 2] and use the Bisection method to find a root, correct to three decimal places.

17. Form a table of difference for the function $f(x) = x^3 + 5x - 7$ $x = -1, 0, 1, 2, 3, 4, 5$. Obtain f(6) from the table.

18. Evaluate $\int_1^3 \frac{1}{x} dx$ by Simpson's 1/3 rule with 4 steps.

19. Using Euler's method find y(0.01) y(0.03) given that $y' = -y$ $y(0) = 1$. **(4×3=12)**

SECTION – D

Answer **any 2** questions from among the questions **20** to **23**. These questions carry **5** marks **each**.

20. The probability function of a random variables X $f(x) = \begin{cases} x^2/81 & -3 < x < 6 \\ 0 & \text{otherwise} \end{cases}$.

    Find the probability density function for (a) $U = X^2$ and (b) $U = \frac{1}{3}(12 - X)$.

21. Solve using simplex method
    Maximize $z = x_1 + x_2$ subject to the constraints
    $2x_1 + x_2 \le 4$ $x_1 + 2x_2 \le 3$ $x_1 \ge 0, x_2 \ge 0$.

22. Given $\frac{dy}{dx} = 1 + y^2$ where y = 0 when x = 0. Find y(0.2) and y(0.4) using fourth order Runge Kutta method.

23. From the following table of values of x and y obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.2.

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

(2×5=10)