K17U 0640

Reg. No. : .....

Name : .....

IV Semester B.C.A. Degree (CBCSS – Reg./Supple./Imp.) Examination, May 2017
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
4C04 MAT – BCA : Mathematics for BCA – IV

Time : 3 Hours Max. Marks : 40

SECTION – A

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

1. What is the expected number of heads when we flip 3 fair coins ?
2. What are the two fundamental conditions on which the simplex method is based ?
3. Give the Newton-Raphson iteration formula.
4. What is meant by the forward differences of a function ? **(4×1=4)**

SECTION – B

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

5. A pair of dice is tossed. Let X denote the maximum of the numbers appearing. Find the variance of X.
6. Suppose a random variable X has mean $\mu = 25$ and standard deviation $\sigma = 2$. Use Chebyshev's inequality to estimate $P(X \geq 20)$.
7. A game consists of tossing a fair coin four times. A player wins $ 3 if two or more heads appear; otherwise the player loses $ 4. Find the expected value of the game.

P.T.O.

8. Rewrite in standard form the following linear programming problem :

   Minimize $z = 2x_1 + x_2 + 4x_3$ subject to the constraints :

   $-2x_1 + 4x_2 \leq 4$, $x_1 + 2x_2 + x_3 \geq 5$, $2x_1 + 3x_3 \leq 2$, $x_1, x_2 \geq 0$ and x_3 unrestricted in sign.

9. Give the standard form of a linear programming problem and explain its characteristics.

10. Obtain an initial basic feasible solution to the following transportation problem using the north-west corner rule:

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

11. The function $y = \sin x$ is tabulated below :

x	0	$\pi/4$	$\pi/2$
sin x	0	0.70711	1.0

Using Lagrange's interpolation formula, find the value of $\sin(\pi/6)$.

12. Given $\frac{dy}{dx} = 1 + xy$, $y(0) = 1$, find $y(0.1)$ correct to four decimal places, by Taylor series.

13. Using Picard's method, find $y(0.1)$, given that $\frac{dy}{dx} = \frac{y - x}{y + x}$ and $y(0) = 1$. **(7×2=14)**

SECTION – C

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

14. Let X be a random variable with distribution :

x	1	2	3
P (X = x)	0.3	0.5	0.2

Find the distribution, mean and standard deviation of the random variable $Y = x^2 + 3x + 4$.

15. Maximize $z = 50x_1 + 60x_2$ subject to the constraints :

$2x_1 + 3x_2 \leq 1500$, $3x_1 + 2x_2 \leq 1500$, $0 \leq x_1 \leq 400$, $0 \leq x_2 \leq 400$.

16. Using Newton's forward difference formula, find the sum $S_n = 1^3 + 2^3 + 3^3 + \ldots + n^3$.

17. Use the method of false position to find a real root, correct to three decimal places of the equation, $x^3 + x^2 + x + 7 = 0$.

18. Evaluate $I = \int_0^1 \frac{1}{1+x}\,dx$ correct to three decimal places using both the trapezoidal and Simpson's rules with $h = 0.125$.

19. Given $y' = x - y^2$; $y(0) = 1$, use Taylor's series method to determine $y(0.1)$, correct to four decimal places. **(4×3=12)**

SECTION – D

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

20. Let X be a random variable with the following distribution and let $Y = X^2$:

x	–2	–1	1	2
P(X= x)	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

a) Find the distribution of Y.

b) Find the joint distribution of X and Y.

c) Determine whether X and Y are independent.

d) Find Cov (X, Y) and $\rho(X, Y)$.

21. Use simplex method to solve the following L.P.P. :

Maximize $z = 4x_1 + 10x_2$ subject to the constraints :

$2x_1 + x_2 \leq 50$, $2x_1 + 5x_2 \leq 100$, $2x_1 + 3x_2 \leq 90$; $x_1 \geq 0$, $x_2 \geq 0$.

22. From the following table of values of x and y, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for 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

23. Solve the initial value problem defined by $\frac{dy}{dx} = \frac{3x + y}{x + 2y}$, y (1) = 1 and find y (1.2) and y (1.4) by the Runge-Kutta fourth order formula. **(2×5=10)**
