Exam Seat no. .....

KADI SARVA VISHWAVIDHYALAYA,

B.E. SEMESTER–IV EXAMINATION (October 2024)

Subject: Probability, Statistics and Numerical Methods **Subject Code: CC402B - N**

Date: 14/10/2024 **Duration: 3 hours** **Total Marks: 70**

Instruction: 1) Answer each section in separate Answer sheet.
2) Use of Scientific calculator is permitted.
3) All questions are **compulsory**.
4) Indicate **clearly**, the options you attempt along with its respective question number.
5) Use the last page of main supplementary for **rough work**.
6) Make necessary assumption when value is not mention

Section I

Q.1 A) A problem in mathematics is given to three students A, B and C whose chances of solving it are 1\2, 1\3 and 1\4 respectively. What is the probability that the problem will be solved? [05]

B) Find a root of equation $x^3 - 4x - 9 = 0$ using bisection method up to fourth approximation. **[05]**

C) State Trapezoidal rule with n = 10 and evaluate $\int_0^1 e^x dx$. **[05]**

OR

C) A fair dice is thrown. Find the probability of getting (i) an even number (ii) a perfect square (iii) an integer greater than or equal to 3. **[05]**

Q.2 A) There are two boxes A & B containing 4 white, 3 red and 3 white, 7 red balls respectively. A box is chosen at random and a ball is drawn from it, if the ball is white, find the probability that it is from box A. **[05]**

B) Using Newton – Raphson method find an iterative formula to find $\sqrt{N}$ and hence find $\sqrt{5}$. **[05]**

OR

Q.2 A) A random variable X has the probability mass function given by **[05]**

X	1	2	3	4
P(X= x)	0.1	0.2	0.5	0.2

Find (i) $P(2 \leq x < 4)$ (ii) $P(x > 2)$ (iii) P(x is odd) **[05]**

B) Find the value of $f(1.6)$ using Newton's forward interpolation formula.

x	1	1.4	1.8	2.2
f(x)	3.49	4.82	5.96	6.5

Q.3 A) Hospital records show that of patients suffering from a certain disease, 75% die of it. What is the probability that of 6 randomly selected patients, 4 will recover using binomial distribution? **[05]**

B) Find the value of $f(1966)$ using Gauss's backward interpolation Formula. **[05]**

x	1931	1941	1951	1961	1971	1981
f(x)	12	15	20	27	39	52

OR

Q.3 A) On an average Friday, a waitress gets no tip from 5 customers. Find the probability that she will get no tip from 7 customers this Friday using poisson distribution. **[05]**

B) Using Lagrange's interpolation formula, compute the value of f(10). **[05]**

x	5	6	9	11
y	12	13	14	16

Section II

Q.4 A) Show that the given function is probability density function and compute P (3< X < 10). **[05]**

$$f(x) = \begin{cases} \frac{1}{7} & 1 < x < 8 \\ 0 & otherwise \end{cases}$$

B) Evaluate $\int_0^6 \frac{1}{1+x}\,dx$ taking h = 1 using Simpson's 1/3 rule. **[05]**

C) Find the regression coefficient of Y on X using following data. **[05]**

X	7	4	8	6	5
y	6	5	9	8	2

OR

C) Find a real root of $x^3 - 5x + 3 = 0$, correct to three decimal places using Newton-Raphson method. **[05]**

Q.5 A) Find the correlation coefficient between x and y using the following data. **[05]**

x	5	9	13	17	21
y	12	20	25	33	35

B) Use secant method to find a real root of $x^3 = 2x + 1$ by taking $x_0 = 1.5$ and $x_1 = 2$. **[05]**

OR

Q.5 A) Solve the following system of equations using Gauss Seidel method. **[05]**

$10x + y + z = 6$,
$x + 10y + z = 6$,
$x + y + 10z = 6$.

B) Two people are selected at random from a group of seven men and five women. Find the probability that both are men or both are women. **[05]**

Q.6 A) Find f (1) using Newton's divided difference interpolation formula. **[05]**

x	-1	0	2	5	10
f(x)	-2	-1	7	124	999

B) Ten students got the following percentage of marks in mathematics and physics. Find the rank correlation coefficient. **[05]**

x	8	36	98	25	75	82	92	62	65	35
y	84	51	91	60	68	62	86	58	35	49

OR

Q.6 A) If X is uniformly distributed over (0, 10), calculate the probability that (a) $X < 3$, (b) $X > 6$, and (c) $3 < X < 8$. **[05]**

B) State Simpson's $\frac{3}{8}$ rule and evaluate $\int_0^1 \frac{1}{1+x^2}\,dx$ taking h = $\frac{1}{6}$. **[05]**

BEST OF LUCK

Exam Seat no. .....

KADI SARVA VISHWAVIDHYALAYA,

Gandhinagar

BE Semester - IV (APRIL 2024)

Probability, Statistics and Numerical Methods (CC402B – N)

Date : 29/4/2024

Max Marks: 70
Duration: 3 hrs.

Instruction: 1) Answer each section in separate Answer sheet.
2) Use of Scientific calculator is permitted.
3) All questions are **compulsory**.
4) Indicate **clearly**, the options you attempt along with its respective question number.
5) Use the last page of main supplementary for **rough work**.

Section- I

Q.1 **(a)** Is the function $f(x)$ defined by **[5]**

$$f(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & otherwise \end{cases}$$

a probability density function. If so, find the probability that the variate having this density falls in the interval $(1, 2)$.

(b) Find the standard deviation for the following data: **[5]**

x	10	11	12	13	14	15	16
f	2	7	11	15	10	4	1

(c) If the random variable X takes the value 1, 2, 3 and 4 such that $2P(X = 1) = 3P(X = 2) = P(X = 3) = 5P(X = 4)$. Find the probability distribution. Also find $P(1 < X < 4)$. **[5]**

OR

(c) Find the constant k such that $pdf, f(x) = \begin{cases} kx^2, & 0 < x < 3 \\ 0, & otherwise \end{cases}$ is a probability function. Also, find the cumulative distribution function $F(x)$. **[5]**

Q.2 **(a)** If 2% of the light bulbs are defective, find the probability that in a box of 100 bulbs (i) at least one is defective (ii) 7 bulbs are defective (iii) None is defective. **[5]**

(b) A sample of 3 items is selected at random from a box containing 10 items including 4 items are defective. Find the expected number of defective items. **[5]**

OR

(a) Two dice are thrown five times. Find the probability of getting the sum as 7 (i) at least one (ii) two times and (iii) $P(1 < X < 5)$. **[5]**

(b) For the following distribution, find mean, variance, $E(2X - 3)$ and $Var(2X - 3)$. **[5]**

X	-2	-1	0	1	2
$P(X)$	0.2	0.1	0.3	0.3	0.1

Q.3 **(a)** A factory has two machines A and B, A producing 300 units and B producing 700 units forming the total output. 5% of the items produced on A are defective and only 1% produced by B are defective. **[5]**

(1) Find the probability that an item drawn randomly from the output is defective.

(2) If a defective item is drawn at random, what is the probability that it is produced by machine A ?

(b) In a class of 50 students, 12 enrolled for both Mathematics and Science, 32 enrolled for Science. If the students of the class enrolled for at least one of the two subjects, then how many students enrolled for only Mathematics but not Science? **[5]**

OR

(a) Given that $P(A) = 0.4$, $P(B) = 0.67$ and $P(A \cap B) = 0.15$. Find **[5]**
(1) $P(\bar{A} \cup \bar{B})$ (2) $P(AUB)$ (3) $P(A/B)$.

(b) (i) Find the number m of permutations of six objects, say, A, B, C, D, E, F, taken three at a time. **[5]**
(ii) Suppose repetitions are not allowed, how many four digit numbers can be formed from six digits 1,2,3,5,7,8?
(iii) How many of such numbers less than 4000?

Section -II

Q. 4 **(a)** Write Simpson's $\frac{1}{3}$ rule. Evaluate $\int_0^{\pi} \frac{\sin^2 x}{5+4\cos x} dx$ with $n = 6$ by using Simpson's $\frac{3}{8}$ rule. **[5]**

(b) Use Gauss-Seidel method to solve: **[5]**

$$6x + y + z = 105,\ 4x + 8y + 3z = 155,\ 5x + 4y - 10z = 65$$

(c) Find a real root of $x^3 - 7x + 3 = 0$ correct to four decimal places using Regula-Falsi method. **[5]**

OR

(c) Find a real root of $3x = \cos x + 1$ correct to four decimal places using Newton's method. **[5]**

Q. 5 **(a)** Prove the following results:
(i) $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$ (ii) $1 + \Delta = E$ **[5]**

(b) Compute $y(300)$ form the following table using Newton's backward difference formula: **[5]**

x	50	100	150	200	250
y	618	724	805	906	1032

OR

(a) Using Newton's divided difference formula, calculate the value of $f(1)$ from the following table: **[5]**

x	0	2	3	4	7	9
$f(x)$	4	26	58	112	466	922

(b) Compute $f(1.3)$ using Newton forward formula form the following table: **[5]**

x	1	2	3	4
$f(x)$	1.1	4.2	9.3	16.4

Q. 6 **(a)** Determine polynomial of degree 3 using Lagrange's interpolation for the data. **[5]**

x	0	1	4	5
$f(x)$	1	3	24	39

(b) Compute the coefficient of correlation between x and y using the following data: **[5]**

x	5	9	13	17	21
y	12	20	25	33	35

OR

(a) Calculate the value of integral $\int_0^1 \frac{dx}{1+x^2}$, by using Trapezoidal rule with $h = 0.2$. **[5]**

(b) Find the regression lines of y on x and x on y for the following data: **[5]**

x	6	2	10	4	8
y	9	11	5	8	7
