

Exam Seat no.

KADI SARVA VISHWAVIDHYALAYA,
Gandhinagar

BE Semester - IV (APRIL 2025)

Probability, Statistics and Numerical Methods (CC402B – N)

Date: 22/04/2025

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)** Find the constant c such that pdf, $f(x) = \begin{cases} cx^2, & 0 < x < 3 \\ 0, & \text{otherwise} \end{cases}$ [5]

Also, find the cumulative distribution function $F(x)$.

- (b)** Calculate the standard deviation of the following data: [5]

x	10	11	12	13	14	15	16	17	18
f	2	7	10	12	15	11	10	6	3

- (c)** A one dimensional random variable X has the following probability distribution: [5]

$X = x$	0	1	2	3	4	5	6	7
$P(X = x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Find (i) k (ii) $P(X < 6)$ (iii) $P(X \geq 6)$ (iv) $P(0 < X < 4)$.

OR

- (c)** Let X be a random variable with pdf, $f(x) = \begin{cases} \frac{1}{3}e^{-x/3}, & x > 0 \\ 0, & \text{otherwise} \end{cases}$ [5]

Find $P(X > 3)$, $E(X)$ and $Var(X)$.

- Q.2 (a)** The probability that a person catch swine flu virus is 0.001. Find the probability [5]
that out of 3000 persons (i) exactly 3, (ii) more than 2 person will catch the virus
by Poisson distribution.

- (b)** What is the probability that a leap year selected at random will have 53 [5]
(i) Mondays (ii) Mondays and Tuesdays (iii) Mondays or Tuesdays.

OR

- (a)** 6 dice are thrown 729 times. How many times do you expect at least 3 dice to [5]
show a 5 or 6 using binomial distribution?

- (b)** For the following distribution, find Mean, Standard deviation, $E(2X - 3)$ and [5]
 $Var(2X + 3)$.

X	-1	0	1	2	3
$P(X)$	0.15	0.1	0.3	0.3	0.15

- Q.3 (a)** Given that $P(A) = 0.4$, $P(B) = 0.67$ and $P(A \cup B) = 0.92$. Find [5]
(1) $P(A \cap B)$ (2) $P(A \cap \bar{B})$ (3) $P(A/\bar{B})$.

- (b)** Eight boys and three girls are to sit in a row for a photograph. Find the total [5]
number of ways that no two girls are sit together.

OR

- (a) There are two boxes A and 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 A using Bayes theorem. [5]
- (b) Applications are invited by a company for the post of production supervisor. Number of applications received that the applicant has a graduate degree in engineering is 96, that has some prior work experience is 120 and that has both is 60. How many are expected to be graduate engineers or having some work experience. [5]

Section -II

- Q. 4 (a) Write Simpson's $\frac{1}{3}$ rule. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's $\frac{3}{8}$ rule. [5]
- (b) Use Gauss Seidal method to solve [5]
- $$8x + y + z = 5, \quad x + 8y + z = 5, \quad x + y + 8z = 5.$$
- (c) Use method of Regula-False to find a real root of $x^3 - 4x - 9 = 0$ correct to 3 decimal places. [5]

OR

- (c) Find a real root of $x - \cos x = 0$ correct to three decimal places using Newton's method. [5]

- Q. 5 (a) Prove the following results:

(i) $\nabla = 1 - E^{-1}$ (ii) $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$ (iii) $\Delta - \nabla = \Delta \nabla$ [5]

- (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

OR

- (a) Find the value of $f(8)$ for given table by Newton's divided difference formula: [5]

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

- (b) Compute $\tan 0.40$ by Newton's backward formula form the following table: [5]

x	0.10	0.15	0.20	0.25	0.30
$\tan x$	0.1003	0.1511	0.2027	0.2553	0.3093

- Q. 6 (a) Find a second degree polynomial $f(x)$ passing through the points (0,0), (1,1) and (2,20) using Langrange's interpolation. Also find $f(1.5)$. [5]

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

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

OR

- (a) Evaluate $\int_0^1 e^x dx$, with $n = 10$ using trapezoidal rule. [5]

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

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9
