4th

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 option you attempted along with its respective question number.
5. Use the last page of main supplementary for rough work.

Section:1

Q.1 (a) In how many ways can a party of 7 persons arrange themselves   [05]

  (i) in a row of 7 chairs?

  (ii) around a circular table?

(b) Compute cosh(0.56) using Newton's forward difference formula from following data.   [05]

x	0.5	0.6	0.7	0.8
y	1.127626	1.185465	1.255169	1.337435

(c) Suppose that X is a continuous random variable whose probability density function is given   [05]
by $f(x) = \begin{cases} Cx^2 & , -1 < x < 1 \\ 0 & , \text{Otherwise} \end{cases}$

  (i) Find the constant C?   (ii) Find $P\{X \geq 1\}$.

OR

(c) Use Gauss's forward interpolation formula to find y(3.3) from the following data.   [05]

x	1	2	3	4	5
$y = f(x)$	15.3	15.1	15	14.5	14

Q.2 (a) Using Stirling's interpolation formula, to compute $y(35)$ from the following data.   [05]

x	20	30	40	50
$y(x)$	512	439	346	243

(b) A die is tossed 3 times. What is the probability using Binomial Distribution   [05]
  (i) No fives turning up?   (iii) 3 fives?
  (ii) 1 five?

OR

Q.2 (a) Using Newton divide difference formula, calculate the value of $f(6)$ from the following data. [05]

x	1	2	7	8
$y = f(x)$	1	5	5	4

(b) Write Baye's Theorem and Three urns contain 6 green, 4 black; 4 green, 6 black and 5 green,   [05]
5 black balls respectively. Randomly selected an urn and a ball is drawn from it. If the ball
drawn is Green then find the probability that it is drawn from the first urn.

Q.3 (a) Find the real root of $f(x) = x^3 + x - 1$, using Newton-Raphson method correct upto six [05] decimal places.

(b) You arrive at a bus stop at 10 o'clock, knowing that the bus will arrive at some time uniformly [05] distributed between 10 and 10:30.

    (i) What is the probability that you will have to wait longer than 10 minutes?

    (ii) If at 10:15 the bus has not yet arrived, what is the probability that you will have to what at least an additional 10 minutes?

OR

Q.3 (a) Find the positive root of $x - \cos x = 0$ correct upto three decimal places by bisection method. [05]

(b) Evaluate $\int\limits_0^6 \frac{1}{1+x}\, dx$ by simpson's $\frac{1}{3}$ with $h = 1$. [05]

Section:2

Q.4 (a) A committee of 3 persons is to be constituted from a group of 2 men and 3 women. [05]

    (i) In how many ways can this be done?

    (ii) How many of these committees would consist of 1 man and 2 women?

(b) Find the root of $x\log_{10}(x) - 1.9 = 0$, correct upto three decimal places with $x_0 = 3$ and [05] $x_1 = 4$, Using Secant Method.

(c) Three light bulbs are chosen at random from 15 bulbs of which 5 are defective. Find the [05] probability that

    (i) none is defective   (ii) exactly one is defective   (iii) at least one is defective

OR

(c) Evaluate $\int\limits_0^1 \frac{1}{1+x^2}\, dx$ by Trepezoidal rule with $h = 0.2$ [05]

Q.5 (a) Determine the interpolating polynomial of degree three using Lagrange's interpolation for [05] the following table.

x	-1	0	1	3
$y = f(x)$	2	1	0	-1

(b) State Simpson's 3/8 rule and evaluate $\int\limits_4^{5.2} \log(x)\, dx$ with h=0.2. [05]

OR

Q.5 (a) Solve the following linear equation by Gauss-seidel method. [05]

$$10x + y + z = 12$$
$$2x + 10y + z = 13$$
$$2x + 2y + 10z = 14$$

(b) A (blindfolded) marksman finds that on the average he hits the target 4 times out of 5. If **[05]** he fires 4 shots, what is the probability(Use Binomial Distribution) of

   (i) more than 2 hits?

   (ii) at least 3 misses?

Q.6 (a) Write definition of conditional probability. A lot of 100 keyboard contain 20 that are defective. **[05]** Two keyboards are selected at random, without replacement, from the lot.

   (i) What is the probability that the first one selected is defective?

   (ii) What is the probability that the second one selected is defective given that the first one was defective?

   (iii) What is the probability that both are defective?

(b) Find the coefficient of correlation between the Intelligence Ratio(I.R.) and **[05]** Emotional Ratio(E.R)from the following data.

Student	1	2	3	4	5	6	7	8	9	10
I.R	105	104	102	101	100	99	98	96	93	92
E.R.	101	103	100	98	95	96	104	92	97	94

OR

Q.6 (a) Evaluate $\int\limits_0^1 e^{-x^2}\, dx$ by the Trapezoidal rule with $h = 0.1$. **[05]**

(b) A die is tossed thrice. Getting 1 or 6 on a toss is a success. Find the mean or expectation **[05]** and variance of the number of successes.

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Exam Seat no. ....

KADI SARVA VISHWAVIDHYALAYA,
Gandhinagar
BE Semester–IV (May 2023)

Probability, Statistics and Numerical Methods (CC402B-N)

Max Marks: 70   Date- 08 | 05 | 2023   Duration: 3 hr.

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 (i)   Three light bulbs are chosen at random from 15 bulbs of which 5 are [5] defective. Find the probability that (a) none is defective (b) exactly one is defective (c) exactly two is defective (d) at least one is defective (e) all are defective.

(ii)   From the following data, find f(35) by Newton Gregory Forward difference [5] formula

x:	20	30	40	50
f(x):	512	439	346	243

(iii)   Find the approximate root of $x=e^{-x}$, using Regula Falsi method correct upto [5] three decimal places.

OR

(iii)   The probabilities of X, Y and Z becoming managers are 4/9, 2/9 and 1/3 [5] respectively. The probabilities that the Bonus Scheme will be introduced if X, Y and Z becomes managers are 3/10, 1/2 and 4/5 respectively. What is the probability that the manager appointed was X if the Bonus Scheme has been introduced.

Q.2 (i)   In an examination, the probability of A passing in physics is 2/3 and the probability of passing in both physics and English is 14/45. The probability [5] that he passes atleast one of these subjects is 4/5. Find the probability that he passes the English subject?

(ii)   A problem of design is given to three architects whose chances of designing are 1/4, 1/2 and 3/4 respectively. Find the probability that the design problem [5] will be solved if all of them try independently?

OR

(i)   Find f(5) by Lagrange's interpolation formula for f(1)=2, f(2)=4, f(3)=8, [5] f(4)=16, f(7)=128.

(ii)   Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by using Simpson's 3/8 rule taking h=1/6. [5]

Q.3 (i) 4 coins are tossed simultaneously. Using Binomial distribution, What is the [5] probability of getting (a) atleast 2 heads (b) atmost two heads.

(ii) The probability distribution of a random variable X is given below. [5]

X: -2 -1 0 1 2
P(X=x): 0.2 0.1 0.3 0.3 0.1

Find
(a) E(X) (b) Var(X) (c) E(2X-3) (d) Var(2X-3) (e) Standard deviation (X)

OR

(i) Using Newton's backward difference interpolation Formula, find the [5] population for the year 1925 of a town. The population is as given below:

Year : 1891 1901 1911 1921 1931
Population : 46 66 81 93 101
(thousands)

(ii) Evaluate $\int_4^{5.2} y\, dx$ by using Simpson's 1/3 rule taking n=6 for following data: [5]

x: 4.0 4.2 4.4 4.6 4.8 5.0 5.2
y: 1.3863 1.4351 1.4816 1.5261 1.5686 1.6049 1.6487

Section II

Q.4 (i) Find the positive root of $x^3-4x-9=0$ correct upto three decimal places by [5] Bisection method.

(ii) Find the root of the equation $x=\cos(x)$ using Newton-Raphson method [5] correct to 4 decimal places taking $x_0=0.5$ as initial root.

(iii) A random variable X has the probability mass function given by [5]

x 0 1 2 3 4 5 6 7
P(X=x) a 4a 3a 7a 8a 10a 6a 9a

Find (i) find the value of a (ii) P(X<3)

OR

(iii) In a certain cafeteria, 25% of the customer ordered Tea, 15% of the [5] customer ordered Coffee and 10% of the customer ordered both Tea and Coffee. A customer is selected at random.

(a) If he ordered coffee, what is the probability that he ordered Tea?

(b) If he ordered Tea, what is the probability that he ordered coffee?

(c) What is the probability that he ordered coffee or Tea?

Q.5 (i) If the probability of a bad reaction from a certain injection is 0.001, Using [5] Poisson distribution, determine the chance that out of 2000 individuals, more than two will get bad reaction.

(ii) Apply Gauss Seidel iteration method to solve the following system of [5] equations: $10x_1+x_2+x_3=12$, $2x_1+10x_2+x_3=13$, $2x_1+2x_2+10x_3=14$.

OR

(i) Calculate the Spearman's rank correlation coefficient for the following data. [5]

x:	1	3	7	.5	4	6	2	10	9	8
y:	3	1	4	5	6	9	7	8	10	2

(ii) Suppose the temperature T during June is normally distributed with mean 68° [5] and standard deviation 6°. Find the probability p that the temperature is between 70° and 80°. (Use $P(0 \leq T^* \leq 2) = .4772$, $P(0 \leq T^* \leq .33) = .1293$ where T^* is standard normal variate)

Q.6 (i) Calculate the correlation coefficient between x and y using the following [5] data:

x:	2	4	5	6	8	11
y:	18	12	10	8	7	5

(ii) Subway trains on a certain line run every half hour between mid-night and [5] six in the morning. Using uniform distribution, find the probability that a man entering the station at a random time during this period will have to wait atleast twenty minutes.

OR

(i) Using the Gauss's forward Interpolation formula to get $f(32)$ for following [5] data

x:	25	30	35	40
f(x):	0.2707	0.3027	0.3386	0.3794

(ii) Find the constant k such that the function [5]
$$f(x) = \begin{matrix} kx^2 & 0 < x < 3 \\ 0 & \text{otherwise} \end{matrix}$$

is a probability density function and compute $P(1 < x < 2)$.

BEST OF LUCK