PRESIDENCY UNIVERSITY
BENGALURU

<u>SCHOOL OF ENGINEERING</u>

TEST 1

Winter Semester: 2021-22
Course Code: MAT 2002
Course Name: Numerical Methods, Probability Distributions
and Sampling Techniques
Program &Sem: B.Tech & IV Sem

Date:
Time:
Max Marks: 30
Weightage: 15%

Instructions:
- (i) *Read all questions carefully and answer accordingly.*
- (ii) *Question paper consists of 3 parts.*
- (iii) *Scientific and Non-programmable calculators are permitted.*

Part A [Memory Recall Questions]

Answer all the questions. Each question carries one mark.   **(5Q x 1M = 5M)**

1. Check whether the system of linear equations

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

is diagonally dominant.   (C.O.NO.1) [Knowledge]

2. The formula for Newton-Raphson method is _____.   (C.O.NO.1) [Knowledge]

3. Newton-Gregory backward interpolation formula can only be used for _____.
                                                                     (C.O.NO.2) [Knowledge]

4. The formula for Newton-Gregory forward interpolation is _____.
                                                                     (C.O.NO.1) [Knowledge]

5. _____ is the process of finding the value of a function y(x) within the given
   range of x.   (C.O.NO.1) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the questions. Each question carries five marks.   **(3Q x 5M = 15M)**

6. Estimate a real root of the equation $cosx - xe^x = 0$ lies in the interval $(0.5, 1)$. Perform
   three iterations of the secant method.   (C.O.NO.1) [Comprehension]

7. The area of a circle (A) corresponding to the diameter (D) is given in the following table:

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

Find the area corresponding to the diameter of 105 using an appropriate interpolation formula.   (C.O.NO.2) [Comprehension]

8. Apply Lagrange's interpolation formula to find y(5) for the following data

x	1	3	4	6
y	3	9	30	132

(C.O.NO.2) [Comprehension]

Part C [Problem Solving Questions]

Answer the following question. The question carries ten marks.   (1Q x 10M = 10M)

9. Apply the LU decomposition method to solve the following system of linear equations

$$3x + 2y + 7z = 4, \ 2x + 3y + z = 5, \ 3x + 4y + z = 7 \ .$$

(C.O.NO.1) [Comprehension]

PRESIDENCY UNIVERSITY
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SCHOOL OF ENGINEERING   SET A

TEST 1

Winter Semester: 2021-22
Course Code:
Course Name:

Program &Sem:

Date: 25th April 2022
Time: 11.30 AM to 12.30 PM
Max Marks: 30
Weightage: 15%

Instructions:

(i)   Read all questions carefully and answer accordingly.

(ii) Question paper consists of 3 parts.

(iii) *Scientific and Non-programmable calculators are permitted.*

Part A [Memory Recall Questions]
Answer all the questions. Each question carries ONE mark.   (5Q x 1M = 5M)

1. Gauss-Seidel method converges _____ as fast as Gauss-Jacobi method.

(C.O.No.1)

[Knowledge]

2. Rate of convergence of Newton-Raphson method is _____.   (C.O.No.1)
[Knowledge]

3. The secant method fails if _____.   (C.O.No.1)
[Knowledge]

4. The process of finding the value of y for any given value of x which lies in between the given range is called _____.   (C.O.No.2)
   [Knowledge]

5. Write the Newton's divided difference interpolation formula.   (C.O.No.2)
[Knowledge]

Part B [Thought Provoking Questions]
Answer all the questions. Each question carries FIVE marks.   (3Q x 5M = 15M)

6. Using Newton-Raphson method, find a real root of $x^3 - 2x - 5 = 0$ correct to 3 decimal places.   (C.O.No.1)
   [Comprehension]

7. Find $f(1955)$ for the given data   (C.O.No.2)
[Comprehension]

x	1951	1961	1971	1981	1991
f(x)	19.96	39.96	58.81	77.21	94.61

8. Find a polynomial $f(x)$ for the given data using Lagrange's interpolation formula

x	0	1	2	5
f(x)	2	3	12	147

(C.O.No.2)

[Comprehension]

Part C [Problem Solving Questions]
Answer the following question. The question carries TEN marks.   (1Q x 10M =
10M)

9. Solve $3x + 2y + 7z = 4$, $2x + 3y + z = 5$, $3x + 4y + z = 7$ using LU decomposition
   method.   (C.O. No.1) [Comprehension]

PRESIDENCY UNIVERSITY
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<u>SCHOOL OF ENGINEERING</u>

TEST 1

Winter Semester: 2021-22
Course Code: MAT2002
Course Name: Numerical Methods, Probability Distributions
and Sampling Techniques
Program &Sem: B.Tech & IV Sem

Date: 25th April 2022
Time: 11.30 AM to 12.30 PM
Max Marks: 30
Weightage: 15%

Instructions:

        (i)   *Read all questions carefully and answer accordingly.*

  (ii) Question paper consists of 3 parts.
  (iii) *Scientific and Non-programmable calculators are permitted.*

Part A [Memory Recall Questions]

Answer all the questions. Each question carries ONE mark.   **(5Q x 1M = 5M)**

1. True or False: The expression $2x^2 - (\sin 1)x + 1 = 0$ is a transcendental equation. (C.O.NO.1) [Knowledge]

2. Write down the lower triangular matrix of the LU decomposition method for the general linear system of 3 equations in 3 unknowns.   (C.O.NO.1) [Knowledge]

3. Every polynomial of degree n has exactly _____ roots. (C.O.NO.1) [Knowledge]

4. The expression of second order divided difference $f(x_1, x_2, x_3) =$ _____.

                                     (C.O.NO.2) [Knowledge]

5. Write down the Lagrange's interpolation formula for the following data

x	x_0	x_1
y	y_0	y_1

                                   (C.O.NO.2) [Knowledge]

Part B [Thought-Provoking Questions]

Answer all the Questions. Each question carries FIVE marks.   **(3Q x 5M = 15M)**

6. Find a real root of the equation $e^{-x} = x$ using Newton-Raphson method correct to 4 decimal places.   (C.O.NO.1) [Comprehension]

7. Compute y when $x = 0.66$ from the following data

x	0.61	0.63	0.65	0.67
y	1.840	1.878	1.195	1.954

                                  (C.O.NO.2) [Comprehension]

8. The upward velocity of a rocket is given as a function of time in the following table.

$t\ (s)$	0	10	15	20
$v(t)\ (m/s)$	0	227.04	362.78	517.35

Find the velocity of the rocket at $t = 12$ by using Lagrange's interpolation formula.

(C.O.NO.2) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. Question carries TEN marks.   (1Q x 10M = 10M)

9.   Solve $2x + 3y + z = 9,\ x + 2y + 3z = 6,\ 3x + y + 2z = 8$ by   using   LU
     decomposition method.   (C.O.No.1) [Comprehension]

PRESIDENCY UNIVERSITY BENGALURU

<u>SCHOOL OF ENGINEERING</u>　　　SET A

TEST 2

Winter Semester: 2021-22

Course Code: MAT2002

Course Name: Numerical Methods, Probability Distributions and Sampling Techniques

Program & Sem.: B.Tech. & IV Sem. (All Programs)

Date: 31st May 2022

Time: 10.00 AM to 11.00 AM

Max Marks: 30

Weightage: 15%

Instructions:

(i)　Read all the questions carefully and answer accordingly.

(ii)　Question paper consists of 3 parts.

(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer ALL the questions. Each question carries ONE mark.　　　(5Q x 1M = 5M)

1. For $n = 4$, the Simpson's 1/3rd rule is _____.　　(C.O.No.2)
[Knowledge]

2. The Taylor's series expansion of $y(x)$ about the point x_0 is _____.

(C.O.No.2)

[Knowledge]

3. For a sure event E, $n(E) =$ _____.　　(C.O.No.3)
[Knowledge]

4. If A and B are independent events, then $P(A \cap B) =$ _____.　(C.O.No.3)
[Knowledge]

5. The conditional probability of event A given event C is defined as $P(A|C) =$ _____.

(C.O.No.3)

[Knowledge]

Part B [Thought Provoking Questions]

Answer ALL the questions. Each question carries FIVE marks.　　　(3Q x 5M = 15M)

6. Using Runge-Kutta method of order 4 solve $\frac{dy}{dx} = x + y$, $y(0) = 1$ at $x = 0.1$ by taking the step length h = 0.1. Carry out the computations correct up to 4 decimal places.

(C.O.No.2)

[Comprehension]

7. A bag contains 7 red, 6 white and 5 blue balls. If 4 balls are drawn at random, find the probability that (a) two are red and two are white (b) three are blue and one is red.

(C.O.No.3)

[Comprehension]

8. Suppose that one of the three men, a politician, a businessman and an educator will be appointed as the vice chancellor of a university. The respective probabilities of their appointments are 0.5, 0.3 and 0.2. The probabilities that research activities are promoted by these people if they get appointed are 0.3, 0.7 and 0.8 respectively. A research activity is promoted. Find the probability that the research activity is promoted by the educator.

(C.O.No.3)

[Comprehension]

Part C [Problem Solving Question]

Answer the following question. The question carries TEN marks. **(1Q x 10M = 10M)**

9. Evaluate the definite integral $\int_0^6 \frac{dx}{1+x^2}$, correct up to 4 decimal places, by considering 6 subintervals using (a) trapezoidal rule (b) Simpson's 1/3rd rule (c) Simpson's 3/8th rule.

(C.O.No.2)

[Comprehension]

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING   SET B

TEST 2

Winter Semester: 2021-22

Course Code: MAT2002

Course Name: Numerical Methods, Probability Distributions and Sampling Techniques

Program & Sem.: B.Tech. & IV Sem. (All Programs)

Date: 31st May 2022

Time: 10.00 am to 11.00 AM

Max Marks: 30

Weightage: 15%

Instructions:

(i)   Read all the questions carefully and answer accordingly.

(ii) Question paper consists of 3 parts.

(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the questions. Each question carries ONE mark.   (5Q x 1M = 5M)

1. The Simpson's 3/8th rule is applicable if n is a multiple of _____.   (C.O.No.2) [Knowledge]

2. In modified Euler's method, we first predict y value by the formula $y_1 = $ _____.

(C.O.No.2)

[Knowledge]

3. If $P(E) = 0.6$, then $P(\bar{E}) = $ _____, where $\bar{E}$ is the complement of the event E.

(C.O.No.3)

[Knowledge]

4. If A and B are mutually exclusive events, then $P(A \cap B) = $ _____.

(C.O.No.3)

[Knowledge]

5. The conditional probability of event B given event A is defined as $P(B|A) = $ _____.

(C.O.No.3)

[Knowledge]

Part B [Thought Provoking Questions]

Answer all the questions. Each question carries FIVE marks. **(3Q x 5M = 15M)**

6. Using Runge-Kutta method of order 4 solve $\frac{dy}{dx} = 3x + \frac{y}{2}$, $y(0) = 1$ at $x = 0.1$ by taking step length h = 0.1. Carry out the computations correct up to 4 decimal places.

(C.O.No.2)

[Comprehension]

7. A bag contains 8 red, 6 white and 6 blue balls. If 3 balls are drawn at random, find the probability that (a) 2 white and 1 blue balls are drawn (b) 1 ball of each color is drawn.

(C.O.No.3)

[Comprehension]

8. A factory has three units A, B and C. Unit A produces 25% of its products, unit B produces 25% and unit C produces 50%. It is known that the percentage of defective items produced by the three units A, B and C are respectively 10%, 20% and 30%. An item is selected randomly from the total products of the factory and it is found to be defective. Find the probability that it is produced by the unit A. (C.O.No.3)
[Comprehension]

Part C [Problem Solving Question]

Answer the following question. The question carries TEN marks. **(1Q x 1M = 10M)**

9. Evaluate the definite integral $\int_0^6 \frac{dx}{1+x}$, correct up to 4 decimal places, by considering 6 subintervals using (a) trapezoidal rule (b) Simpson's 1/3rd rule (c) Simpson's 3/8th rule.

(C.O.No.2)

[Comprehension]