PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKE-UP EXAMINATION – JAN 2023

Course Code: MAT 2002

Course Name: Num. Methods, Prob. Distributions and Sampling Techniques

Program : B.Tech – (All Programs)

Date: 20-JAN-2023

Time: 9.30AM - 12.30PM

Max Marks:100

Weightage:50%

Instructions:
- *(i)   Read the all questionscarefully and answer accordingly.*
- *(ii) Scientific calculator and distribution tables are allowed.*

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries FOUR marks.   (5Qx 4M=20M)

1. Define algebraic equation and write the iterative formula for Newton Raphson method

(C.O.No.1) [Knowledge level]

2. Define Interpolation and write the Newton's Forward interpolation formula.(C.O.No.2) [Knowledge level]

3. While tossing a coin 3 times, find the probability of getting a tails atmost two times.

(C.O.No.4) [Knowledge level]

4. Define Null hypothesis, Alternative hypothesis, equally likely events and independent events.

(C.O.No.5) [Knowledge level]

5. The probability mass function of a variable X is given below, then find the value of k and $P(x \leq 3)$.

X	0	1	2	3	4	5
P(X)	k	3k	6k	5k	2k	3k

(C.O.No.3) [Knowledge level]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks.   (5Qx10M= 50M)

6. Solve the system of equations 3x + y - 2z = 7, x - 3 y +4 z = 15, 2x - 2y +z = 12 by using Gauss- Seidel method.   (C.O.No2) [Comprehensive level]

7. Using Runge kutta method, find y(0.2) given $y' = y + e^x$, $y(0)$ = 0. (Carry out computations correct to 4 decimal places)   (C.O.No.2) [Comprehensive level]

8. ABC Auto Insurance classifies drivers as good, medium, or poor risks. Drivers who apply to them for insurance fall into these three groups in the proportions 30%, 50% and 20% respectively. The probability a "good" driver will have an accident is 0.01, the probability a "medium" risk driver will have an accident is 0.03, and the probability a "poor" driver will have an accident is 0.10. The company sells an insurance policy to a driver and he has an accident. What is the probability that the driver is a medium risk driver?   (C.O.No3) [Comprehensive level]

9. A certain type of storage battery lasts, on average 3.0 years with a standard deviation of 0.5 years. Assuming that battery life is normally distributed, find the probability that a given battery will last less than 2.3 years.   (C.O.No4) [Comprehensive level]

10. Consider the following joint probability distribution table, and then find the covariance of X and Y?

$f(x,y)$	x 0	1	2	$h(y)$
y 0	$\frac{3}{28}$	$\frac{9}{28}$	$\frac{3}{28}$	$\frac{15}{28}$
1	$\frac{3}{14}$	$\frac{3}{14}$	0	$\frac{3}{7}$
2	$\frac{1}{28}$	0	0	$\frac{1}{28}$
$g(x)$	$\frac{5}{14}$	$\frac{15}{28}$	$\frac{3}{28}$	1

(C.O.No4) [Comprehensive level]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries FIFTEEN marks.   (2Qx15M= 30M)

11.(a) Evaluate $\int_0^{0.6} e^{-x^2} dx$ using Simpson's 1/3rd rule by taking seven ordinates.

   (b) By using modified Euler's method, solve $\frac{dy}{dx} = y + 2x$, y(0) = 2 at the pointx = 0.1 by taking step length h = 0.1(up to 4 decimal places).   (C.O.No2) [Application level]

12. (a) It is known that 5% of the books bound at a certain bindery will have defective bindings. Find the probability that

   i). 3 of 100 books bound by this bindery will have defective bindings.

   ii). 4 to 6 books bound by this bindery will have defective bindings.

(b) (i). Is the function defined below is a density function?

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

   (ii). If so, determine the probability that the variate having this density will fall in the interval (1,2).

   (iii). Also find the cumulative probability function F(2).

(C.O.No4) [Application level]