UNIT–I (Numerical Methods-I)

1. Use Newton's formula for interpolation to find the net premium at the age 25 from the table given below - 7

Age	20	20	20	20
Net Premium	0.01427	0.01581	0.01772	0.01996

2. Using Newton-Raphson's method find the real root of $x^4 - x - 10 = 0$.
3. Find the real root of the equation $x^3 - 3x - 5 = 0$ correct to four places of decimals by Newton Raphson Method.
4. Find the real root of the equation $xe^x - 3 = 0$ correct to three decimal places by Regula-falsi method.
5. Find the real root of the equation $x\log_{10} x - 1.2 = 0$ correct to five places of decimal by Regula Falsi Method
6. Given that $\log x$ for $x = 310,320,330,340,350$ and 360 are according to following table. Find the value of $\log 337.5$.

x	310	320	330	340	350	360
logx	2.4913617	2.5051500	2.5185139	2.5314789	2.5440680	2.5563025

7. Prove that

$$\Delta^n \sin(ax + b) = \left(2\sin\frac{dh}{2}\right)^n \text{x}\sin\left[ax + b + n\left(\frac{ah + \pi}{2}\right)\right]$$

8. Find a positive root of the equation by iteration $\text{method}3x = \cos x + 1.7$
9. Using Lagrange's interpolation formula, find $y(6)$ from the following data:

x	3	5	7	9	11
y	6	24	58	108	74

10. Given that $\sin 45 = 0.7071, \sin 50 = 0.7660, \sin 55 = 0.8192, \sin 60 = 0.8660$. Then find the $\sin 58$ by using Newton's backward interpolation formula.
11. Prove that : $(1 + \Delta)(1 - \nabla) \equiv \Delta\nabla$
12. Evaluate $\Delta^6(ax - 1)(bx^2 - 1)(cx^3 - 1); h = 1$
13. Using Newton's divided difference formula, find $f(8)$ and $f(15)$ from the following table.

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

14. Find the value of $f(5)$ from the following table.

X	1	2	3	4	7
F(x)	2	4	8	16	128

UNIT–II (Numerical Methods-II)

1. Evaluate parts using $\int_0^{\pi} \sin x dx$ by dividing the range into 10 equal parts using
   a) Trapezoidal rule
   b) Simpson's $\frac{1}{3}$ rule
2. Using Gauss-Seidel iteration method to solve the $\begin{array}{l} 10x + y + z = 12 \\ 2x + 10y + z = 13 \\ 2x + 2y + 10z = 14 \end{array}$
3. Using Simpson's $\frac{3}{8}$ rule, evaluate the range into 6 equal parts. $\int_0^6 \frac{dx}{1+x^2}$ by dividing the range into 6 equal parts.
4. Evaluate $\int_1^2 \frac{1}{x} dx$ by Simpson's $\frac{1}{3}^{\text{rd}}$ rule.
5. Evaluate $\int_4^{5.2} \log e^x dx$ by Simpson's $\frac{3}{8}^{\text{th}}$ rule.
6. Solve the following system $\begin{array}{l} 10x + 2y + z = 9 \\ 2x + 20y - 2z = -44 \\ -2x + 3y + 10z = 22 \end{array}$
   by Gauss-Seidel method to two places of decimal.
7. Find the value of log 2 from $\int_0^1 \frac{x^2}{1+x^2}$, using Simpson's $\frac{1}{3}$ rule by dividing it, into four equal parts.
8. Solve the following equations by Jacobi's method: $\begin{array}{l} 10x + 2y + 3z = 15 \\ x + 7y + 2z = 10 \\ 4x + 2y + 10z = 16 \end{array}$
9. Solve the equation by Gauss - Elimination method $\begin{array}{l} 2x + y + 4z = 12 \\ 8x - 3y + 2z = 23 \\ 4x + 11y - z = 33 \end{array}$
10. Solve the following system of equations by Crout's method $\begin{array}{l} x + y + z = 3 \\ 2x - y + 3z = 16 \\ 3x + y - z = -3 \end{array}$
11. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\frac{1}{3}$ rule taking $h = \frac{1}{4} h = \frac{1}{4}$

UNIT–III (Numerical Methods-III)

1. Given $\frac{dy}{dx} = x + \sin y$ and $y(0) = 1$. Compute $y(0.2)$ and $y(0.4)$ with $\mathrm{h} = 0.2$ using Euler's modified method.
2. Using Runge-Kutta method of fourth order solves $y' = xy, y(l) = 2$ at $x = 1.2$ with $\mathrm{h} = 0.2$.
3. Find $y(0.1)$ by Runge Kutta Method. Given $y = y^3, y(0) = 10y'(0) = 5$
4. Use Euler's method to find $y(0.4)$ from the differential equation $\frac{dy}{dx} = xy, y(0) = 1, \mathrm{h} = 0.1.$
5. Use Euler's method to solve $\frac{\mathrm{dy}}{\mathrm{dx}} = \frac{\mathrm{y}^2-\mathrm{x}}{\mathrm{y}^2+\mathrm{x}}, \mathrm{x} = 0, \mathrm{y} = 1$. Compute $\mathrm{y}(0.1), \mathrm{y}(0.2)$.
6. Using Euler's method, compute $y(0.04)$ for the differential equation. $\frac{dy}{dx} = -y, y(0) = 1$ Take $h = 0.01$
7. Given that $\frac{dy}{dx} = \log_{10}(x + y), y(0) = 1$, find $y(0.2)$ using modified Euler's method.
8. Prove that $x^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty}(-1)^n \frac{\cos nx}{n^2}, -\pi < x < \pi$

   Hence show that $\sum \frac{1}{n^2} = \frac{\pi^2}{6}$
9. Find the first and second order derivative at the point $\mathrm{x} = 1.5$ for the following data.

x :	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$:	3.375	7.000	13.625	24.000	38.875	59.000

10. Use Runge-Kutta method to approximate y, when $x = 0.1$, given that $x = 0$, when $\mathrm{y} = 1$ and $\frac{dy}{dx} = x + y$

UNIT–IV (TRANSFORM CALCULUS)

1. Using Laplace Transform, Evaluate $\int_0^\infty \frac{\cos at - \cos bt}{t} dt$
2. Find $L^{-1} = \left\{\frac{s^2}{(s^2+a^2)^2}\right\}$
3. Using Laplace Transform, Solve $(\mathrm{D}^2 + 2\mathrm{D} + 5)\mathrm{y} = e^{-t} \sin t$ given that $\mathrm{y}(0) = 0, \mathrm{y}^1(0) = 1$
4. Find the Laplace transform of $f(t) = \begin{cases} 1 & 0 \le t < 2 \\ t-2 & 2 \le t \end{cases}$
5. Find the Fourier transform of $\begin{matrix} f(x) = 1 \text{ for} & |x| < a \\ 0 \text{ for} & |x| > a \end{matrix}$
6. Find the Fourier series for periodic extension of

$$\mathrm{f(t)} = \begin{cases} \sin \mathrm{t}, & 0 \le \mathrm{t} \le \pi \\ 0, & \pi \le \mathrm{t} \le 2\pi \end{cases}$$

7. Find $L\left\{e^{3t} \sin t + \frac{\sin t}{t}\right\}$
8. Evaluate $L^{-1}\left\{\frac{s+1}{s^2+6s+25}\right\}$
9. Solve $(D^2 + 9)y = \cos 2t$ if $y(0) = 1, y\left(\frac{\pi}{2}\right) = -1$
10. Evaluate $L\left\{\int_0^t \frac{\sin t}{t} dt\right\}$

UNIT–V (CONCEPT OF PROBABILITY)

1. 20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random.
   a. None is Defective
   b. One is Defective
   c. $P(1 < x < 4)$.
2. Derive Mean of the Normal Distribution.
3. If a random variable has a Poisson distribution such that $P(1) = P(2)$. Find out 7
   (i) Mean of the distribution
   (ii) $P(x \geq 1)$
   (iii) $P(1 < X < 4)$
4. a) Find the probability of getting 4 heads in 6 tosses of fair coin.
   b) b) What do you mean by probability density function?
5. If 10% of bolt's produced by a machine are defective. Determine the probability that out of 10 bolts, chosen at random

b) 1

c) None

d) At most 2 bolts will be defective

6. The random variable x has a poisson distribution if $p(x = 1) = 0.01487$, $p(x = 2) = 0.04461$. Then find $p(x = 3)$.
7. a) Find mean and variance of binomial distribution.
   b) Fit a second degree parabola to the following data;

x :	0	1	2	3	4
y :	1	1.8	1.3	2.5	6.3

8. Fit Poisson's distribution to the following and calculate theoretical frequencies
   $e^{-0.5} = 0.61$

Deaths:	0	1	2	3	4
Frequency:	122	60	15	2	1

OR

9. Show that the mean deviation from the mean of the normal distribution is $\frac{4}{5}$ times its standard deviation.
10. a) Find mean and variance of Poisson distribution.
    b) Write a short note on random variables, their types and probability distribution.
11. 100 tablets are found defectives in a lot of 5000 tablets. Find the probability that at most 3 tablets are defective in a box of 100 tablets.
12. The mean height of 500 students is 151 cm and standard deviation is 15cm. assuming that heights are normally distributed. Find how many students have heights between 120 and 155cm.
13. Six coins are tossed 6400 times. Using the binomial distribution, find the approximate probability of getting six head x times.

14. Six dice are thrown 729 times. How many times do you expect at least three dice to show a five or six?
15. Explain the Binomial theorem in brief.

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THANK YOU