Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2019 - 20 Examination

Semester: 3 **Date: 04/12/2019**
Subject Code: 03191203 **Time: 2:00 pm to 4:30 pm**
Subject Name: Mathematics-III **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Answer the following Questions: **(15)**

1. The order of the differential equation $\left(\frac{d^{10}y}{dx^{10}}\right)^2 = \left(\frac{d^2y}{dx^2}\right)^{10} + 2x$ is _____.
   (a) 3 (b) 10 (c) 0 (d) 2

2. The general solution of the linear second order homogeneous differential equation with constant coefficients having roots $m_1 = m_2 = m$ is _____.
   (a) $y = c_1e^{m_1x} - c_2e^{m_2x}$ (b) $y = c_1e^{m_1x} + c_2e^{m_2x}$ (c) $y = (c_1 + c_2x)e^{mx}$ (d) $y = c_1e^{m_1x} - c_2e^{m_2}$

3. A function $f(x)$ is said to be periodic function if _____
   (a) $f(x+p) = f(x)$ (b) $f(x+p) = f(0)$ (c) $f(x+p) = f(p)$ (d) None

4. The fundamental period of $\sin x$ is _____
   (a) p (b) 2π (c) 0 (d) π

5. $(1+\Delta)(1-\nabla) =$ _____
   (a) E (b) ∇ (c) 1 (d) 0

6. The solution of the given partial differential equation $\frac{\partial z}{\partial x} = \cos y$ is _____.

7. The degree of the differential equation $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial^2 z}{\partial y^2}\right) = -4$ is _____.

8. The rate of convergence of Newton-Raphson method is_____ than Secant method.
9. The Gauss-elimination method for solving system of linear equations is also known as_____.
10. The formula for Trapezoidal Rule is _____.
11. Write formula for two point Gaussian quadrature method.
12. Prove that $1 + \Delta = E$.
13. Find ordinary differential equation for $y = ax^2 + c$.
14. The Newton-Raphson method is fail at $f'(x) = 0$. **(True/False)**
15. Lagrange's interpolation formula is true for equally spaced data. **(True/False)**

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Solve $y''+4y'+4y = 0, y(0) = 2, y'(0) = 1$

B) Find the Fourier Series of $f(x) = \begin{cases} 0\,; & -\pi \le x \le 0 \\ x\,; & 0 \le x \le \pi \end{cases}$

C) Solve $(x^2 - y^2 - z^2)p + 2xyq = 2xz$ by using Lagrange's multiplier method.

D) Solve $z(p^2 - q^2) = x - y$.

Q.3 A) Find the root of $f(x) = x^3 - 4x - 9$ by using Bisection method correct up to two decimal places. **(07)**

B) (1) Solve the following system of linear equations by using Gauss-Elimination method: **(04)**
$x + y + z = 7, 3x + 3y + 4z = 24, 2x + y + 3z = 16$

(2) Evaluate $\int_0^1 \frac{dt}{1+t}$ by three point Gaussian formulae. **(04)**

OR

B) (1) Solve the following system of linear equations by using Gauss-Seidel method: **(04)**

$12x_1 + 3x_2 - 5x_3 = 1, x_1 + 5x_2 + 3x_3 = 28, 3x_1 + 7x_2 + 13x_3 = 76$

correct up to 3-decimal places. Use $x_1 = 1, x_2 = 0$ *and* $x_3 = 1$ as the initial guess.

(2) Evaluate $\int_0^3 \frac{1}{1+x} dx$, with $n = 6$ using Simpson's 3/8 rule. **(04)**

Q.4 A) (1) Using Gauss's forward interpolation formula, find the value of $y(32)$. **(07)**

x	25	30	35	40
y	0.2707	0.3027	0.3386	0.3794

OR

A) Using Lagrange's interpolation formula, find y when $x = 10$ from the following data: **(07)**

x	5	6	9	11
y	12	13	14	16

B) (1) Using Taylor's series method find the value of y at x = 0.1 for the IVP **(04)**

$\frac{dy}{dx} = x^2 y - 1, \quad y(0) = 1$

(2) Using Euler's method, find $y(0.2)$ given $\frac{dy}{dx} = y - \frac{2x}{y}, \quad y(0) = 1$ with h=0.1. **(04)**