Seat No: _____________ Enrollment No: __________________

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2019 - 20 Examination

Semester: 3 **Date: 04/12/2019**
Subject Code: 203191203 **Time: 2:00pm to 4:30pm**
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 Objective Type Questions **(15)**

1. The coefficient of correlation r =_______________.
   (a) $\pm\sqrt{b_{yx}+b_{xy}}$ **(b)** $\pm\sqrt{b_{yx}*b_{xy}}$ **(c)** $\pm\sqrt{b_{yx}-b_{xy}}$ **(d)** $b_{yx}*b_{xy}$
2. In Simpson's 1/3rd rule, the number of intervals (n) should be multiple of _______________.
   (a) 3 **(b)** 1 **(c)** 2 **(d)** none of these
3. The rate of convergence of Bisection Method is _____________.
   (a) 2 **(b)** 1.5 **(c)** 1 **(d)** None of these
4. Newton's first divided difference $[x_0, x_1] =$ _________ .
   (a) $y_1 - y_0$ **(b)** $\frac{y_1 - y_0}{x_1 - x_0}$ **(c)** $\frac{y_1 - y_0}{x_0 - x_1}$ **(d)** None of these
5. The Laplace Transform of $t^{\frac{-1}{2}}$ is ________.
   (a) $\frac{\pi}{\sqrt{s}}$ **(b)** $\sqrt{\frac{\pi}{s}}$ **(c)** $\frac{\sqrt{\pi}}{s}$ **(d)** none of these
6. If the correlation coefficient $r = \pm 1$, then the angle between the regression lines θ =__________.
7. $E\nabla =$ _________
8. $L^{-1}\{1\} =$ _____
9. If $L\{f(t)\} = \bar{f}(s)$, then $L\{e^{at}f(t)\} =$ __________
10. Write the Laplace equation.
11. Gauss Seidel method converges faster than Gauss Jacobi method. **True/False**
12. The non-linear equation $f(x) = x^3 + 4x^2 - 10$ has atleast one real root in the interval $[0,1]$ **True/False**
13. The regression coefficients are independent of scale but not of origin. **True/False**
14. The convergence of Newton Raphson method is quadratic. **True/False**
15. The solution of the partial differential equation $z = px + qy + 2\sqrt{pq}$ is $z = ax + by + 2\sqrt{ab}$ **True/False**

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

A) Find the coefficient of rank correlation.

x	35	40	42	43	40	53	54	49	41	55
y	102	101	97	98	38	101	97	92	95	95

B) Using Runge–Kutta method of fourth order, solve $\frac{dy}{dx} = x + y$, y(0)=1 at x = 0.4 taking h=0.2.

C) Construct Newton's forward interpolation polynomial for the following data :

x	4	6	8	10
y	1	3	8	16

Hence evaluate y for $x=5$.

D) Solve the partial differential equation $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = e^{2x+5y}$

Q.3 A) (i) Using Laplace transformation, solve the initial value problem **(04)**

$$y'' + 2y' + 5y = e^{-t}\sin t, \qquad y(0) = 0, y'(0) = 1$$

(ii) Evaluate $L^{-1}\left\{\frac{6s-8}{s^2-s-6}\right\}$ **(03)**

B) (i) Find a linear law of the form Y=aX+b **(05)**

Y	29	33	48	59
X	10	12	22	27

Compute Y when X=15 kg.

(ii) Evaluate $\int_0^6 \frac{1}{1+x^2}dx$, with $n = 6$ using Simpson's 1/3 rule. **(03)**

OR

B) (i) Solve by using method of separation of variables $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$ given u(x,0)= $4e^{-x}$ **(05)**

(ii) Form the partial differential equations from the relation $z = ax + by + ab$ **(03)**

Q.4 A) (i) Use Lagrange's method to solve $x(y-z)p + y(z-x)q = z(x-y)$ **(04)**

(ii) Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \cos y$ given that $\frac{\partial z}{\partial y} = -2\cos y$ when $x = 0$ and $z = 0$ when y is a multiple of π. **(03)**

OR

A) (i) Find a positive real root for the equation $x^3 - 7x + 3 = 0$ using Newton-Raphson Method **(04)**

(ii) Using Lagrange's formula, find f(3) for the following data: **(03)**

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

B) (i) Solve the following System of linear Equations using Gauss Seidel's Method **(05)**
$12x_1 + 3x_2 - 5x_3 = 1$, $x_1 + 5x_2 + 3x_3 = 28$, $3x_1 + 7x_2 + 13x_3 = 76$ correct up to three decimal places taking initial values as (1,0,1)

(ii) Find $L\left\{\frac{1-\cos t}{t}\right\}$ **(03)**