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

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2018 - 19 Examination

Semester: 3 **Date: 30/05/2019**
Subject Code: 03191203 **Time: 02:00pm to 04:30pm**
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 A. Choose the correct answer **(15)**

1. If $y_1 = e^x$ any $y_2 = e^{-x}$, the Wronskian $W(y_1, y_2)$ is

(a) 1 (b) 0 (c) -2 (d) e^{2x}

2. Partial differential equation $\frac{\partial^2 u}{\partial x^2} = 9\frac{\partial^2 u}{\partial y^2}$

(a) Laplace equation (b)Wave equation (c) One dimensional wave equation (d) none of these

3. The non-linear equation $f(x) = x^3 + 4x^2 - 10$ has atleast on real root in the interval

(a) $[0,1]$ (b) $[1,2]$ (c) $[-1,0]$ (d) none of these

4. While evaluating a definite integral by Trapezoidal rule, the accuracy can be increased by taking _____.

(a) large number of sub-intervals (b) small number of sub-intervals

(c) odd number of sub-intervals (d) none

5. $(1+\Delta)(1-\nabla) =$

(a) 0 (b) $\Delta\nabla$ (c) ∇ (d) 1

B. Fill in the blanks with appropriate answer

1. The value of $\cos n\pi$ is _____.

2. The general solution of $y'' + 4y$ is _____.

3. $\Delta\nabla =$ _____

4. The order and degree of the partial differential equation $\left(\frac{\partial^3 u}{\partial x^3}\right)^4 + 2\left(\frac{\partial u}{\partial y}\right)^5 = u$ is _____ and _____.

5. The convergence rate of Newton Raphson method is _____.

C. State True or False

1. Gauss Jacobi method converges faster than Gauss Seidel method.

2. $f(x) = x^2 - x$ is an odd function.

3. The solution of the partial differential equation $p + q = 1$ is $z = ax + (1-a)y$

4. If $f(x) = x^3$ in (-1,1), then the Fourier coefficient a_n is 0.

5. The Gaussian Quadrature formula for n points gives the exact solution for polynomials up to degree 2n-1.

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

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

B) Find the solution to the following system of equations using the Gauss-Seidel method correct up to 3 decimal places $27x + 6y - z = 85,\ x + y + 54z = 110,\ 6x + 15y + 2z = 72$

C) Compute $f(3)$ by using Lagrange's interpolation formula from the following data:

x	0	1	2	5
y	2	3	12	147

D) Obtain the Fourier cosine series for the function $f(x) = e^x$ in the range (0, 1).

Q.3

A) Find the Fourier series of $f(x)=\begin{cases}-x-\pi, & -\pi \le x<0\\ x+\pi, & 0\le x\le \pi\end{cases}$. **(07)**

B) (i) Use Runge-Kutta fourth order method to find the approximate value of y(0.2) given that $\frac{dy}{dx}=x+y$ and y(0)=1 and h=0.2 **(04)**

(ii) Using Newton's forward difference interpolation formula to find approximate value of $f(1.3)$ from the following data: **(04)**

x	1	2	3	4
$f(x)$	1.1	4.2	9.3	16.4

OR

B) (i) Solve the partial differential equation $\frac{\partial^2 u}{\partial x \partial y}=\cos x \cos y$. **(04)**

(ii) Solve $\left(D^2+10DD'+25D'^2\right)=e^{3x+2y}$ **(04)**

Q.4

A) Using the method of separation of variables, solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$, given $u(x,0)=6e^{-3x}$. **(07)**

OR

A) Solve the Cauchy- Euler differential equation $x^2y''-3xy'+4y=x^2$, given that $y(1)=1,\ y'(1)=0$. **(07)**

B) (i) Solve the following differential equations using Undetermined coefficient method **(05)**

$y''-3y'+2y=e^x$

(ii) Solve the partial differential equations $p^2+q^2=2pq$ **(03)**