Marks: 50
Time: 2 hours

I   **Fill up the blanks**   **(10x1=10)**

1   Convergence of an infinite series remains unaffected by multiplying each term by a -------

2   Raabe's test is applied when the --------------- test fails.

3   If the series $1 + \dfrac{1}{2^2} + \dfrac{1}{3^2} + \dfrac{1}{4^2} + \dfrac{1}{5^2} + ...$ convergent, then the series

$1 - \dfrac{1}{2^2} + \dfrac{1}{3^2} - \dfrac{1}{4^2} + \dfrac{1}{5^2} + ...$ is ------------------ .

4   Condition for the exact differential equation Mdx + Ndy = 0 is -----------------.

5   Clairaut's equation is of the form --------------------------.

6   Basis of solutions of the homogeneous ordinary differential equation on any interval is
$y_1 = \cos x$ and $y_2 = \sin x$. Then the Wronskian $W(y_1, y_2)$ is -----------.

7   Bessel's equation is of the form --------------------------.

8   Elimination of one arbitrary constant from a given relation leads a ----------order partial
differential equation.

9   A solution in which the number of arbitrary constants is equal to the number of
independent variables is called ---------------------.

10 Order of Laplace, Heat and Wave equation is -------------.

II   **Write Short notes on any FIVE of the following**   **(5x2=10)**

1   Define a bounded sequence and monotonic sequence.

2   Write any two properties of a series.

3   Reduce the ODE $xdy - ydx = 0$ into exact equation and find the solution.

4   Solve the non homogeneous ODE $y'' + y = sec x$ by method of variation of
parameters.

5   Write the Lagrange's linear partial differential equation and its subsidiary equation.

6   Write the one dimensional heat equation and its correct solution which satisfies all the
boundary conditions.

7   Write three possible solutions of a Laplace equation.

P.T.O

III   **Answer any FIVE of the following.**   (5x4=20)

1   Test the convergence of the series $\sum \frac{4.7\ldots(3n+1)}{1.2\ldots.n}x^n$ by Raabe's test.

2   Define absolutely convergent series. Test whether the series $\sum_{n=2}^{\infty} \frac{(-1)^n}{n(\log n)^2}$

     is absolutely convergent or not?

3   Define linear differential equation and its order and degree.

4   Solve $y' - y = 0$ by power series solution technique.

5   Solve: px + qy = z

6   Form the partial differential equation by eliminating the arbitrary constants in
     $z = (x - a)^2 + 1 + (y - b)^2$.

7   Define a second order homogeneous linear partial differential equation with constant
     coefficients. Solve $2\frac{\partial^2 z}{\partial x^2} + 5\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = 0$.

IV   **Answer any ONE of the following**   (1x10=10)

1   Solve $(D^3 - 3D^2 + 3D - 1)y = x^2 e^x$.

2   Solve the Legendre's linear equation $(2x-1)^2 \frac{d^2 y}{dx^2} + (2x-1)\frac{dy}{dx} - 2y = 8x^2 - 2x + 3$.

****