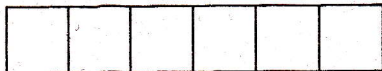


Oct-2014



कानन - 015

MATHEMATICS PAPER - I : MTH - 121
Differential Equations
(12115)

P. Pages : 3

Time : Two Hours

Max. Marks : 40

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to the right indicate full marks.

1. Attempt **any eight** of the following.

8

- i) Define homogeneous function.
- ii) State necessary and sufficient condition for the differential equation $Mdx + Ndy = 0$ to be exact.
- iii) To solve the differential equation of type $f'(y)\frac{dy}{dx} + pf(y) = Q$ we put....., where P & Q are functions of x alone.
- iv) Define general differential equation of first order and of degree n.
- v) Is differential equation $y = 2px + x^2 p^4$ solvable for x ?
- vi) Define Clairaut's equation.
- vii) Define homogeneous liner differential equation.
- viii) Complementary function of equation $(D^2 - n^2)y = 0$ is.....
- ix) If $f(-a^2) \neq 0$ then $\frac{1}{f(D^2)} \sin(ax + b) = \dots\dots\dots$

x) To reduce the homogeneous differential equation

$$x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^2 + 2 \log x \text{ into LDE with constant coefficient}$$

form put $x = \dots\dots\dots$

2. a) Attempt any two of the following.

6

i) Define linear differential equation and explain the method of solving it.

ii) Solve $\left(\frac{1}{x} + y\right) dx + \left(\frac{1}{y} - x\right) dy = 0$

iii) Solve $(x^2 + y^2 + x) dx + xy dy = 0$

b) Find an I. F. of $\frac{dy}{dx} + \frac{3x^2}{1+x^3} y = \frac{\sin^2 x}{1+x^3}$

2

3. Attempt any two of the following.

8

i) Explain the method of solving the differential equation $f(x, y, p) = 0$ where $p = \frac{dy}{dx}$, solvable for y .

ii) Solve $x^2 \left(\frac{dy}{dx}\right)^2 + xy \frac{dy}{dx} - 6y^2 = 0$

iii) Solve $(x - py)(px - y) = 2p$ using substitution $u = x^2$ and $v = y^2$.

4. a) Attempt any two of the following.

6

i) If X is a function of x alone then show that

$$\frac{1}{D-m} X = e^{mx} \int X e^{-mx} dx$$

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

iii) Solve $(D^2 - 2D + 1) y = x^2 e^{3x}$

b) Solve

2

$$\frac{d^2 y}{dx^2} - 7 \frac{dy}{dx} + 12y = 0$$

5. a) i) Explain the method of solving the homogeneous linear differential equation. 4

ii) Solve $(1+x)^2 \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 4\cos[\log(1+x)]$ 4

OR

i) Solve $(x+3)^2 \frac{d^2y}{dx^2} - 4(x+3) \frac{dy}{dx} + 6y = \log(x+3)$ 4

ii) Solve $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + 6y = x^5$ 4
