Oct-2014

कानन - 015

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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 $y = 2px + x^2p^4$ 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 $\frac{1}{f(D^2)} \sin(ax + b) =$ .....

x) To reduce the homogeneous differential equation

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

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

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

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

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

b) Solve 2

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

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

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