Seat Number

Nov-2015



**MATHEMATICS PAPER - I : MTH - 121**

# Differential Equations (12115)

**P. Pages : 2**

**Time : Two Hours** **Max. Marks : 40**

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Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink 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 exact differential equation.

   ii) Find an I.F. of $(x+y)dx+(y-x)dy=0$

   iii) If P & Q are functions of y alone, then to solve the differential equation of the type $f'(x)\frac{dx}{dy}+pf(x)=Q$ put ----------

   iv) Define general differential equation of first order and higher degree.

   v) Is differential equation $y+p^2=2px$ solvable for y?

   vi) Define Clairaut's equation.

   vii) Define homogeneous linear differential equation.

   viii) LDE with constant coefficients $f(D)y=X$ has P.I. = .............

   ix) If $f(-a^2)\neq 0$ then $\frac{1}{f(D^2)}\cos(ax+b)=$......

   x) To reduce the homogeneous differential equation $x^3\frac{d^3y}{dx^3}+3x^2\frac{d^2y}{dx^2}+3x\frac{dy}{dx}+8y=65\cos(\log x)$ into LDE with constant coefficients form put x = ...........

2. a) Attempt **any two** of the following. 6

i) Define Bernoulli's differential equation and explain method of solving it.

ii) Solve $(\sin x \cos y + e^{2x})dx + (\cos x \sin y + \tan y)dy = 0$.

iii) Solve $x\cos x \frac{dy}{dx} + (x\sin x + \cos x)y = 1$.

b) Find an I.F. of $(x^2 + y^2 + x)dx + xy\,dy = 0$. 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 p.

ii) Solve $y = 2px + x^2p^4$

iii) Solve $\cos px \cos y = \sin px \sin y + p^2$.

4. a) Attempt **any two** of the following. 6

i) If LDE is of type $f(D)y = e^{ax}$ with $f(a) \neq 0$, then show that $P.I. = \frac{1}{f(D)} e^{ax} = \frac{e^{ax}}{f(a)}$

ii) Solve $(D^3 + D)y = \sin 3x$.

iii) Solve $(D^2 - 6D + 13)y = e^{3x} \sin 2x$

b) Solve $(D^2 + 4)y = 0$. 2

5. a) i) Solve $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin[\log(1+x)]$. 4

ii) Explain the method of solving the homogeneous linear differential equation. 4

**OR**

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

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

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