Seat Number

Oct-2016

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MATHEMATICS PAPER - I : MTH - 121
Ordinary Differential Equations
(111201)

P. Pages : 4

Time : Two Hours

Max. Marks : 60

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 indicates full marks.

1. a) Attempt **any six** of the following. **6**

i) If $u = e^x \sin xy$ then $u_y(0, 0) =$ ....

a) -1 b) 0
c) 1 d) $\pi/2$

ii) If $\dfrac{\dfrac{\partial M}{\partial y} - \dfrac{\partial N}{\partial x}}{N} = f(x)$ then I.F. of equation Mdx + Ndy = 0 is ....

a) $e^{\int f(x)dx}$ b) $e^{\int f(y)dy}$
c) $f(x)$ d) $f(y)$

iii) If the equation F(x, y, p) = 0 is expressed as y = f(x, p) then it said to be solvable for ....

a) p b) y
c) x d) none of these

iv) The General solution of equation $(y - px)(p - 1) = p$ is

a) $y = cx + \dfrac{c}{c-1}$ b) $y = cx - \dfrac{c}{c-1}$

c) $y = cx$ d) $y = cx + \dfrac{(c-1)}{c}$

v) If f(D)y = X is a linear differential equation with constant coefficients then its auxiliary equation is ....

a) f(D) y = 0 b) $\frac{1}{f(D)}X=0$

c) $f(D)=0$ d) X = 0

vi) The General solution of equation $\frac{d^2y}{dx^2}+4y=0$ is ....

a) y = A cos2x b) y = Asin2x

c) $y=ce^{4x}$ d) $y=A\cos 2x+B\sin 2x$

vii) $1-D+D^2-D^3+D^4$ .... is the expansion of ....

a) e^D b) sinD

c) $\frac{1}{1+D}$ d) $\frac{1}{1-D}$

viii) To solve the equation $x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}-4y=x^2+2\log x$ we put x = ...

a) z b) log z

c) $\frac{1}{z}$ d) e^z

b) Attempt **any six** of the following. **6**

i) Define linear differential equation.

ii) Find $\frac{\partial u}{\partial y}$ if $u=\tan^{-1}\frac{y}{x}$

iii) Is the equation $x^2\left(\frac{dy}{dx}\right)^2+xy\frac{dy}{dx}-6y^2=0$ solvable for x ?

iv) Define Clairaut's equation.

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

vi) If $D\equiv\frac{d}{dx}$ and f(D) is a polynomial in D with constant coefficient then $\frac{1}{f(D)}xV=$..... where V is a function of x.

vii) If $D \equiv \frac{d}{dz}$ and $z = \log(2x+1)$ then $(2x+1)\frac{dy}{dx} = ...$

viii) If $D \equiv \frac{d}{dz}$ and $x = e^z$ then $x\frac{dy}{dx} = ...$

2. Attempt **any six** of the following. **12**

i) Define Bernoulli's equation.

ii) Define fyx(a, b).

iii) Find the I.F. of $(x^2 - 5xy + 7y^2)dx + (5x^2 - 7xy)dy = 0$.

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

v) Write G.S. of equation $y = px + p - p^2$.

vi) Define linear differential equation with constant coefficients.

vii) If $D \equiv \frac{d}{dx}$ then $\frac{1}{D-m}X = ...$ where X is a function of x.

viii) Define homogeneous linear equation.

ix) If $D \equiv \frac{d}{dz}$ and z = log x then $x^2\frac{d^2y}{dx^2} = ...$

3. Attempt **any four** of the following. **12**

i) If differential equation $Mdx + Ndy = 0$ is exact then show that $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

ii) Solve $(1+xy)ydx + (1-xy)xdy = 0$.

iii) Explain the method of the diff. equation f(x, y, p) = 0 when solvable for p.

iv) Solve $y - 2px = f(xp^2)$

v) Solve $(D^2 + 4)y = \cos 2x$

vi) Solve $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}-3y=0$

4. Attempt **any three** of the following. **12**

i) Solve $x^2ydx-(x^3+y^3)dy=0$

ii) Explain the method of solving linear differential equation.

iii) Explain the method of solving Clairaut's equation.

iv) Solve $y=3px+6y^2p^2$

v) Solve $\frac{d^2y}{dx^2}-9y=e^{2x}+x^2$

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

5. Attempt **any two** of the following. **12**

i) Solve $e^{3x}(p-1)+p^3e^{2y}=0$ by using substitution $e^x=u, e^y=v$.

ii) If $D\equiv\frac{d}{dx}$ and f(D) is a polynomial in D with constant coefficients then show that $\frac{1}{f(D)}e^{ax}V=e^{ax}\frac{1}{f(D+a)}V$ where V is a function of x.

iii) Explain the method of solving Homogeneous linear differential equation.

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