B.Sc. EXAMINATION, OCT - 2017

CODE : 20409

SEMESTER -II

PAPER NO:M-201

DIFFERENTIAL EQUATIONS

TIME:2:30 HOURS

TOTAL MARKS:70

INSTRUCTIONS: (1) All questions are compulsory.
(2) Each question carries equal marks.

Q.1 A ઉકેલો: $\left(1+e^{\frac{x}{y}}\right)dx+e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy=0.$ [7]

B ઉકેલો: $(9y+2x-20)dx=(6x+2y-10)dy.$ [7]

OR

Q.1 A ઉકેલો: $\frac{y}{x}\frac{dy}{dx}+\frac{2(x^2+y^2)-1}{(x^2+y^2)+1}=0.$ [7]

B ઉકેલો: $x^4\frac{dy}{dx}+x^3y+cosec\,(xy)=0.$ [7]

Q.2 A સુરેખ વિકલ સમીકરણ લખો અને ઉકેલો . [7]

B ઉકેલો: $(\sin x\sin y+sec^2x)dx+(tan^2y-\cos x\cos y)dy=0$ [7]

OR

Q.2 A વિકલ સમીકરણ M( x , y )dx + N( x , y )dy = 0 યથાર્થ થાય તે માટેની આવશ્યક અને પર્યાપ્ત શરત લખો અને સાબિત કરો. [7]

B ઉકેલો: $(x^3y^3+x)dx=dy.$ [7]

Q.3 A ઉકેલો: $y-2px=\tan^{-1}(xp^2).$ [7]

B ક્લેરોટના વિકલ સમીકરણ લખો અને ઉકેલો . [7]

OR

Q.3 A લાગ્રાંજના વિકલ સમીકરણ લખો અને ઉકેલો . [7]

B ઉકેલો: $x=\frac{p}{1+p^2}+\tan^{-1}p.$ [7]

Q.4 A જો $f(D)y=e^{ax}V$ એ આપેલ સુરેખ વિકલ સમીકરણ હોય અને V એ x નું કોઈપણ વિધેય હોય, તો સાબિત કરો કે $\frac{1}{f(D)}e^{ax}V=e^{ax}\frac{1}{f(D+a)}V.$ [7]

B ઉકેલો: $(D^4-1)y=\cos x\ \cos 2x.$ [7]

OR

Q.4 A જો $f(D^2)y=\sin(ax+b)$ એ આપેલ સુરેખ વિકલ સમીકરણ હોય અને $f(-a^2)\neq 0$, તો સાબિત કરો કે $\frac{1}{f(D^2)}\sin(ax+b)=\frac{1}{f(-a^2)}\sin(ax+b).$ [7]

B ઉકેલો: $\frac{d^3y}{dx^3}-3\frac{dy}{dx}+2y=e^{-2x}+2\sin x.$ [7]

Q.5 A ઉકેલો: $(x^3D^3+2x^2D^2+2)y=10\left(x+\frac{1}{x}\right).$ [7]

B ઉકેલો: $2(x+1)y''+y'-8y=0.$ [7]

OR

Q.5 A ઉકેલો: $y''-2\,y'\tan x+3y=0.$ [7]

B ઉકેલો: $(x^2D^3-xD^2)y=\frac{1}{x}.$ [7]

ENGLISH VERSION

| | | | |
|---|---|---|---|
| Q.1 | A | Solve: $\left(1+e^{\frac{x}{y}}\right)dx+e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy=0.$ | [7] |
| | B | Solve: $(9y+2x-20)dx=(6x+2y-10)dy.$ | [7] |

OR

| | | | |
|---|---|---|---|
| Q.1 | A | Solve: $\frac{y}{x}\frac{dy}{dx}+\frac{2(x^2+y^2)-1}{(x^2+y^2)+1}=0.$ | [7] |
| | B | Solve: $x^4\frac{dy}{dx}+x^3y+cosec\,(xy)=0.$ | [7] |
| Q.2 | A | State and solve Linear differential equation. | [7] |
| | B | Solve: $(\sin x\sin y+sec^2x)dx+(tan^2y-\cos x\cos y)dy=0.$ | [7] |

OR

| | | | |
|---|---|---|---|
| Q.2 | A | State and prove the necessary and sufficient conditions for the differential equation $M(x,y)dx+N(x,y)dy=0$ to be exact. | [7] |
| | B | Solve: $(x^3y^3+x)dx=dy.$ | [7] |
| Q.3 | A | Solve: $y-2px=\tan^{-1}(xp^2)$ | [7] |
| | B | State and solve Clairaut's differential equation. | [7] |

OR

| | | | |
|---|---|---|---|
| Q.3 | A | State and solve Lagrange's differential equation. | [7] |
| | B | Solve: $x=\frac{p}{1+p^2}+\tan^{-1}p.$ | [7] |
| Q.4 | A | If $f(D)y=e^{ax}V$ is given linear differential equation where V is a function of x, then prove that $\frac{1}{f(D)}e^{ax}V=e^{ax}\frac{1}{f(D+a)}V.$ | [7] |
| | B | Solve: $(D^4-1)y=\cos x\ \cos 2x.$ | [7] |

OR

| | | | |
|---|---|---|---|
| Q.4 | A | If $f(D^2)y=\sin(ax+b)$ is given linear differential equation and $f(-a^2)\neq 0$, then prove that $\frac{1}{f(D^2)}\sin(ax+b)=\frac{1}{f(-a^2)}\sin(ax+b).$ | [7] |
| | B | Solve: $\frac{d^3y}{dx^3}-3\frac{dy}{dx}+2y=e^{-2x}+2\sin x.$ | [7] |
| Q.5 | A | Solve: $(x^3D^3+2x^2D^2+2)y=10\left(x+\frac{1}{x}\right).$ | [7] |
| | B | Solve: $2(x+1)y''+y'-8y=0.$ | [7] |

OR

| | | | |
|---|---|---|---|
| Q.5 | A | Solve: $y''-2y'\tan x+3y=0.$ | [7] |
| | B | Solve: $(x^2D^3-xD^2)y=\frac{1}{x}.$ | [7] |