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SIVS 209 A-2K12

B.A/B.Sc. IVth Semester Degree Examination

Mathematics

Differential Equation - I

Paper - 4.2

Time : 3 Hours Maximum Marks : 60

Instructions to Candidates :

*Answer **all** the Sections.*

Section - A

I. Answer **any ten** of the following : **(10×2=20)**

1. Solve : $\sec^2 x \tan y\,dx + \sec^2 y \tan x\,dy = 0$

2. Show that the equation

$(y\cos x + \sin y + y)dx + (\sin x + x\cos y + x)dy = 0$ is Exact and solve.

3. Find the suitable integrating factor of the equation $y(8x-9y)dx + 2x(x-3y)dy = 0$

4. Find the complete solution of the equation $yp^2 - 2xp + y = 0$

5. Find the General and Singular solution of $y = px + \sin^{-1} p$

6. Find the complementary function of $(D^3 - D^2 - D + 1)y = 0$

7. Find the particular Integral of $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{2x}.\sin x$

8. Define Cauchy's homogeneous differential equation and give an example.

9. Find the part of complementary function of the equation $y'' + y'\cot x - y\,\mathrm{cosec}^2 x = 0$

10. Solve : $(1+x^2)^2\frac{d^2y}{dx^2} + 2x(1+x^2)\frac{dy}{dx} + y = 0$ using transformation $z = \tan^{-1} x$

11. Find the Wronekian W of the equation $\frac{d^2y}{dx^2} + y = \tan^{-1} x$

12. Show that the equation $x^2(1+x)\frac{d^2y}{dx^2} + 2x(2+3x)\frac{dy}{dx} + 2(1+3x)y = 0$ is Exact.

Section - B

II. Answer **any three** of the following **(3×5=15)**

1. Solve : $xdy - ydx = \sqrt{x^2 + y^2}\ dy$

2. Solve : $Sinx.Cosx\frac{dy}{dx} + \tan x = y$

3. Find the suitable integrating factor and solve the equation $xydx - (x^2 + 2y^2)dy = 0$

4. Solve : $p^2 + 2py\cot x = y^2$

Section - C

III. Answer **any three** of the following : **(3×5=15)**

1. Solve : $\left(D^2 - 4D + 3\right)y = e^{2x}.\sin 3x$

2. Solve : $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 2x^2$ by a suitable substitution $x = e^z$.

3. Solve the simultaneous differential equations $\frac{dx}{dt} + 4x + 3y = t;\ \frac{dy}{dt} + 2x + 5y = e^t$

4. Find the singular and general solution of $\left(a^2 - x^2\right)p^2 + 2xyp + b^2 - y^2 = 0$

Section - D

IV. Answer **any two** of the following : **(2×5=10)**

1. Solve : $x^2\frac{d^2y}{dx^2} - \left(x^2 + 2x\right)\frac{dy}{dx} + (x+2)y = x^2.e^x$ given that $y = x$ is a part of C.F.

2. Solve : $x^2\frac{d^2y}{dx^2} - \frac{dy}{dx} - 4x^3y = 8x^3\sin x^2$ by using transformation $z = x^2$.

3. Solve : $\frac{d^2y}{dx^2} - \frac{2}{x}\frac{dy}{dx} + \left(1 + \frac{2}{x^2}\right)y = x.e^x$ by reducing to normal form.

4. Solve : $x^2y_2 - x(x+2)y_1 + (x+2)y = x^3$ by the method of variation of parameters if $y = x$ and $y = x.e^x$ are the solution of $x^2y_2 - x(x+2)y_1 + (x+2)y = 0$
