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Roll No. | | | | | | | | | | | |

of Question Paper : **155**

e Paper Code : **42357501** **IC**

of the Paper : **Differential Equations**

of the Course : **B.Sc. (Math. Sci.)/B.Sc. (Prog.) : DSE-1**

ster : **V**

tion : **3 Hours** Maximum Marks : **75**

your Roll No. on the top immediately on receipt of this question paper.)

All the questions are compulsory.

Attempt any *two* parts from each question.

(*a*) Solve : 6.5

$$\left(2xy^2 + y\right)dx + \left(2y^3 - x\right)dy = 0.$$

P.T.O.

(b) Solve :

$$\frac{dy}{dx} - \frac{y}{x} = -\frac{y^2}{x}.$$

(c) Solve :

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

2. (a) Solve the initial value problem :

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = 2xe^{2x} + 6e^x, \; y(0) = 1, \; y'(0$$

(b) Find the general solution of the differential equa

$$x^2\frac{d^2y}{dx^2} - 5x\frac{dy}{dx} + 8y = 2x^3.$$

(c) For the differential equation :

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

show that e^x and xe^x are solutions on th

$-\infty < x < \infty$. Are these linearly independent

Find the solution that satisfies the conditions

$y'(0) = 4$.

(a) Using the method of variation of parameters, solve the differential equation : 6

$$\frac{d^2y}{dx^2} + y = \tan^2 x.$$

(b) Given that $y = x$ is a solution of : 6

$$\left(x^2 - 1\right)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0,$$

find a linearly independent solution by reducing the order. Write the general solution.

(c) Find the general solution of : 6

$$\left(x^2 + 2x\right)\frac{d^2y}{dx^2} - 2(x+1)\frac{dy}{dx} + 2y = (x+2)^2,$$

given that $y = x + 1$ and $y = x^2$ are linearly independent solutions of the corresponding homogeneous equation.

(a) Solve : 6

$$\frac{dx}{x^2} = \frac{dy}{y^2} = \frac{dz}{nxy}.$$

(*b*) Solve :

$$\frac{dx}{dt} + \frac{dy}{dt} - x + 5y = t^2,$$

$$\frac{dx}{dt} + 2\frac{dy}{dt} - 2x + 4y = 2t + 1.$$

(*c*) Check condition of integrability and so

$$\left(y^2 + yz\right)dx + \left(xz + z^2\right)dy + \left(y^2 - xy\right)$$

5. (*a*) Eliminate the arbitrary function *f* from th

$$z = f\left(\frac{xy}{z}\right)$$

to form the corresponding partial differ

(*b*) Find the general integral of the par

equation :

$$px(x + y) = qy(x + y) - (x - y)(2x +$$

(*c*) Show that the equations :

$$xp - yq = x, \quad x^2p + q = xz$$

are compatible and find their solution.

(a) Find the complete integral of the equation : 6.5

$$p = (z + qy)^2.$$

(b) Find the complete integral of the equation : 6.5

$$zpq = p + q.$$

(c) Reduce the following differential equation to canonical form : 6.5

$$\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 0.$$