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of Question Paper : 155

Paper Code : 42357501

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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

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

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 :

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

(b) Find the general solution of the differential equation

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

(c) For the differential equation :

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

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

$-\infty < x < \infty$. 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

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

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

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

find a linearly independent solution by reducing the order.

Write the general solution.

- (c) Find the general solution of 6

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

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

$$(y^2 + yz)dx + (xz + z^2)dy + (y^2 - xy)dz$$

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

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

to form the corresponding partial differential equation

(b) Find the general integral of the partial differential equation :

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

(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

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

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

$$zpq = p + q.$$

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

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

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