

**M.Sc. MATHEMATICS
FIRST SEMESTER
ORDINARY DIFFERENTIAL EQUATION
MSM – 105**

**SET
A**

[USE OMR FOR OBJECTIVE PART]

Duration: 1:30 hrs.

Full Marks: 35

Time: 15 mins.

(Objective)

Marks: 10

Choose the correct answer from the following:

1×10=10

1. The General form of LDE with variable coefficient is

- a. $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$, where P, Q, R are functions of x, y, z only
- b. $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$, where P, Q, R are functions of x only
- c. $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$, where P, Q, R are constant
- d. $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$, where P, Q are functions of x only

2. $\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}, \frac{\partial Q}{\partial z} = \frac{\partial R}{\partial y}, \frac{\partial R}{\partial x} = \frac{\partial P}{\partial z}$ is known as

- a. Condition of Exactness
- b. Condition of integrability
- c. Necessary condition for solve
- d. none of the above

3. $Pdx + Qdy + Rdz = 0$, P, Q, R are functions of x, y, z is known as

- a. Simultaneous Differential Equation
- b. Homogeneous Equation
- c. Total Differential Equation
- d. None of the above

4. If $1 - P + Q = 0$, then the complementary function (C.F) is

- a. $y = e^{-x}$
- b. $y = e^x$
- c. $y = x$
- d. $y = x^2$

5. Auxillary equation of a total differential equation is

a. $\frac{dx}{\frac{\partial Q}{\partial z} - \frac{\partial R}{\partial y}} = \frac{dy}{\frac{\partial R}{\partial x} + \frac{\partial P}{\partial z}} = \frac{dz}{\frac{\partial P}{\partial y} - \frac{\partial Q}{\partial x}}$

b. $\frac{dx}{\frac{\partial Q}{\partial z} + \frac{\partial R}{\partial y}} = \frac{dy}{\frac{\partial R}{\partial x} - \frac{\partial P}{\partial z}} = \frac{dz}{\frac{\partial P}{\partial y} - \frac{\partial Q}{\partial x}}$

c. $\frac{dx}{\frac{\partial Q}{\partial z} - \frac{\partial R}{\partial y}} = \frac{dy}{\frac{\partial R}{\partial x} - \frac{\partial P}{\partial z}} = \frac{dz}{\frac{\partial P}{\partial y} + \frac{\partial Q}{\partial x}}$

d. $\frac{dx}{\frac{\partial Q}{\partial z} - \frac{\partial R}{\partial y}} = \frac{dy}{\frac{\partial R}{\partial x} - \frac{\partial P}{\partial z}} = \frac{dz}{\frac{\partial P}{\partial y} - \frac{\partial Q}{\partial x}}$

6. In Simultaneous Differential Equation $f_1(D)x + f_2(D)y = T_1$
 $\phi_1(D)x + \phi_2(D)y = T_2$, the symbol D represent

a. $\frac{d}{dt}$

b. $\frac{d}{dx}$

c. $\frac{d}{dy}$

d. none of the above

7. In variation of Parameter Method complete primitive of the following differential equation $\frac{d^2 y}{dx^2} - y = \frac{2}{1 + e^x}$ is

a. $y = A \cos 2x + B \sin 2x$, A, B are parameter of function of x only

b. $y = C_1 \cos 2x + C_2 \sin 2x$, C_1, C_2 are constant

c. $y = Ae^x + Be^{-x}$, A, B are parameter or function of x only

d. $y = C_1 \cos 2x - C_2 \sin 2x$, C_1, C_2 are constant

8. In Removal of first derivative method for the DE $\frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} + (x^2 + 1)y = x^2 + 3x$, what is the value of u ?

a. $u = e^{x^2/2}$

b. $u = e^{-x^2/2}$

c. $u = e^{-x/2}$

d. $u = -e^{-x^2/2}$

10. The solution of the equation $\frac{d^2y}{dx^2} - (a+b)\frac{dy}{dx} + aby = 0$ is
- a. $c_1 e^{ax} + c_2 e^{bx}$, c_1 & c_2 are arbitrary constant
- b. $c_1 \cos(-ax) + c_2 \sin(-bx)$, c_1 & c_2 are arbitrary constant
- c. $c_1 \cos ax + c_2 \sin bx$, c_1 & c_2 are arbitrary constant
- d. $c_1 e^{-ax} + c_2 e^{-bx}$, c_1 & c_2 are arbitrary constant

b. Solve by Removal of first derivative Method

$$\frac{d^2 y}{dx^2} - 2 \tan x \frac{dy}{dx} + 5y = 0$$

3. Solve the following DE

5+5=10

(a) $\frac{d^2 y}{dx^2} - \frac{dy}{dx} - 2y = \sin 2x$

(b) $\frac{d^2 y}{dx^2} - 4 \frac{dy}{dx} + 4y = x + \cos 2x + e^{-5x}$

4. Solve the following Simultaneous differential equation

6+4=10

$$\frac{dx}{dt} - 7x + y = 0$$

(a) $\frac{dy}{dt} - 2x - 5y = 0$

$$\frac{dx}{dt} + \frac{dy}{dt} - 2y = 2 \cos t - 7 \sin t$$

(b) $\frac{dx}{dt} - \frac{dy}{dt} + 2x = 4 \cos t - 3 \sin t$

5. a. Verify that the equation

6+4=10

$(y-z)(y+z-2x)dx + (z-x)(z+x-2y)dy + (x-y)(x+y-2z)dz = 0$
Is exact and find the solution.

b. Find $f(y)$ if

$f(y)dx - zxdy - xy \log y dz = 0$ is integrable.
Find the corresponding integral.

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