

**The LNM Institute of Information Technology  
Jaipur, Rajasthan**

**Math-II (2015-16), Quiz-2: Section-B**

Name:

Roll No:

Time: 15 Minutes

Maximum Marks: 10

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- Q1. Verify the exactness of the ODE  $(xy + x^2)dx + (y^2 + xy)dy = 0$  and then find an integrating factor if it is not exact. [5]

(Hint: Coefficients of  $dx$  and  $dy$  are homogeneous functions of degree 2)

**Sol.** Here,  $M = xy + x^2$  and  $N = y^2 + xy$ . Since  $\frac{\partial M}{\partial y} = x$  and  $\frac{\partial N}{\partial x} = y$ , The given DE is not exact.

Since  $M = xy + x^2$  and  $N = y^2 + xy$  are both homogeneous function of degree 2, the integrating factor is  $\frac{1}{Mx+Ny}$  i.e.  $\frac{1}{(x+y)(x^2+y^2)}$ .

- Q2. Solve the differential equation  $yy'' + (y')^2 = 0$ . [5]

**Sol.** In this equation independent variable  $x$  is missing explicitly. So introduce  $y' = p$  and  $y'' = \frac{dp}{dx} = \frac{dp}{dy} \frac{dy}{dx} = \frac{dp}{dy} p$ .

Substituting in the given DE, we get a 1st order equation in  $p$ , i.e.  $yp \frac{dp}{dy} + p^2 = 0$ .

By method of separation variables we get the solution as  $py = c_1$ .

By substituting  $y' = p$  and solving we get the solution as  $y^2 - 2c_1x + 2c_2 = 0$  or  $y^2 - c_1x + c_2 = 0$ .