Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **M.Sc.I**

19MIMS101

1st Semester Regular Examination 2019-20

MATHEMATICS

BRANCH : M.Sc.I.(MSE)

Max Marks : 100

Time : 3 Hours

Q.CODE : HR576

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) Write the order and degree of $y'' + 4y' = sin3x$.

b) $(x^3 + 3xy^2)dx + (y^3 + 3x^2y)dy = 0$. Verify the given equation is exact or not.

c) Define integrating factor for a differential equation.

d) Find the asymptotes parallel to the co-ordinate axes, of the curve

$$(x^2 + y^2)x - ay^2 = 0.$$

e) In how many points the asymptote of 7th degree curve cut to the given curve ?

f) Write the formula for radius of curvature for Cartesian equation.

g) Write the maclaurin's series of e^{2x}.

h) Find the Legendre polynomial for degree 1.

i) Find $\Gamma(7)$.

j) Write the value of $\Gamma\left(\frac{1}{2}\right)$.

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Solve the IVP $y' = -2xy$, $y(0) = 1$.

b) Solve the differential equation $y' + y\,tanx = sin2x, y(0) = 1$.

c) Find the basis of solution for $x^2y'' - xy' + y = 0, y_1 = x$.

d) Solve the IVP $4x^2y'' + 24xy' + 25y = 0, y(1) = 2, y'(1) = -6$.

e) Solve the differential equation $y'' - 3y' + 2y = e^x$.

f) Solve the differential equation $x^2y'' - 4xy' + 6y = 21x^{-4}$.

g) Find the asymptote of the curve $= \frac{a}{\frac{1}{2} - cos\theta}$.

h) Find all the asymptotes of the curve $y^3 - 6xy^2 + 11x^2y - 6x^3 + x + y = 0$.

i) Show that the curvature of the curve $x^3 + y^3 = 3axy$ at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ is $\frac{-8\sqrt{2}}{3a}$

j) Solve the differential equation $y'' + 9y = 0$ by using power series method.

k) Find the Legendre polynomial of degree 5.

l) Solve by Cramer's rule $x + 2y + 3z = 20, 7x + 3y + z = 13, x + 6y + 2z = 0$.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 Solve the differential equation $3y'' + 10y' + 3y = 9x + 5\,cosx$.

Q4 Find the Eigen values and Eigen vectors of $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

Q5 Find all the asymptotes of the curve $x^3 - x^2y - xy^2 + y^3 + 2x^2 - 4y^2 + 2xy + x + y + 1 = 0$.

Q6 $x = a(t + sint), y = a(1 - cost)$, prove that radius of curvature is equal to $4a\cos(\frac{1}{2}t)$.