THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1.   Solve the following: (6x5=30)

(i)	Solve the following initial value problem $\frac{dy}{dx} = 1 + x + y^2 + xy^2$, $y(1) = 0$.
(ii)	Solve the following differential equation by using integrating factor or otherwise $(2xy + e^x)dx = \frac{e^x}{y}dy$.
(iii)	Find the values of m_1 and m_2 so that the function $y = e^{m_1 x} + e^{m_2 x}$ is a solution of the differential equation $y'' + 4y' + 3y = 0$.
(iv)	Find the orthogonal trajectories of the given family of curves $y = x - 1 + ce^{-x}$.
(v)	Determine the appropriate form for a particular solution of the following differential equation $(D - 3)^2(D^2 + 16)\, y = xe^{3x} + x\sin 3x$.
(vi)	Find the power series solution of $y'' + x^2 y = 0$ around the ordinary point $x = 0$.

Solve the following: (5x6=30)

Q.2	Solve the following differential equation $3x\cos\left(\frac{y}{x}\right)dy - \left[2x\sin\left(\frac{y}{x}\right) + 3y\cos\left(\frac{y}{x}\right)\right]dx = 0$.
Q.3	Find the general solution to the following $y'' + 4y = 4\tan 2x$.
Q.4	Find the general solution of $y'' - 2y' + y = e^x \arcsin x$. using variation of parameter method.
Q.5	Determine whether the given functions are linearly independent or dependent on $(-\infty, \infty)$: $f(x) = 1, g(x) = \sin x, h(x) = \cos x$.
Q.6	Use the power series method to solve the given initial value problem. $(x - 1)y'' - xy' + y = 0$ $y(0) = -2, y'(0) = 6$.