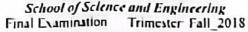
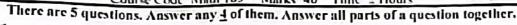
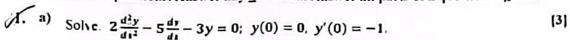
United International University



Course Title: Linear Algebra, Ordinary & Partial Differential Equations

Course Code Math 183 Marks 40 Time 2 Hours





- b) The population of a metropolitan city grows at a rate proportional to the population present at time t. The initial population of Po increases by 23% in 15 years. What [5] will be the population in 35 years? How long will it take to 4 times of the initial population?
- c) Solve: $(D^4 + 6D^2 + 9)y = 0$. [2]
- Solve the following differential equations: i. $(x-y^3+y^2\sin x)dx = (3xy^2+2y\cos x)dy$ ii. $x\frac{dy}{dx} = y + \sqrt{x^2-y^2}; x > 0$
 - b) Solve: $y'' + 4y' + 13y = 3\cos 2x \sin 2x$. [3]
- 3. a) Find the series solution in powers of x about $x_0 = 0$ for the differential equation [5] (1-x)y'' + xy' y = 0.
 - Find the general solution of the system of differential equations $X' = \begin{pmatrix} -3 & \sqrt{2} \\ \sqrt{2} & -2 \end{pmatrix} X$ [5] and describe the behavior of the solution as $t \to \infty$.
- 4. a) Use the method of reduction of order to find a second solution of the differential equation $t^2y'' t(t+2)y' + (t+2)y = 0$, t > 0; $y_1(t) = t$. [5]
 - b) Solve: $(D^3 2D + 4)y = 5t^2 e^t \cos^2 t$. [5]
- 5. a) A tank contains 35 pounds of salt dissolved in 175 gallons of water. A water containing 4 lb of salt/gal is entering the tank at a rate of 5 gal/min and the well-stirred mixture is draining from the tank at the same rate. Find the amount of salt in the tank after a long time.
 - b) Solve: $(D^2 2D + 3)y = e^{-t} \sinh 2x 7 \sin 3x \sin 2x$. [5]