Ministry of Higher Education		
Higher Institute for Engineering and Technology at Manzala		
First Semester: 2023/2024		Date: 12/11/2023
Midterm Exam		Level: 1
Department: Basic Science		Time allowed: 60 min
Total Marks: 40		Code: BS 110
Course title: Mathematics 3		Examiner: Dr. Hamouda Abueldahab
رقم المسلسل		اسم الطالب

Q.1. A circuit consisting of a resistor R, an inductor L, and a voltage source V(t) connected in series. Deduce the mathematical model for the R-L circuit, then solve it , $i(0) = 0$ **[4 Mark]**
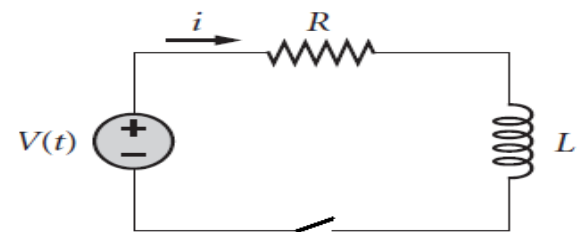
Q .2. Solve the following differential equations: **[16Mark]**

1- $\dfrac{ds}{dt} = 3t^2 + 2t + 3 \qquad , s(0) = 2$

2- $\dfrac{dy}{dx} = \dfrac{2xy\, e^{\left(\frac{x}{y}\right)^2}}{y^2 + y^2\, e^{\left(\frac{x}{y}\right)^2} + 2x^2\, e^{\left(\frac{x}{y}\right)^2}}$

3- $\dfrac{dy}{dx} = \sin(x + y + 3)$

4- $xy\dfrac{dy}{dx} = x^2 + y^2$

5- $\dfrac{dx}{dy} = \dfrac{1}{y + x^2}$

6- $\dfrac{d^2y}{dx^2} + 4y = 0$

7- $\dfrac{d^2y}{dx^2} - 9y = 0$

8- $\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} + y = 0$

Q .3. Find the D.E and the general solution of the D.E. whose characteristic equation is

$$(r-1)(r+2)(r^2+4)=0$$
[3 Mark]

Q .4. Choose the correct answer from, a, b, c, or d.   **[10 Mark]**

1 If $D = \dfrac{d}{dx}$ then the general type of the equation: $(D+3)^2 y = 2x^2 - 1$ is:

    (a) Ordinary differential equation (ODE)   (b) Partial differential equation (PDE)

    (c) Algebraic equation   (d) Transcendental equation

2 The type of the first order ordinary differential equation: $y' = y + x$ is:

    (a) Separable   (b) Homogenous

    (c) Linear   (d) Bernoulli

3 5) If c is a constant, then the general solution of the ordinary differential equation (ODE) $y\,y' = x$ is:

    (a) $y = cx$ (b) $y^2 - x^2 = c$

    (c) $y^2 + x^2 = c$ (d) $y = c\,e^x$

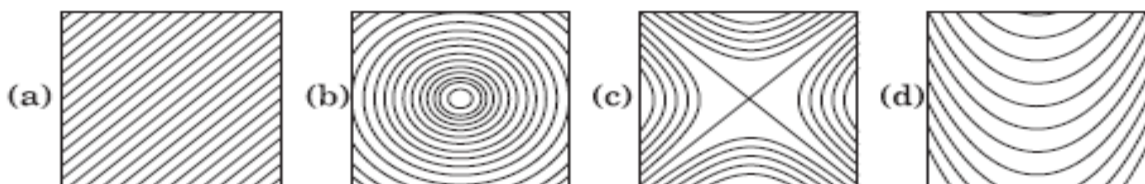**4** If c_1 and c_2 are constants, then the general solution of the ODE $y'' - y' = 0$ is:

    (a) $c_1 e^{-x} + c_2\, e^x$ (b) $c_1 + c_2\, e^x$

    (c) $y = c_1 e^x$ (d) $c_1\, e^{2x} + c_2\, e^x$

5 If $y = e^{2x}$ is a solution of $\dfrac{d^2y}{dx^2} - 4ky = 0$ then $k =$

    (a) -4   (b) 1

    (c)   -1   (d) 4

Q (5) The general solution of the differential equation $\dfrac{dy}{dx} = \dfrac{1-x}{y}$ is a family of curves which looks most like which of the following? **[4 Mark]**

  (a)   (b)   (c)   (d)

Q (6) Which one of the following curves represents the solution of the initial value problem $\dfrac{dy}{dx} = 100 - y$, Where $y(0) = 50$ **[3 Mark]**

  (a)   (b)   (c)   (d)