

Philadelphia University
Faculty of Engineering

Student Name:
Student Number:

Dept. of Communications & Electronics
Final Exam, Second Semester: 2004/2005

Course Title: Engineering Analysis I

Date: 9/06/2005

Course No: (630201)

Time Allowed: 2 Hours

Lecturer: Dr. Abdel-Rahman Al-Qawasmi

No. of Pages: 1

Dr. Wael Al-Sawalmeh

Question 1: (7 Marks)

Objective: Separable Method.

Solve the initial value problem:

$$y' + \sin x = 0,$$

$$y(0) = 5$$

Question 2: (4 Marks)

Objective: Second-order Differential Equations.

If the general solution of second order homogeneous differential equation with constant coefficients is $y = e^{2x}(C_1 \cos 3x + C_2 \sin 3x)$, find the corresponding differential equation.

Question 3: (12 Mark)

Objective: Higher Order Differential Equations.

a- Find the general solution of the following differential equation:

$$y'' + y' = e^{-x} + x$$

b- Solve the Euler-Cauchy higher order differential equation:

$$x^3 y''' - 3x^2 y'' + 8xy' = 0$$

Question 4: (7 Mark)

Objective: Direct & Inverse Laplace Transform.

a- Use the Laplace Transform to find the particular solution:

$$y' + 2y = e^{t-2}u(t-2), \quad y(0) = 1$$

b- Find the inverse Laplace Transform:

$$1- F(s) = \frac{-e^{-s} + s(e^{-2s} + e^{-s})}{s(s-1)}, \quad 2- F(s) = \ln \left| \frac{s+a}{s+b} \right|,$$

Where (a, b) are constants.

Question 5: (10 Mark)

Objective: About Frobenius Method.

Find the **Recursion Formula** of the hypergeometric differential equation:

$$x(1-x)y'' + (3-5x)y' - 4y = 0$$

Question 6: (10 Mark)

Objective: Modeling of RL-circuit.

Model the following electric circuit as shown in figure below and find:

a- L so that I(t) can reach 40% of its maximum value after 1ms. [I(0)=0]

b- E_0 If $40\% I_{\max} = 2mA$ after 1 ms.

