MT232: Differential Equations

Worksheet 10

Fri Nov 16, 2018 *Fall 2018*

Student 1 Roll No._____ **Evaluator 1 Roll No.**_____

Student 2 Roll No._____ **Evaluator 2 Roll No.**_____

Problem 1 (40 Marks)

For the initial value problem:
$y'' + 4y' + 4y = e^{-2t} \sin 2t, \qquad y(0) = 1 \text{ and } y'(0) = -1.5$

(a) Determine whether the system is stable, unstable or marginally stable.

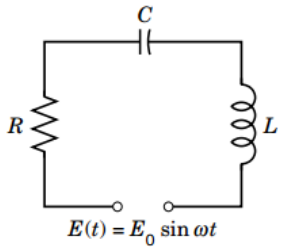
(b) Find value of natural frequency (ω_o), damping ratio (ζ) and quality factor (Q).

(c) Is the system undamped, underdamped, overdamped or critically damped?

(d) Solve the initial value problem.

Problem 2 (40 Marks)

Consider the initial value problem for the RLC circuit given in the following figure. The data is given as: R=8, L=0.2, C=0.0125, E=100cos $10t$. Assume zero initial current and initial charge.



(a) Determine whether the system is stable, unstable or marginally stable.

(b) Find value of natural frequency (ω_o), damping ratio (ζ) and quality factor (Q).

(c) Is the system undamped, underdamped, overdamped or critically damped?

(d) Solve the initial value problem.
