27-11-2018

MECE 233 Midterm

Name:

Surname:

Number:

Signature:

Q1) Design a RC circuit with a voltage source (Vs), 2 resistors (R1 and R2) and a capacitor (C=10-6 Farad) such that it is governed with the first order differential equation $\frac{dV\_{c}}{dt}+100V\_{c}=50V\_{s}$ where Vc stands for the capacitor voltage. **(30 points)**

**Hint:** One of the resistors (say R1) might be in parallel with the capacitor

Q2) The circuit diagram of a second order circuit with two resistors with the (R1=1 Ohm and R2) and two inductors (L1=1 Henry and L2) and a Voltage source (Vs) is given below. What should be the value of R2 and L2 such that the circuit has a characteristic equation s2+5s+6=0. (**25 points)**



Q3) The characteristic equation of circuit governing the state variable x(t) is given by s2+5s+6=0.

1. Is this system overdamped, underdamped or critically damped why? **(2 points)**
2. If the applied input to this system is zero (zero input situation) and if the initial conditions are x(0)=1 and x’(0)=-2 fid x(t) **(8 points)**

Q4) f(t)=u(t)+u(t-1)-r(t-2)+r(t-4) where u(t) stands for unit step function and r(t) stands for unit ramp function. Draw f(t) and indicate its important points. **(15 points)**



Q5) For the circuit below R1=R2=R3=1 Ohm, R4=0.5 Ohm, Vs1=10 Volt, Vs2=2VK Volt. Find the values of Node M, N and L. **(20 points)**

