**13-12-2017**

**MECE233 Midterm**

**Name:**

**Surname:**

**Signature:**

**Q1)** For the circuit below R1 = R2 = R3 = 1 Ω, Vs = 10 Volt, Vd = 5K1 Volt and K1 is the voltage over resister R1. Find the Thevenin Equivalent Circuit between points A and B. **(20 points)**



**Q2)** For the circuit below write the first order differential equation governing VC. **(15 points)**

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**Q3)** Draw y(t)=r(t)-2r(t-1)+r(t-2)+u(t-2) where r(t) stands for unit ramp function, u(t) stands for unit step function**. (10 points)**

**Q4)** f(t)=5t2+1, find f(t)×δ(t) where δ(t) stands for impulse function. **(3 points)**

**Q5)**

1. Find the state space representation of the circuit below where the state variables are the capacitor Voltage ‘VC’ and inductor current ‘IL’. **(10 points)**
2. Find the second order differential equation governing VC. **(10 points)**



**Q6)** A differential equation governing the state variable ‘VC’ for a second order circuit is given by the $\frac{d^{2}}{dt^{2}}V\_{C}+7\frac{d}{dt}V\_{C}+10V\_{C}=10$

Assume VC(0)=0 Volt and $\frac{d}{dt}V\_{C}\left(0\right)=0$ Volt/sec. Find VC(t). **(12 point)**

**Q7)** For the circuit below L=1 Henry, C=1 Farad, R= 0.5 Ohm, VC(0)=1 Volt IL(0)=0 Ampere. The Switch S1 is kept open when 0<t<2π and it is closed when t=2π. Find VC(t) and IL(t) when t>0. **(20 point)**

