28-12-2018

MECE 347 Midterm Make-Up

Name:

Surname:

Number:

Signature:

Q1) For the amplifier circuit below find the transfer function in Laplace domain**.** Select suitable values for R1, Rf, Rx and C to obtain a maximum gain of 10 and a cut of angular frequency of 10000 rad/sec. **(33 points).**

 

Q2) We have 2 inputs which are named as V1(t) and V2(t). Design a circuit diagram that generates the output function $V\_{out}\left(t\right)=-2\frac{d^{2}}{dt^{2}}V\_{out}\left(t\right)+V\_{1}\left(t\right)-3V\_{2}\left(t\right).$ In your design you can use any number of amplifier units given in the figures below. However each unit should either demonstrate an inverting differentiator or an inverting-summing amplifier characteristics or a simple inverting amplifier characteristics. Indicate gain value of each unit **(33 points).**

**Inverting Amplifier unit Inverting Differentiator Amplifier unit**

 
**Inverting Summing Amplifier unit**



Q3)A FET amplifier structure in small signal AC analysis is given below. This circuit is examined for low frequency range and it should have 3 cut of frequencies due to the capacitors Cg, Cd and Cs. Find approximately the cut-off frequency (fcut\_of\_Cd) due to capacitor Cd. In the calculations take r0=RL=RD=RS=RM=1000 Ω, Cd= 1 μFarad, gm=10-3 Siemens. **(34 points).** The procedure for findingfcut\_of\_Cd is given below.

Procedure:

* Kill all sources
* Short the capacitors (Except for Cd)
* Put source instead of Cd (VTest)
* Calculate the current originating from the source (ITest)
* VTest/ITest=RCd
* fcut\_of\_Cd=$\frac{1}{2πC\_{d}R\_{Cd}}$

