23-11-2018

MECE 347 Midterm

Name:

Surname:

Number:

Signature:

Q1) For the amplifier circuit below the transfer function is given as H(s)= in Laplace domain**.** This circuit acts as a low pass active filter**.** Select suitable values for R1, Rf, Rx and C to obtain the exact transfer function given as H(s). Choose your resistor values in M Ohms and **(31 points).**



Q2) We have 2 inputs which are named as V1(t) and V2(t). Design a circuit diagram that generates the output function In your design you can use any number of amplifier units given in the figures below. However each unit should either demonstrate an inverting integrator or an inverting-summing amplifier characteristics or simple an inverting amplifier characteristics. Indicate gain value of each unit **(31 points).**

**Inverting Amplifier unit Inverting integrator 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=1000 Ω, Cd= 1 μFarad, gm=10-3 Siemens. **(33 points). The procedure for finding** fcut\_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=



Q4) For an operational amplifier the slew rate is SR= 2 Volt/μsec. What is the maximum possible closed-loop voltage gain that can be used when the input signal varies by 0.5 Volt in 10 μsec. **(5 points).**