Selected Topics: Electronic System Design Practice Exam
May 2012

Solve As Much As You Can – Maximum Grade: 40 Points

1. [4 points] Design a monostable multivibrator circuit that has a pulse width of 1 s and a normally off load. Draw the output waveform of the circuit for a single pulse of width 100 ms.

2. [4 points] Design a circuit that performs a weighted sum of 4 signals with relative weights of 1:2:4:8 respectively.

3. [4 points] Design a lowpass filter that is flat in both passband and stopband with cutoff frequency of 100 Hz and 30dB attenuation at 400 Hz and assuming a source and load resistances of 50 each. Provide two versions of the filter in (a) Shunt C and (b) Series L.

4. [4 points] Design a 50 Hz bandreject filter such that the stop band is between 45 Hz and 55 Hz. Assume any missing information.

5. [4 points] Design a +5V to +12V switching mode power supply. Assume any missing information.

6. [4 points] It is desired to have a single low-voltage digital signal control a switch connecting a heater to a 220 V AC supply. The desired design is such that when the signal is 1 both switches are turned on and when the signal is 0 both switches are turned off. Assume any missing information.

7. [4 points] Design a temperature control circuit that controls a Peltier cooler to maintain a desired temperature value. Assume any missing information.

8. [4 points] Design a system that allows the control of the motion of a machine part to a desired linear displacement position. Assume any missing information.

9. [4 points] Design a system that can detect the level of a fluid in a tank. Assume any missing information.

10. [4 points] Select temperature sensors for the following application and justify your selection: Home refrigerator.

Best of luck