Islamic University of Technology

EEE-4483 (Digital Electronics and Pulse Techniques)

November 11, 2020

Total score: 25 Time: 22 minutes

Question No. 1

1. Draw the block diagram of a 555 timer with appropriate pin configuration. [5]

2. What is Virtual Ground of an OpAmp? Explain with necessary circuit diagram. [6]

3. Write down the full form of VHDL. [2]

4. A 5-bit (output) DAC has a current output. For a digital input of 10100, an output current of 10 mA is produced. What will I_{out} be for a digital input of 11101? [5]

5. Determine the common mode output voltage of Fig. 5(a). Given CMRR = 65 dB. [7]

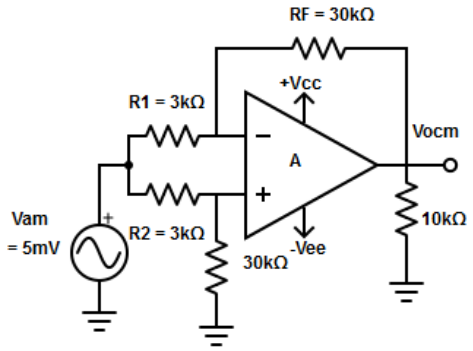

Fig. 5(a)

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Question No. 2

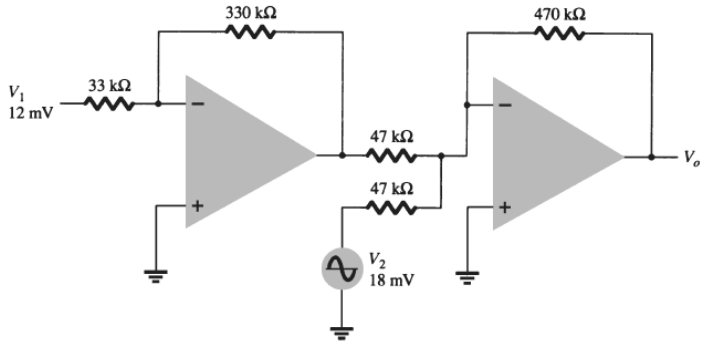
6. Draw the Schmitt Trigger circuit using OpAmp (Add $+V_R$ to the non-inverting terminal). Then Draw the waveforms of V_{in} (sinusoidal) and V_{out}. Derive the equations for UTP, LTP, and V_{Hys}. Now Draw the Hysteresis loop for the Schmitt Trigger circuit naming all relevant sections in the loop. [8]

7. What is the difference between ***std_logic*** and ***bit***? [3]

8. What is the significance of process statement in VHDL? Explain with example. [3]

9. Write a sample testbench code for D flip-flop. [4]

10. Determine the output voltage of the following circuit. [7]



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Question No. 3

11. What is Duty cycle? What do you mean by 65% Duty Cycle? [5]

12. Briefly explain capacitor charging and discharging with necessary formula and derivation. [7]

13. Draw the circuit diagram of a 6-bit successive approximation ADC. Consider the clock rate is 3 MHz and the range of the DAC output is $0\ V \leq V_{DAC} \leq V_{ref}$ in addition to the offset of +0.5 LSB. [10]

14. Calculate the conversion rate (in MHz) of the ADC from question 1(a). [3]