Islamic University of Technology
EEE-4483 (Digital Electronics and Pulse Techniques)

January 13, 2021

Instructions: Marks in the margin indicate full marks. Programmable calculators are not allowed. Assume values of the parameters if not provided. The questions may contain excess information. Always keep your videos and microphone turned on. In some questions there are redundant information.

Total score: 25   Time: 22 minutes

Question No. 1

1.   What is PWM? Draw various types of PWM signals.   [5]

2.   What is the main difference between a traditional motor and a servo motor? Mention at least 6 applications of Servo motors.   [5]

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

4.   what is loop gain and closed loop gain   [5]

5.   For the following unconfigured PAL schematic in Fig. 1(a), draw in the connection points (i.e., the X's) [8] to implement the two SOP logic expressions show on the outputs.
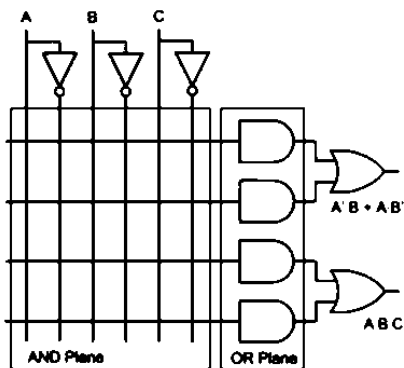

Fig. 1(a)

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Question No. 2

1. The following is a truth table of a 3-input, 4-output combinational circuit. Tabulate the PAL programming table for the circuit and mark the fuses to be blown in a PAL diagram similar to the one [8] shown in Fig. Q2(a).

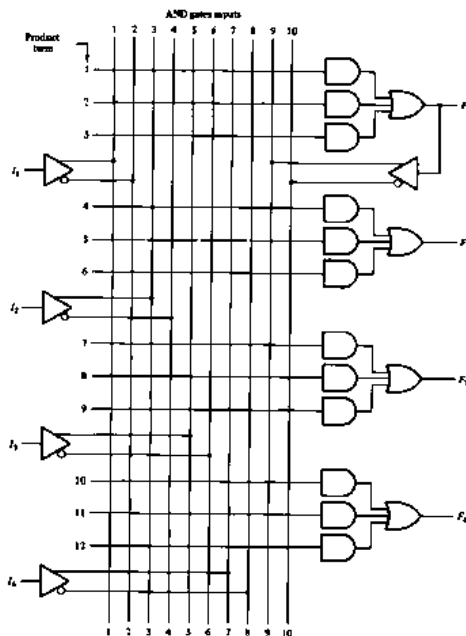| Inputs		Outputs
x y z		A B C D
0 0 0		0 1 0 0
0 0 1		1 1 1 1
0 1 0		1 0 1 1
0 1 1		0 1 0 1
1 0 0		1 0 1 0
1 0 1		0 0 0 1
1 1 0		1 1 1 0
1 1 1		0 1 1 1

Fig. Q2(a)

2. Draw the circuit diagram of a Wein-bridge oscillator. Find the equivalent impedance of lag-lead network in the circuit. Why do we use such network in the oscillator? [6]

3. Show daisy-chained SPI connection for a single master and two slaves. [4]

4. A 3-stage RC phase shift oscillator shown in Fig. Q2(b) is required to produce an oscillation [7] frequency of 6.5 kHz. If 1nF capacitors are used in the feedback circuit, calculate the value of the frequency determining resistors and the value of the feedback resistor required to sustain oscillations.
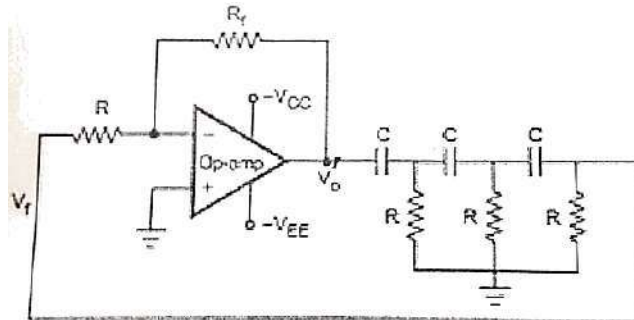

Fig. Q2(b)

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Question No. 3

1. For the clipping circuit shown in Fig. Q3(a), $V_R = 10$ V, $V_m = 20$ V, $R_f = 50\Omega$, $R = 10$ kΩ and R_r [6] $= 100$ kΩ. Calculate and plot the output (i) when the diode is ideal and (ii) when the diode has $R_f = 50\Omega$ and $R_r = 100$ kΩ.
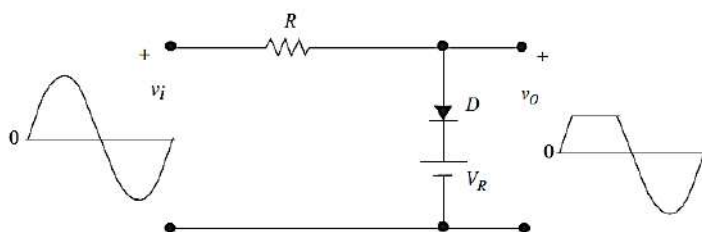

Fig. Q3(a)

2. For the clipper circuit in Fig. Q3(b), sketch the output with and without C_1 and C_2.   [7]
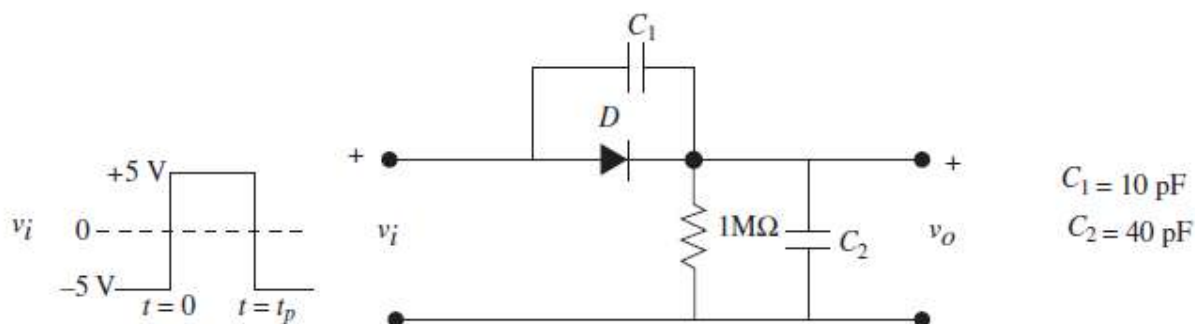

Fig. Q3(b)

3. Draw the block diagram of 1:4 Demux. Write down the testbench code to design the Demux.   [6]

4. What are the advantages and disadvantages of 1-T DRAM cell over 6-T SRAM cell?   [3]

5. Draw the equivalent circuit of a crystal-controlled oscillator.   [2]