

University : Menoufia
 Faculty : Electronic Engineering
 Department : Electr. & Elect. Comm.
 Academic level : 4th Year
 Course Name : Elective Course (5)
 Course Code : ECE 416



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 Examiners : Dr: Mohamed Salah

د. محمد صلاح طيور --- تصميم الدوائر المتكاملة

Question 1

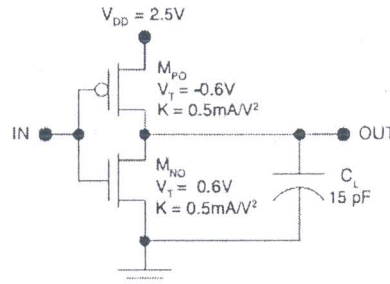
(14 Marks)

- a) State the Electrical Properties of Digital Integrated Circuits. (3)
- b) Explain with draw the Seven-stage ring oscillator with a buffered output. (5)
- c) What is meant by (Fan-In) – (Fan-Out) – (V_T) – (Logic Swing)? (2)
- d) What is the importance of calculating the noise margins of the logic gates? (4)

Question 2

(14 Marks)

- a) Estimate t_P (15-pF load) for the symmetric CMOS inverter depicted in the following figure, with $V_{DD} = 2.5$ V, $V_T = 0.6$ V, and $K = 0.5$ mA/V². (6)



- b) Draw the realization circuit using CMOS and the logic gates level of: $Y = (ABC + D) + EF + G$ (8)

Question 3

(14 Marks)

- a) Lay out a 60-k Ω resistor using a PSELECT layer with a sheet rho of 300 W/square. (6)
- b) Design the layout for a CMOS standard cell that realizes the function $Y = ABC + DE$. (8)

Question 4

(14 Marks)

- a) Realize the following decoder as a distributed gate array. (7)

A	B	D ₀	D ₁	D ₂	D ₃
0	0	1	0	0	0
0	1	0	0	1	0
1	0	0	0	0	1
1	1	0	1	0	0



- b) Draw XOR circuit design as a transistor switch array with: a) depletion implanted overpass
b) metal overpass. (7)
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Question 5

(14 Marks)

- a) Compare between the characteristics of (6)
- 1- bipolar technology,
 - 2- CMOS technology, and
 - 3- BICMOS technology.
- b) Draw the circuit diagram of BiCMOS NAND2 gate. (8)

WITH BEST WISHES

Assoc. Prof. Dr. Mohamed Salah Tabbour