



**M.E DEGREE EXAMINATIONS: JUNE 2018**

(Regulation 2015)

Second Semester

**APPLIED ELECTRONICS**

P15AETE24 : Low Power VLSI Design

**COURSE OUTCOMES**

**CO1:** Discuss the sources of power dissipation in CMOS logic design.

**CO2:** Apply low power design and optimization techniques.

**CO3:** Estimate the power at different levels.

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions**

**PART A (10 x 1 = 10 Marks)**

1. Assertion: Reducing gate capacitance will improve the performance of CMOS circuit. CO2 [K<sub>2</sub>]

Reason: Switching speed of a CMOS gate depends on C<sub>L</sub>.

- a) both A and R are individually true and R is the correct explanation of A      b) both A and R are individually true but R is not the correct explanation of A  
c) A is true but R is false      d) A is false but R is true

2. Identify the basic key principles of low power VLSI CO1 [K<sub>2</sub>]

- a) Thermodynamics and Quantum mechanics      b) Thermodynamics and Electromagnetics  
c) Thermodynamics, Quantum mechanics and Electromagnetics      d) Quantum mechanics and Electromagnetics

3. Leakage power is due to CO1 [K<sub>2</sub>]

- a) Reverse bias diode leakage      b) Subthreshold leakage  
c) Capacitor leakage      d) Both a & b

4. Match the following CO1 [K<sub>2</sub>]

List I	List II
A. Static power	i. Switching activity
B. Dynamic power	ii. Direct path
C. Short circuit power	iii. Reverse biased Diode
D. Leakage power	iv. Constant input voltage

	A	B	C	D
a)	ii	i	iii	iv
b)	iv	i	ii	iii
c)	iv	iii	i	ii
d)	iii	i	ii	Iv

5. Assertion (A): Device limits are independent of the particular circuit configuration in which a transistor or an interconnect is applied. CO1 [K<sub>2</sub>]

Reason (R): The most important device in modern microelectronics is the MOSFET

- |   |   |
|---|---|
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6. Consider the following sequence of steps for synthesizing dynamic CMOS circuit. CO2 [K<sub>2</sub>]

1. Input circuit
2. Unate Decomposition
3. Partitioning
4. Technology Mapping

Which of the following sequence is correct?

- |            |            |
|------------|------------|
| a) 1,3,4,2 | b) 1,3,2,4 |
| c) 3,4,1,2 | d) 4,1,3,2 |

7. Which of the following statements are true CO2 [K<sub>2</sub>]

1. Encoding can be used either to remove undesired correlation among the data Bits
2. One popular example of the non-redundant encoding scheme is the Gray coding
3. Hamming distance for gray code is 2.
4. Reduction in switching activity leads to low power.

- |          |          |
|----------|----------|
| a) 2,3,4 | b) 1,2,4 |
| c) 3,4   | d) 1,2,3 |

8. Assertion (A): VTCMOS circuit has low subthreshold leakage current in normal mode CO2 [K<sub>2</sub>]

Reason (R): Body effect occurs in VTCMOS during normal mode.

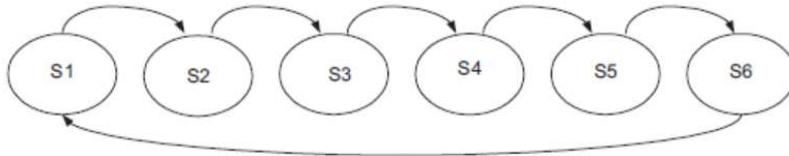
- |   |   |
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| a) both A and R are individually true and R is the correct explanation of A | b) both A and R are individually true but R is not the correct explanation of A |
| c) A is true but R is false   | d) A is false but R is true   |



**Answer any FOUR Questions**

**PART D (4 x 10 = 40 Marks)**

27. Discuss about the short circuit component of power in CMOS circuits. CO1 [K<sub>2</sub>]
28. Explain simple Adder-Comparator architecture with pipelining and parallel processing for low power. CO2 [K<sub>3</sub>]
29. Describe FSM state encoding for a modulo 6 counter. The state transition diagram of the same is shown below CO2 [K<sub>3</sub>]



30. Elucidate the VTCMOS approach and write the algorithm for energy constrained Dual  $V_T$  assignment. CO2 [K<sub>2</sub>]
31. Explain the propagation of static probability in logic circuits. CO3 [K<sub>3</sub>]

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