

Total No. of printed pages = 3

**ECE 1818 PE 31**

Roll No. of candidate

17/6/23

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2023

Azara, Hatkhowapara  
Guwahati - 781017

**B.Tech. 8<sup>th</sup> Semester End-Term Examination**

**(Even Semester-new regulation)**

**MIXED SIGNAL DESIGN**

**New Regulation (w.e.f. 2017-18) & New Syllabus (w.e.f. 2018-19)**

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

**GROUP A**

1. (i) In ON state the MOSFET switch is equivalent to
  - (a) Resistor
  - (b) Inductor
  - (c) Capacitor
  - (d) Battery
- (ii) Current Mirror is a
  - (a) Constant Voltage Source
  - (b) Unstable Voltage Source
  - (c) Constant Current Source
  - (d) Unstable Current Source
- (iii) PLL is used to lock
  - (a) Its output frequency
  - (b) Phase to the frequency
  - (c) Phase of the input signal
  - (d) All of the above
- (iv) An ideal op-amp has \_\_\_\_\_
  - (a) Infinite input resistance
  - (b) Infinite differential voltage gain
  - (c) Zero output resistance
  - (d) All of the above
- (v) Which of the following option is not true?
  - (a) Comparator compares input signal levels
  - (b) A Switch capacitor integrator consist of combination of switches and capacitor wich forms resister
  - (c) A noninverting amplifier has same polarity as input voltage signal
  - (d) A Switch capacitor circuit is more sensitive towards parasitics

[Turn over

(vi) Which A/D converter is considered to be simplest, fastest and most expensive?

- (a) A Servo converter                      (b) A Counter type ADC  
(c) A Flash type ADC                      (d) A Cyclic DAC

(vii) Which of the following statement is true? Negative feedback in an amplifier

- (a) reduces gain  
(b) increase frequency and phase distortion  
(c) reduces bandwidth  
(d) increases noise

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(viii) Find the output voltage of an ideal op-amp. If  $V_1$  and  $V_2$  are the two input voltages

- (a)  $V_0 = V_1 - V_2$                       (b)  $V_0 = A \times (V_1 - V_2)$   
(c)  $V_0 = A \times (V_1 + V_2)$               (d)  $V_0 = V_1 \times V_2$

(ix) What is VCO

- (a) Exhibits a frequency that can be varied with a dc control voltage  
(b) A single pole low pass filter  
(c) Is the terminal of the op-amp where input resistors are placed  
(d) All of the choices

(x) For an operational amplifier which of the following tells how fast the output voltage can change?

- (a) Frequency response                      (b) Common mode rejection ration  
(c) Slew rate                                      (d) Open-loop voltage gain

### GROUP B

Answer any four

2. (a) Why CMOS technologies is preferred over other fabrication technologies for analog-Mix-signal Integrated circuit. (3)  
(b) Draw and explain folded cascade configuration and list out its advantages. (6)  
(c) Explain the working and derive the output impedance of a simple MOS current mirror. (6)

3. (a) What is switched capacitor? Draw the circuit diagram and explain the working of a Switched Capacitor integrator. (2+5=7)
- (b) If  $C_1 = C_2 = C$ , find the value of  $c$  that will emulate a 1 M ohm resistor if the clock frequency is 200 KHz. (5)
- (c) Explain how a MOSFET can be used as a Current Controlled Current source. (3)
4. (a) What are biquad filter? Explain about the two switched capacitor biquad realization. (8)
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- (b) With neat diagram, explain the working of a sample and hold circuit. (7)
5. (a) Discuss the Characterization of Comparator using hysteresis. Elaborate the Performance improvement of Open-Loop Comparators. (9)
- (b) Explain the types of discrete time Comparator. (6)
6. (a) What are the dynamic and static characteristics that influences the performance of DACs. (5)
- (b) What is flash converter? Discuss the working of a 3-bit flash A/D converter. (6)
- (c) Write short note on hybrid data converters. (4)
7. (a) Draw the block diagram of a charge pump PLL and explain the function of each block. (7)
- (b) Differentiate the working of analog PLL circuits from digital PLL circuits. (5)
- (c) Explain the non ideal effects in PLLs. (3)