

M.TECH/AEIE/1ST SEM /AEIE 5101/2015
2015

Micro Electronic Devices and Circuits
(AEIE 5101) 10

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group - A

(Multiple Choice Type Questions)

10 x 1=10

1. Choose the correct alternatives for the following:
- (i) ICs have advantages over discrete device circuits which is
 - (a) lower cost
 - (b) high reliability
 - (c) smaller size
 - (d) All of the above.
 - (ii) PMOS and NMOS circuits are used largely in
 - (a) MSI functions
 - (b) LSI functions
 - (c) diode functions
 - (d) TTL functions.
 - (iii) What is the approximate short circuit current output of 741 op amp?
 - (a) 15 mA
 - (b) 25 mA
 - (c) 30 mA
 - (d) 35 mA.
 - (iv) Which is not a MOSFET terminal?
 - (a) Gate
 - (b) Drain
 - (c) Source
 - (d) Base.
 - (v) Which component cannot be fabricated into ICs?
 - (a) Diode
 - (b) Resistor
 - (c) Inductor
 - (d) Transistor.
 - (vi) CMOS stands for
 - (a) complex metal oxide semiconductor
 - (b) complementary material oxide semiconductor
 - (c) complex material oxide semiconductor
 - (d) complementary metal oxide semiconductor.
 - (vii) Basic building block digital circuit(s) is/are
 - (a) NAND
 - (b) NOR
 - (c) AND
 - (d) both (a) and (b)

M.TECH/AEIE/1ST SEM /AEIE 5101/2015

- (viii) What characteristic does not apply to an opamp?
(a) Low power (b) High gain
(c) High input impedance (d) Low output impedance.
- (ix) TTL digital logic family uses
(a) unipolar (b) bipolar
(c) high (d) low.
- (x) What is the slew rate of a 741 operational amplifier?
(a) $0.5 \text{ V}/\mu\text{s}$ (b) $1 \text{ V}/\mu\text{s}$
(c) $0.5 \text{ V}/\text{ms}$ (d) $1 \text{ V}/\text{ms}$.

Group - B

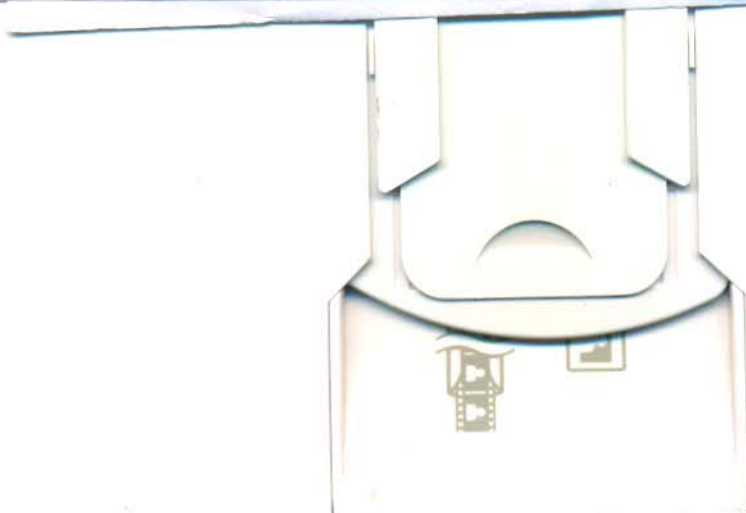
- 2.(a) Briefly describe the steps associated with IC processing, fabrication and packaging.
(b) Write short note on MOS based active resistor circuit. 8 + 4 = 12
- 3.(a) Describe the operation of NMOS Logic inverter.
(b) Write Short note on High Swing Cascode current Mirror circuit. 6 + 6 = 12

Group - C

- 4.(a) "In a 741 op-amp, input stage is a differential pair with active load" - explain.
(b) Derive expressions for the transconductance (G_m) and differential input impedance (R_{id}) of the above input stage. 3 + 9 = 12
- 5.(a) Derive the expression of dominant pole frequency (f_p), unity gain bandwidth (f_c) and slew rate (SR) of 741 op-amp. How are they related to each other?
(b) With neat circuit derive the overall small signal gain of 741 op-amp. 6 + 6 = 12

Group - D

- 6.(a) Determine the frequency response of two-stage CMOS op-amp considering small signal equivalent circuit.
(b) Briefly explain about transconductance and transresistance amplifier. 8 + 4 = 12



M.TECH/AEIE/1ST SEM /AEIE 5101/2015

7.(a) Briefly explain the operation of charge-redistribution Analog-to-Digital Converter.

(b) Consider a 5-bit charge redistribution A/D converter with $V_{REF} = 4V$. What is the full scale voltage of this converter?

10 + 2 = 12

Group - E

8.(a) Briefly explain the operation of CMOS transmission gates based switch circuits.

(b) Write Short Notes on FPGA.

5 + 7 = 12

9.(a) Briefly explain the operation of OAI gate with truth table and logic equivalent circuit.

(b) Draw the CMOS realization to implement $Y = \overline{A(B+CD)}$.

8 + 4 = 12