

2021

ELECTRONICS — GENERAL

Paper : GE/CC-2

(Linear and Digital Integrated Circuits)

Full Marks : 50

The figures in the margin indicate full marks.

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

Answer **question no. 1** and **any four** questions, taking at least **one** question from each **Unit**.

1. Answer **any ten** questions :

1×10

- (a) Characteristics of an ideal OP-AMP is/are
- (i) infinite input impedance
 - (ii) zero output impedance
 - (iii) infinite voltage gain
 - (iv) All of these.
- (b) CMRR of an ideal OP-AMP is
- (i) Infinite
 - (ii) Zero
 - (iii) One
 - (iv) 10.
- (c) A monostable multivibrator using IC 555 timer requires
- (i) an optimum input signal at threshold pin
 - (ii) an optimum input signal at trigger pin
 - (iii) no signal at trigger pin
 - (iv) None of these.
- (d) Calculate the output voltage of an OP-AMP as summing amplifier for three inputs :
 $V_1 = 1V$, $V_2 = -2V$, $V_3 = 3V$. Assume, all resistance connected in the circuit as $1\text{ K}\Omega$.
- (i) $-2V$
 - (ii) $2V$
 - (iii) $2000V$
 - (iv) $-2000V$.
- (e) The decimal equivalent of the binary number 1010.011 is
- (i) 10.5
 - (ii) 10.10
 - (iii) 10.375
 - (iv) 10.75.
- (f) The Boolean expression $x(x + y)$ is equal to
- (i) x
 - (ii) $x + x.y$
 - (iii) $x.y$
 - (iv) y .

Please Turn Over

- (g) Weighted code among the following is/are
- (i) 8421
 - (ii) Excess-3
 - (iii) Gray code
 - (iv) ASCII.
- (h) A MOD-8 counter can be designed using
- (i) 5 flip flop
 - (ii) 2 flip flop
 - (iii) 4 flip flop
 - (iv) 3 flip flop.
- (i) Which of the following logic gate(s) provide zero output for equal inputs?
- (i) OR
 - (ii) NOR
 - (iii) NAND
 - (iv) Ex-OR.
- (j) A full Adder can be designed using
- (i) two-half adder and a NOR gate
 - (ii) two-half adder and an OR gate
 - (iii) two-half adder and a NAND gate
 - (iv) two-half adder and an AND gate.
- (k) J and K inputs are _____, when toggle state arises.
- (i) Both high
 - (ii) Both low
 - (iii) J-high; K-low
 - (iv) K-high; J-low.
- (l) Resolution is
- (i) inversely proportional to total number of steps.
 - (ii) directly proportional to total number of steps.
 - (iii) independent of total number of steps.
 - (iv) None of the above.

Unit - I

2. (a) Draw the schematic diagram of an integrator circuit using OP-AMP and analyse its performance.
(b) Explain OP-AMP as a differential amplifier.
(c) What is slew rate? 4+4+2
3. (a) Explain the term virtual ground in connection with an OP-AMP.
(b) What do you mean by frequency response of an OP-AMP?
(c) How can an OP-AMP be used as a non-inverting amplifier? Find the expression for its voltage gain. 2+3+5

Unit - II

4. (a) Perform $(1011 - 1101)_2$ by 2's complement method.
(b) Find the complement of the following function :
 $F = (x'yz' + x'y'z)$
(c) Simplify the following expression using Karnaugh Map :
 $F(A,B,C,D) = \sum m(0,1,2,4,5,6,8,9,12,13,14)$. 2+3+5
5. (a) Design a 4:16 decoder using two 3:8 decoders and give the truth table.
(b) Why is a multiplexer called data selector?
(c) How can you use Ex-OR gate as a controlled inverter? 5+2+3
6. (a) Draw a logic block diagram of 4:1 multiplexer and explain its operation.
(b) Implement a full adder circuit by using NAND gates. Give the truth table. 5+5

Unit - III

7. (a) State the difference between combinational and sequential logic systems.
(b) Draw the circuit of a MOD-6 counter and explain its operation.
(c) What is race around condition? How can it be eliminated? 2+5+3
8. (a) Draw a D-type flip flop using NAND gates and write down its truth table.
(b) Draw and explain the circuit of a 4-bit shift register with serial loading. 5+5
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