

3 (Sem-1) CSC M 2 (O)

2019

**COMPUTER SCIENCE
(Major)**

Paper : 1.2

(Basic Electronics)

Full Marks : 60

Time : 3 hours

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

1. Fill up the blanks : 1×7=7

- (a) _____ diode can be used for voltage regulation.
- (b) A diode conducts current when _____ biased.
- (c) An OP-AMP amplifies the _____ between the two input signals.
- (d) A device which converts AC voltage to DC voltage is called a _____.
- (e) The process of removing or minimizing the ripples of the rectifier output is known as _____.

(2)

- (f) An ideal OP-AMP has _____ output impedance.
- (g) Any logical expression can be realized by using only _____ gates.

2. Answer the following questions : $2 \times 4 = 8$

- (a) State Thevenin's theorem.
- (b) State Kirchhoff's law.
- (c) Define the terms 'charge' and 'voltage'.
- (d) What are capacitor and inductor?

3. Answer any *three* of the following questions : $5 \times 3 = 15$

- (a) Draw and explain briefly the characteristic curve of a Zener diode. Mention one of its uses.
- (b) Draw a circuit to show how the diode works as a full-wave rectifier. Explain the working principle.
- (c) State and prove De Morgan's theorem.

(3)

- (d) What are the differences between combinational and sequential circuits? Mention one example of each circuit.
- (e) Explain the operation of a 4:1 multiplexer.

4. Answer any *three* of the following questions : $10 \times 3 = 30$

- (a) What are conductors, insulators and semiconductors? Explain briefly any one type of extrinsic semiconductors. Draw the *V-I* characteristics curve of a junction diode and explain. $3+3+4=10$
- (b) Describe briefly the working of PNP transistor. Draw the different configurations of a transistor. Mention three characteristics of an ideal OP-AMP. $4+3+3=10$
- (c) What is the effect of using a filter in a rectifier circuit? Explain with the help of a half-wave rectifier circuit and its input-output waveforms. Draw a simple power supply circuit and explain its different parts. $5+5=10$
- (d) What are basic gates and universal gates? Describe them with their symbols and truth tables. 10

(e) Draw the logic diagram of the following Boolean expressions :

(i) $\bar{x}y\bar{z} + xyz + \bar{x}y\bar{z}$

(ii) $\bar{A}\bar{B}CD + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}BC\bar{D}$

Plot the following logical expression on a K-map and obtain the simplified expression from the map : $2+3+5=10$

$$Y = ABCD + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}BC\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}BCD + \bar{A}\bar{B}CD + \bar{A}\bar{B}\bar{C}D$$

(f) Design a half-adder. Explain with its truth table. Design a full-adder with half-adder. Design a clocked S-R flip-flop and explain with its truth table.

$3+2+5=10$
