



BRAINWARE UNIVERSITY

Course –B.Sc. (CS)

Digital Electronics and Instrumentation (EC301)

(Semester – 3)

Time allotted: 3 Hours

Full Marks: 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Questions)

10 x 1 = 10

1. *Choose the correct alternative from the following*
 - (i) Decimal equivalent of an octal number $(137.21)_8$ is

a. $(952.65)_{10}$	b. $(95.265)_{10}$
c. $(9526.5)_{10}$	d. $(9.5265)_{10}$
 - (ii) Electrostatic type instruments are primarily used as

a. ammeters	b. watt meters
c. voltmeters	d. ohm meters
 - (iii) The difference of two binary numbers 1101 and 111 is

a. 110	b. 1000
c. 1110	d. none of these
 - (iv) The source of emission of electrons in a CRT is

a. p-n junction diode	b. barium and strontium oxide coated cathode
c. accelerating anodes	d. post-accelerating anodes
 - (v) An arithmetic digital building block that has one data input, more than one data outputs and more than one control inputs is the

a. data subtractor	b. multiplexer
c. decoder	d. de-multiplexer

- (vi) An aquadag is needed in a CRO to collect
 - a. primary electrons
 - b. secondary emission electrons
 - c. both primary and secondary emission electrons
 - d. none of these
- (vii) A flip-flop has
 - a. one stable state
 - b. two stable states
 - c. no stable state
 - d. none of these
- (viii) The Q factor of a coil at the resonant frequency 1.5 MHz of an LCR series circuit is 150. The bandwidth is
 - a. 225 MHz
 - b. 1.06 MHz
 - c. 10 KHz
 - d. none of these
- (ix) A full adder circuit has
 - a. two inputs and one outputs
 - b. two inputs and two outputs
 - c. two inputs and three outputs
 - d. three inputs and two outputs
- (x) The bandwidth of a CRO is 0-20 MHz. The fastest rise time for a sine wave can have to be accurately reproduced by the instrument is
 - a. 35 ns
 - b. 35 μ s
 - c. 17.5 ns
 - d. 0.17 μ s

Group – B

(Short Answer Type Questions)

3 x 5 = 15

Answer any *three* from the following

- 2. Write notes on i) Noise margin ii) Fan-out iii) Fan-in iv) Propagation delay v) Power dissipation. [1+1+1+1+1]
- 3. A 4 bit converter is used for a d.c voltage of range 0-10V. Find the weight of MSB & LSB. Also find exact range of the converter and the error. [5]
- 4. Draw the circuit diagram of a positive logic OR gate with two diodes and explain its operation. Give its logic symbol and the truth table. [3+2]
- 5. A galvanometer can be converted into a voltmeter to measure up to i) V volt by connecting a resistance R_1 in series with galvanometer coil ii) $\frac{V}{2}$ volt by connecting a resistance R_2 in series with galvanometer coil. Find the resistance in terms of R_1 & R_2 required to convert it into voltmeter that can read up to 2V volt. [5]
- 6. (a) Show that $\bar{A}B\bar{C} + \bar{A}\bar{B}C + \bar{A}BC + A\bar{B}C = \bar{A}B + \bar{B}C$ [3]
 (b) Find the octal equivalent of $(379.115)_{10}$ [2]

Group – C

(Long Answer Type Questions)

3 x 15 = 45

Answer any *three* from the following

7. (a) i) Find the decimal equivalent of $(4FF)_{16}$ [2+2+2+2]
- ii) Find the octal equivalent of $(379.115)_{10}$
- iii) Illustrate 1'S complement and 2'S complement
- iv) Make the binary subtraction $1101-111$ by 1'S complement method.
- (b) i) State De-Morgan's theorem for more than two variables. [2+2+3]
- ii) Illustrate NOR gate.
- iii) Establish the action of NOR gate as Universal gate.
8. (a) Write short notes on Anderson bridge. [8]
- (b) What is Q factor relating to series LCR circuit? What its unit? [1+1]
- (c) A coil of resistance 10Ω is connected in the Q-meter circuit. Resonance occurs at a frequency of 1MHz with the tuning capacitor being set at 65pF. Calculate the % change in the value of Q, if additional resistance of 0.02Ω is used across the oscillator circuit. [5]
9. (a) Describe how a NOT gate is implemented by using BJT. Also, show how the circuit resistances are calculated. [3+3]
- (b) Write down the Boolean expression of output Y of EX-OR gate. Show how it can be realized by using AND, OR and NOT gates. Present the logic symbol for XOR gate. [1+3+1]
- (c) What is a half adder? Give its symbol and truth table. How can it be implemented with logic gates? [1+1+2]
10. (a) Write the working principle of CRO with appropriate block diagram. [8]
- (b) Draw and explain D/A weighted resistor network for 4 bit input. [7]
11. (a) Draw circuit diagram to show how an RS flip-flop can be converted into JK flip-flop. Explain the working of JK flip-flop. Give its truth table. [2+4+2]
- (b) How can you design 1 to 4 de-multiplexer using basic gates? Give its block diagram. Write down the Boolean expression of output and its truth table. [3+1+2+1]