



BRAINWARE UNIVERSITY

Course –B.Sc. (HN)

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) Frequency can be measured by using

e. Maxwell's bridge	f. Schering bridge
g. Heaviside Campbell bridge	h. Wien's bridge
 - (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) The NOR gate is OR gate followed by
- AND gate
 - NAND gate
 - NOT gate
 - none of the these
- (vi) Which number system has a base of 16
- Decimal
 - Octal
 - Hexadecimal
 - none of these
- (vii) A flip-flop has
- one stable state
 - two stable states
 - no stable state
 - 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
- 225 MHz
 - 1.06 MHz
 - 10 KHz
 - none of these
- (ix) A full adder circuit has
- two inputs and one output
 - two inputs and two outputs
 - two inputs and three outputs
 - three inputs and two outputs
- (x) The bandwidth of a CRO is 20 MHz. The fastest rise time that a sine wave can be accurately reproduced by the instrument is given as
- 35 ns
 - 35 μ s
 - 17.5 ns
 - 0.17 μ s

Group – B

(Short Answer Type Questions)

(Answer any *three* from the following)

3 x 5 = 15

- Write notes on i) Noise margin ii) Fan-out iii) Fan-in iv) Propagation delay v) Power dissipation [1+1+1+1+1]
- Write down the basic features of i) DTL ii) TTL iii) ECL iv) MOS logic v) CMOS logic [1+1+1+1+1]
- 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. The four impedances of an a.c bridge are $Z_1 = 400\Omega \angle 50^\circ$,
 $Z_2 = 200\Omega \angle 40^\circ$, $Z_3 = 800\Omega \angle -50^\circ$ & $Z_4 = 400\Omega \angle 20^\circ$. Find out
 whether the bridge is balanced under these conditions or not. [5]
6. (a) Show that $\bar{A}(\bar{A} + BC) + \bar{A}(B + C) = \bar{A}$ [3]
 (b) Find the octal equivalent of $(869.625)_{10}$ [2]

Group – C

(Long Answer Type Questions)
 (Answer any *three* from the following)

3 x 15 = 45

7. (a) i) Find the decimal equivalent of $(2FF)_{16}$.
 ii) Find the octal equivalent of $(879.625)_{10}$.
 iii) Illustrate 1'S complement and 2'S complement.
 iv) $ABC + A\bar{B}C + AB\bar{C} = A(B + C)$ [2+2+2+2]
- (b) i) State De-Morgan's theorem for more than two variables.
 ii) Establish the action of NAND gate as Universal gate. [2+5]
8. (a) Write short notes on Anderson bridge. [8]
 (b) What is Q factor relating to series LCR circuit? What is 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 XOR 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 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 [1+4+2]
into JK flip-flop. Explain its working principle. Give its truth table.
(b) How can you design a 1 to 4 de-multiplexer using basic gates. Give its [4+1+2+1]
block diagram. Write down the Boolean expression of output and its
truth table.