CBCS SCHEME

USN | | | | | | | | | | |

17ELN15/25

First/Second Semester B.E. Degree Examination, June/July 2019
Basic Electronics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is PN junction diode? With the help of circuit diagram, explain the VI characteristics of a diode. **(07 Marks)**

b. What is rectifier circuit? Explain the classification of the rectifier. Derive the following expressions for Half-wave rectifier: (i) I_{dc} (ii) I_{rms} (iii) η (iv) γ **(08 Marks)**

c. Design a Zener diode voltage regulator circuit to meet the following specifications: $I_L = 20$ mA, Vo = 5V, $P_z = 500$ mW, Vi = 12 ± 2V and $I_{zmin} = 8$ mA. **(05 Marks)**

OR

2 a. What is a transistor? What are its applications? Explain the various current gains in a transistor and derive the relation between α and β. **(07 Marks)**

b. With a neat circuit diagram, explain the input and output characteristics of the common emitter configuration. **(08 Marks)**

c. Explain the operation of full wave rectifier with capacitor filter. **(05 Marks)**

Module-2

3 a. For the base bias circuit, $V_{CC} = 18V$, $R_C = 2.2$ KΩ, $R_B = 470$ KΩ and $\beta = 100$. Find I_B, I_C and V_{CE}. Draw the DC load line and locate the operating point. **(07 Marks)**

b. Draw the circuit diagram of the voltage divider biasing circuit. Derive the expressions of I_B and V_{CE}. **(05 Marks)**

c. List out the various deal op-amp characteristics. Explain the terms CMRR and Slew rate. **(08 Marks)**

OR

4 a. Derive the output equation of the inverting adder. Design an adder op-amp circuit to obtain an output voltage $V_0 = -(0.1V_1 + 0.5V_2 + 20V_3)$. Select $R_f = 10$ KΩ. **(07 Marks)**

b. What is an integrator? Derive its output equation. **(05 Marks)**

c. Derive the output expressions for the following op-amp applications:
(i) Voltage follower (ii) Subtractor **(08 Marks)**

Module-3

5 a. What are Radix-2, Radix-8, Radix-10 and Radix-16 number system? Perform the following operations:
i) $(1234.56)_8 = (?)_{10}$ ii) $(BAD.DAD)_{16} = (?)_8$ iii) $(988.86)_{10} = (?)_{16}$ **(08 Marks)**

b. Perform the following using 2's complement method:
i) $(15)_{10} - (28)_{10}$ ii) $(1011.10)_2 - (1000.01)_2$ **(05 Marks)**

c. Write the symbol and truth table of the following gates:
i) AND ii) NOR iii) XOR iv) NAND **(07 Marks)**

OR

6 a. Simplify and realize the following Boolean expressions using basic gates:
i) $Y = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,\overline{B} + A\overline{B}$
ii) $Y = ABC + A\overline{B}C + AB\overline{C} + \overline{A}BC$
iii) $Y = \overline{(A+B)}(\overline{A}+\overline{C})(\overline{B}+C)$ **(08 Marks)**

b. Implement XOR gate using only NOR gates. **(05 Marks)**

c. Write truth table of half-adder and full-adders. Realize the full-adder using two half-adders. **(07 Marks)**

Module-4

7 a. What is flip-flop and latch? Explain the operation of SR latch using NAND gates. **(07 Marks)**

b. Explain the working of clocked SR flip-flop with a suitable logic diagram and a truth table. **(08 Marks)**

c. Explain the working of NAND gate latch and NOR gate latch. **(05 Marks)**

OR

8 a. What is microcontroller? List out the main features of 8051 microcontroller. **(05 Marks)**

b. With a neat block diagram, explain the architecture of 8051 microcontroller. **(09 Marks)**

c. What is stepper motor? Explain the working and interfacing of stepper motor to a 8051 microcontroller. **(06 Marks)**

Module-5

9 a. What is amplitude modulation and frequency modulation? With the help of neat waveform, derive the expression for AM wave. **(07 Marks)**

b. A carrier signal with $A_C = 40$ V and $f_c = 1$ MHz is amplitude modulated with a modulating signal $A_m = 4$V and $f_m = 2.5$ kHz. The depth of the modulation is 75%. Calculate the following: (i) P_C (ii) P_T (iii) P_{SB} (iv) BW (v) Sideband frequencies. Assume R = 2Ω. **(07 Marks)**

c. What is demodulation? Explain the working of AM detector circuit. **(06 Marks)**

OR

10 a. What is transducer? Explain the working of resistance transducer and resistance thermometer. **(07 Marks)**

b. What is LVDT? Explain the construction, operation and applications of LVDT. **(07 Marks)**

c. Explain the working of piezoelectric and photoelectric transducers. **(06 Marks)**

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