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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: $I_L = 20 \text{ mA}$, $V_o = 5 \text{ V}$, $P_z = 500 \text{ mW}$, $V_i = 12 \pm 2 \text{ V}$ and $I_{zmin} = 8 \text{ mA}$. (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, $V_{CC} = 18 \text{ V}$, $R_C = 2.2 \text{ K}\Omega$, $R_B = 470 \text{ K}\Omega$ 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 ideal 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 $V_o = -(0.1V_1 + 0.5V_2 + 20V_3)$. Select $R_f = 10 \text{ K}\Omega$. (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)



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OR

- 6 a. Simplify and realize the following Boolean expressions using basic gates:
- $Y = \overline{A} \overline{B} \overline{C} + \overline{A} \overline{B} C + \overline{A} B \overline{C} + A \overline{B} \overline{C}$
 - $Y = ABC + A\overline{B}C + AB\overline{C} + \overline{A}BC$
 - $Y = (\overline{A+B})(\overline{A+C})(\overline{B+C})$
- (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 $A_C = 40\text{ V}$ and $f_c = 1\text{ MHz}$ is amplitude modulated with a modulating signal $A_m = 4\text{ V}$ and $f_m = 2.5\text{ kHz}$. 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 $R = 2\Omega$. (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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