17ELN 15/25

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 in °dale.

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) ld $_e$ /I (iv) y **(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 $_{lzmin}$ = 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 **a** and I. **(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, Vcc = 18V, R_c- = 2.2 KO, RB = 470 K1 and = 100. Find I_B, Ic and Va. 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 Is and VcE. **(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 = —(0.1V, + 0.5V, + 20V,). Select Rf = 10 KO. **(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) $_{in}$ = (?)8 iii) (988.86)1o= (?)I6 **(08** Marks)

b. Perform the following using 2's complement method:
i) (15)io ¯ (28)io ii) (1011.10)2— 0000.002 **(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) $Y=ABC+ABC+AB+AB$

ii) $Y = A\overline{BC} + ABC + ABt + ABC$

iii) $Y = (A+B)(A+C)(B+C)$ (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 Ac = 40 V and f_e = 1 MHz is amplitude modulated with a modulating signal A_m = 4V and f_m = 2.5 kHz. The depth of the modulation is 75%. Calculate the following: (i) Pc **(ii)** P_T (iii) Psa (iv) BW (v) Sideband frequencies. Assume R = **(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 Marks1**

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)**

* * * * *