17ELN15/25

USN

First/Second Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Electronics

Time: 3 hrs.   Max. Marks: 100

Note : 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
      2. *Write neat sketches as and when required.*

Module-1

1 a. Explain the operation of PN junction diode under forward and reverse bias condition.
                                                                 (08 Marks)
   b. Explain the working of half wave rectifier with capacitor filter. Explain the role of capacitor filter in the circuit. **(08 Marks)**
   c. Differentiate between Avalanche break down and Zener break down. **(04 Marks)**

OR

2 a. Derive the expressions for I_{dc}, V_{dc}, I_{rms}, V_{rms}, Percentage regulation, efficiency 'η' and ripple factor 'γ' for an full wave rectifier. **(08 Marks)**
   b. With a neat diagram, explain the input and output characteristics of a transistor in common base configuration. **(08 Marks)**
   c. For a transistor, $I_E = 1mA$, $I_B = 10\mu A$, determine 'α' and 'β'. **(04 Marks)**

Module-2

3 a. What is Biasing? Explain need of biasing. Give the comparison between various biasing circuits. **(08 Marks)**
   b. For the base bias circuit, $V_{CC} = 18V$, $R_C = 2.2k\Omega$, $R_B = 470\ k\Omega$, $h_{fe} = 100$ and $V_{BE} = 0.7V$. Find I_B , I_C and $V_{C\varepsilon}$. Draw the DC load line and indicate the Q – point. **(08 Marks)**
   c. Design the voltage divider bias circuit to operate from 12V supply. The bias conditions are $V_{C\varepsilon} = 3V$, $V_E = 5V$ and $I_C = 1mA$. Assume $V_{BE} = 0.7V$. **(04 Marks)**

OR

4 a. List the various ideal Op – amp characteristics. **(08 Marks)**
   b. Explain with a neat circuit diagram, how an Op-amp can be used as subtractor. **(08 Marks)**
   c. An Op – amp is used as an inverting amplifier to amplify an input sine wave of amplitude 100m V_{p-p}. The input resistor is $R_1 = 1k\Omega$ and feedback resistance is $R_f = 10k\Omega$. Calculate the voltage gain. **(04 Marks)**

Module-3

5 a. State and prove Demorgan's theorem. **(04 Marks)**
   b. Design a full adder circuit and implement it using basic gates. **(08 Marks)**
   c. Justify why NAND and NOR gates are called as Universal gates. Realize AND and OR gates using universal gates. **(08 Marks)**

OR

6 a. Convert : i) $(655.70)_8 = (?)_{10} = (?)_{16}$ ii) $(238.20)_{10} = (?)_8 = (?)_2$. **(08 Marks)**
   b. Subtract $(111001)_2$ from $(101011)_2$ using 2's Complement method. **(04 Marks)**
   c. Show that :
     i) $\overline{\overline{AB + \overline{A}} + AB} = 0$ ii) $\overline{X}\ \overline{Y}\ \overline{Z} + \overline{X}\ \overline{Y}\ Z + \overline{X}\ Y + X\ \overline{Y} = \overline{Y}$. **(04 Marks)**
   d. Simplify and realize the following using NAND gates $A\ \overline{B}\ \overline{C} + \overline{A}\ \overline{B}\ C + \overline{A}\ \overline{B} + \overline{AC}$. **(04 Marks)**

Module-4

7 a. What is Flip Flop? Distinguish between a latch and a flip flop. (05 Marks)
   b. With diagram and truth table, explain the operation of NOR latch gate. (07 Marks)
   c. What is RS flip – flop? With the help of neat circuit diagram, explain its operation, logic symbol and truth table. (08 Marks)

OR

8 a. Define and mention the applications of Micro controllers. (05 Marks)
   b. List the features of 8051 microcontroller. (07 Marks)
   c. With a block diagram, explain Microcontroller based stepper motor control system. (08 Marks)

Module-5

9 a. What is Modulation? Explain the need for modulation. List the different types of modulation technique. (10 Marks)
   b. Explain the elements of Communication system, with the help of block diagram. (06 Marks)
   c. The total power content of an AM wave is 2.64 kw at a modulation factor of 80%. Determine the power content of i) Carrier ii) Each side band. (04 Marks)

OR

10 a. Define Transducers. Explain the operation of Piezoelectric transducers. (08 Marks)
   b. Explain the working operation of Resistance Thermometer. (06 Marks)
   c. Write short note on :
      i) Peltier effect   ii) Thompson effect   iii) Hall effect. (06 Marks)

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