

# CBCS SCHEME

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15ELN15/25

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024

## Basic Electronics

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- What is semiconductor diode? Draw and explain the forward bias and reverse bias characteristics of a semiconductor diode. (05 Marks)
  - Draw and explain a bridge rectifier with relevant waveforms. (05 Marks)
  - Explain the common emitter configuration of a Bipolar Junction Transistor with relevant circuit diagram, input characteristics, output characteristics and current gain characteristics. (06 Marks)

OR

- What do you understand by the terms DC load line and Q – point as applied to a diode? Explain with relevant circuit, graph and equations. (05 Marks)
  - Explain with relevant circuit diagrams and waveforms, the operation of a two-diode full wave rectifier with capacitor filter. (05 Marks)
  - What is a Bipolar junction transistor? Derive the relationship between  $\alpha$  and  $\beta$  of a transistor. Calculate  $I_C$ ,  $I_E$  and  $\beta$  for a transistor that has  $\alpha = 0.98$  and  $I_B = 100\mu A$ . (06 Marks)

### Module-2

- Explain the analysis of a fixed – bias or base bias circuit, with suitable circuit diagram and equations. (04 Marks)
  - List the characteristics of an ideal op-amp. (04 Marks)
  - With relevant diagrams and output voltage expression derivations, explain how op-amp can be used as :
    - inverting summer
    - Integrator. (08 Marks)

OR

- With a neat circuit diagram and equations, explain divider bias circuit. (07 Marks)
  - With relevant diagrams and output voltage expression deviations, explain how op-amp can be used as :
    - Non – inverting amplifier
    - Subtractor
    - Differentiator. (09 Marks)

### Module-3

- Convert :
    - $(11001.0101)_2 = (?)_{10}$
    - $(111110101101)_2 = (?)_8$
    - $(1010111011110101)_2 = (?)_{16}$
    - $(11.6875)_{10} = (?)_2$ . (04 Marks)
  - Perform : i)  $(47)_{10} - (23)_{10}$  ii)  $(23)_{10} - (47)_{10}$  in binary form using 2's complement method. (06 Marks)
  - Design full adder and realize using 2 half adders. (06 Marks)

OR

- 6 a. State and prove Demorgan's theorem for 3 variables. (06 Marks)  
 b. Give the truth table and draw the symbols with relevant logical expressions for the following gates :  
 i) AND gate  
 ii) OR gate  
 iii) XOR gate. (06 Marks)  
 c. Implement  $y = AB + CD + E$  using only NAND gate. (04 Marks)

Module-4

- 7 a. Define Flip-Flop with the help of circuit diagram and truth table, explain the working of a RS Flip-Flop. (05 Marks)  
 b. What is a microcontroller? List the applications of microcontrollers. (03 Marks)  
 c. With a neat block diagram, explain a microcontroller based stepper motor control system. (08 Marks)

OR

- 8 a. With the help of circuit diagram and truth table, explain the working of :  
 i) NAND Gate Latch  
 ii) NOR Gate Latch. (08 Marks)  
 b. With a neat diagram, explain the architecture and working of 8051 microcontroller. (08 Marks)

Module-5

- 9 a. Explain basic block diagram of communication system with neat sketch. (05 Marks)  
 b. What is modulation? Explain the need of modulation. (03 Marks)  
 c. Explain the following transducers :  
 i) Resistance thermometers  
 ii) LVDT. (08 Marks)

OR

- 10 a. Define AM and show that  $P_t = P_c(1 + m^2/2)$ . Give comparison between AM and FM. (08 Marks)  
 b. What is a transducer? Distinguish between active and passive transducers with example. (05 Marks)  
 c. The total power content of an AM signal is 1000W. Determine the power being transmitted at carrier frequency and at each of the side bands when percentage modulation is 100%. (03 Marks)

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