

# CBCS SCHEME

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18EC36

## Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Power Electronics and Instrumentation

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Explain power electronics system with neat block diagram. (08 Marks)
- b. List the applications of power electronics. (04 Marks)
- c. Explain the static anode cathode characteristics of SCR with circuit diagram and V-I characteristics. (08 Marks)

OR

- 2 a. The latching current of a thyristor circuit is 50 mA. The duration of the firing pulse is 50  $\mu$ sec. Given  $V_s = 100$  V,  $R = 20\Omega$ ,  $L = 0.5$ H are connected in series.
  - (i) Calculate the current  $i(t)$
  - (ii) Draw the variation of current  $i(t)$  with respect to time.
  - (iii) Will the thyristor device gets turned on? (06 Marks)
- b. Explain different turn on methods of SCR. (06 Marks)
- c. Explain the basic operation of UJT with circuit diagram and waveform. (08 Marks)

### Module-2

- 3 a. Explain the operation of step up chopper with neat diagram and waveform. Derive the expression for output voltage. (08 Marks)
- b. Differentiate between controlled and uncontrolled rectifier. (04 Marks)
- c. Explain the operation of single phase half wave converter with resistive load with necessary circuit diagram and waveform. Derive the expression for average and RMS output voltage. (08 Marks)

OR

- 4 a. A single phase fully controlled bridge rectifier with R-L load to obtain a regulated DC output voltage. The RMS value of the AC voltage is 230 V at 50 Hz and the firing angle is at  $\pi/3$ . Load current is 4 Amps.
  - i) Calculate D average output voltage
  - ii) Active and reactive power. (06 Marks)
- b. Explain the control strategies used to operate choppers. (06 Marks)
- c. Explain the operation of single phase fully controlled converter with inductive load with circuit diagram and waveform. (08 Marks)

### Module-3

- 5 a. Define (i) Accuracy (ii) Precision (iii) Absolute error (iv) Relative error. (06 Marks)
- b. Explain single phase full bridge inverter with resistive load with necessary circuit diagram and waveform. (08 Marks)
- c. Explain the errors encountered in measurement. (06 Marks)



OR

6. a. With neat diagram explain isolated flyback converter. (08 Marks)  
 b. Define inverter. How inverters are classified? (04 Marks)  
 c. A basic D'Arsonval movement with a deflection of 2 mA and an internal resistance of  $50 \Omega$  is available. It is to be converted into a 0 – 10 V, 0 – 100 V, 0 – 250 V multirange voltmeter, Determine the value of multiplier resistances. (08 Marks)

Module-4

7. a. Explain the working of Ramp type DVM with neat block diagram and waveform. (08 Marks)  
 b. Explain the working of unbalanced Wheatstone bridge and derive the expression for galvanometer current. (08 Marks)  
 c. An inductance comparison bridge is used to measure inductive impedance at a frequency of 5 Hz. The bridge constants at balance are  $L_3 = 10 \text{ mH}$ ,  $R_1 = 10 \text{ k}\Omega$ ,  $R_2 = 40 \text{ k}\Omega$ ,  $R_3 = 100 \text{ k}\Omega$ . Find the equivalent series circuit of an unknown impedance. (04 Marks)

OR

8. a. With a neat block diagram explain the working of digital frequency meter. (08 Marks)  
 b. What are the advantages of digital instruments over analog instruments? (04 Marks)  
 c. With a neat block diagram explain the working of successive approximation DVM. (08 Marks)

Module-5

9. a. Explain the working of resistance thermometer. Mention the advantages and disadvantages. (08 Marks)  
 b. With a neat diagram explain the construction and working of LVDT. (08 Marks)  
 c. List the factors considered while selecting the transducer. (04 Marks)

OR

10. a. Explain instrumentation amplifier with transducer bridge. Derive the expression for output voltage. (10 Marks)  
 b. Explain (i) Analog Weight Scale (ii) PLC Structure and Operation. (10 Marks)

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