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.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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 μsec. Given $V_s = 100$ V, R = 20Ω, L = 0.5H 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 π/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 Ω 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 mH, R_1 = 10 kΩ , R_2 = 40 kΩ , R_3 = 100 kΩ . 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)**

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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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