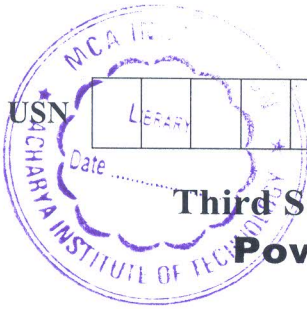


CBCS SCHEME



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18EC36

Third Semester B.E. Degree Examination, Jan./Feb. 2023 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

- Explain the static anode cathode characteristic of SCR. (04 Marks)
 - With the help of waveforms, explain dynamic turn on switching characteristics and turn-off mechanism of SCR. (08 Marks)
 - Write the applications of power electronics in various sectors. (08 Marks)

OR

- Draw the circuit diagram of R.C. firing and explain its operation. (06 Marks)
 - With the help of circuit diagram and waveforms, explain Class-A commutation circuit. (06 Marks)
 - Design a UJT relaxation oscillator using UJT 2N2646, for triggering an SCR. The UJT has the following characteristics $\eta = 0.7$, $I_P = 50 \mu\text{A}$, $V_V = 2\text{V}$, $I_V = 6 \text{ mA}$, $V_{BB} = 20 \text{ V}$, $R_{BB} = 7 \text{ k}\Omega$, $I_{EO} = 2 \text{ mA}$. (08 Marks)

Module-2

- With the help of circuit diagram and waveforms, explain the working of single phase full wave controlled rectifier. Consider M2 (midpoint) configuration and R-Load. (08 Marks)
 - Explain the effect of free wheeling diode in controlled rectifiers. (04 Marks)
 - A step down DC chopper has a resistive load of $R = 15 \Omega$ and input voltage $E_{dc} = 200 \text{ V}$. When the chopper remains ON. Its voltage drop is 2.5 V. The chopper frequency is 1 kHz. If the duty cycle is 50%, determine: (i) Average output voltage (ii) RMS output voltage (iii) Chopper efficiency (08 Marks)

OR

- Give the classifications of choppers according to the directions of output voltage and current. (05 Marks)
 - Explain the principle of operation of step up/down choppers with the help of circuit diagram. (09 Marks)
 - A single phase half wave controlled converter is operated from a 120 V, 50 Hz supply. Load resistance $R = 10 \Omega$. If the average output voltage is 25% of the maximum possible average output voltage, determine: (i) Firing angle (ii) rms and average output currents (iii) Average and rms SCR currents (06 Marks)

Module-3

- Define the following terms: (i) Measurement (ii) Resolution (iii) Error (iv) Sensitivity (04 Marks)
 - Design a multi-range ammeter with range of 0-1A, 5A and 10A employing individual shunt in each D'Arsonval movement with an internal resistance of 500Ω and a full scale deflection of 10 mA is available. (08 Marks)
 - With the help of necessary circuit diagram and waveforms, explain the operation of single phase half bridge inverter with R-Load. (08 Marks)

OR

- 6 a. Define the following:
- Instrumental error
 - Environmental errors
 - Observational errors
- (06 Marks)
- b. A voltmeter having a sensitivity of $1 \text{ K}\Omega/\text{V}$ is connected across an unknown resistance in series with a milliammeter reading 80 V on 150 scale. When the milliammeter reads 10 mA , calculate the
- Apparent resistance of the unknown resistance
 - Actual resistance of the unknown resistance
 - Error due to the loading effect of the voltmeter.
- (06 Marks)
- c. With the help of necessary circuit and waveforms, explain the operation of Buck converter.
- (08 Marks)

Module-4

- 7 a. With the help of neat block diagram, explain the working of dual slope integrating type digital voltmeter.
- (08 Marks)
- b. An unbalanced Wheatstone bridge is given in Fig.Q7(b). Calculate the current through the galvanometer.

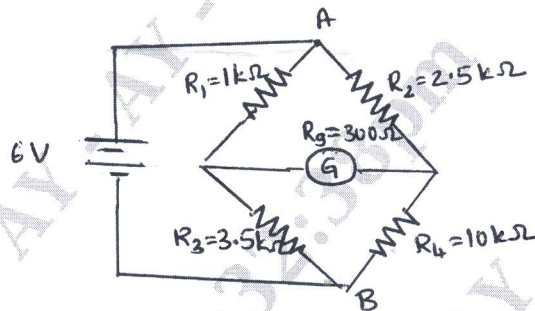


Fig.Q7(b)

- (08 Marks)
- c. What is the principle of digital frequency measurement? Explain.
- (04 Marks)

OR

- 8 a. Explain successive approximation type digital voltmeter with the help of block diagram.
- (08 Marks)
- b. Derive an expression for measuring unknown capacitance using capacitance comparison bridge.
- (06 Marks)
- c. Obtain an expression for audio frequency using Wein's bridge
- (06 Marks)

Module-5

- 9 a. What are the parameters to be considered while selecting a transducer?
- (04 Marks)
- b. Obtain an expression for the gauge factor of a strain gauge.
- (08 Marks)
- c. Write the circuit of instrumentation amplifier and derive an expression for output voltage.
- (08 Marks)

OR

- 10 a. Explain the structure of PLC.
- (07 Marks)
- b. Explain different type of thermistors. Also mention its advantages.
- (06 Marks)
- c. With the help of diagram, explain the operation of linear variable differential transformer.
- (07 Marks)
