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## Third Semester B.E. Degree Examination, July/August 2022 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. List and briefly explain the different types of power electronic converters. (10 Marks)
- b. Explain the different turn-on methods of thyristor. (10 Marks)

OR

- 2 a. With neat circuit diagram and waveforms, explain class-A and class-B commutation methods of a thyristor. (10 Marks)
- b. With neat diagram, explain static anode-cathode characteristics of SCR. Define latching current and holding current. (10 Marks)

### Module-2

- 3 a. With the help of neat circuit diagram and waveforms describe the operation of a 1 $\phi$  FWCR for B-2 connection for R-load. Derive expressions for rms and average output voltages and for rms and average output currents. (10 Marks)
- b. A single phase half-wave converter is operated from a 120V, 60Hz supply. The load is resistive with  $R = 10\Omega$ . If the average output voltage is 75% of maximum possible average output voltage, determine: i) Firing angle ii) rms and average output currents iii) average and rms SCR currents. (06 Marks)
- c. Explain different control techniques of phase control converters. (04 Marks)

OR

- 4 a. What is dc-dc converter? What are its applications? Explain the classification of chopper. (06 Marks)
- b. Explain the operation of step-up chopper with neat circuit diagram and waveforms. (08 Marks)
- c. For a chopper shown in Fig.Q.4(c), dc source voltage = 230V, load resistance = 10. Consider voltage drop of 2V across chopper when it is on. For a duty cycle of 0.4, calculate: i) Average and rms value of output voltage ii) Chopper efficiency. (06 Marks)

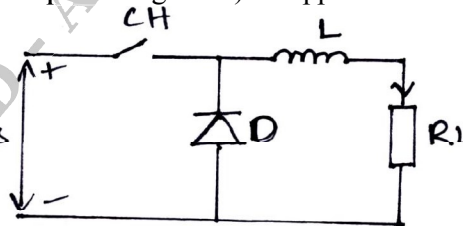


Fig.Q.4(c)

**Module-3**

- 5 a. Explain the operation of single-phase half bridge voltage source inverter with resistive load. Draw associated circuit diagram and waveforms. Derive the expressions for RMS output voltage and instantaneous output voltage. (10 Marks)
- b. With the help of circuit diagram and waveforms explain the operation of flyback converter in discontinuous mode. Also list the advantages and disadvantages. (10 Marks)

**OR**

- 6 a. Explain different types of errors, and how to minimize them. (06 Marks)
- b. Explain with a diagram how a PMMC can be used as an ammeter. How can a basic ammeter be converted into a multirange ammeter? (08 Marks)
- c. Calculate the value of multiplier resistance for the multiple range dc voltmeter circuit shown in Fig.Q.6(c). (06 Marks)

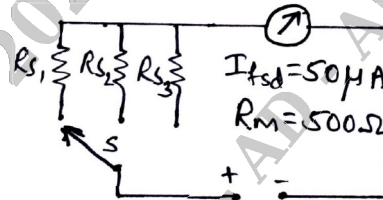


Fig.Q.6(c)

**Module-4**

- 7 a. Explain with the help of diagram and equations, the working principle of dual slope type DVM. (10 Marks)
- b. With neat diagram, explain the operation of SAR type DVM. (10 Marks)

**OR**

- 8 a. Explain with the help of block diagram the operation of a function generator. (06 Marks)
- b. Explain Wien's bridge with diagram. And derive the two balance conditions for a Wien bridge. (06 Marks)
- c. If the sensitivity of the galvanometer in the circuit of Fig.Q.8(c) is  $10\text{mm}/\mu\text{A}$ , and its internal resistance =  $150\Omega$ . Determine its deflection. (08 Marks)

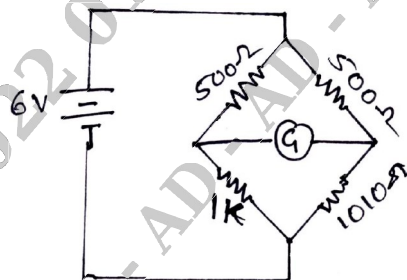


Fig.Q.8(c)

**Module-5**

- 9 a. State the various parameters and advantages of electrical transducer. (06 Marks)
- b. Explain the working principle of thermistor. (06 Marks)
- c. Explain with diagrams the structure and operation of a PLC. (08 Marks)

**OR**

- 10 a. Explain in brief bonded strain gauge. (10 Marks)
- b. Explain how the strain gauge bridge circuit is used as analog weight scale. (10 Marks)

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