

CBCS SCHEME

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18EC36

Third Semester B.E. Degree Examination, Jan./Feb. 2021

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. Discuss various power converter circuits with necessary sketches and applications of each. (07 Marks)
- b. With necessary sketches, explain the static V-I characteristics of SCR and its operation. (08 Marks)
- c. List different turn-on methods, explain all in brief. (05 Marks)

OR

- 2 a. Explain turn-ON/turn-OFF dynamic characteristics of SCR with neat diagram. (07 Marks)
- b. With suitable diagram and waveform, explain the working of RC full wave firing circuit. (08 Marks)
- c. Describe the operation of UJT with neat sketches. (05 Marks)

Module-2

- 3 a. Explain the working of 1ϕ full wave center tapped controlled rectifier for resistive load with necessary sketches and also develop mathematical model to evaluate performance parameter of same (V_{dc} , V_{rms} , Efficiency). (10 Marks)
- b. Evaluate performance parameter of 1ϕ half controlled rectifier with resistive load, has a transformer secondary voltage of 230V, 50Hz with $R = 10\Omega$ and firing angle $\alpha = 60^\circ$. Determine:
 - i) Average voltage and current
 - ii) Rms value of voltage and current
 - iii) Efficiency
 - iv) Ripple factor
 - v) Form factor. (10 Marks)

OR

- 4 a. Input to the step-up chopper is 200V the output required is 600V, if the conduction time of thyristor is $200\mu\text{sec}$. Compute:
 - i) Chopping frequency
 - ii) If the pulse width is halved for constant frequency operation, find the new output voltage. (07 Marks)
- b. Explain the operation step-up chopper with neat diagram and derive an expression for output voltage. (08 Marks)
- c. Elaborate on the control techniques used in choppers and also give detailed classification of choppers. (05 Marks)

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-3

- 5 a. With neat circuit diagram and waveforms. Explain the operation of 1ϕ full bridge inverter for RL load. (07 Marks)
- b. Design a multi range ammeter with range 0-1A, 0-5A and 0-10A employing individual shunt in each a D'Arsonval movement with an internal resistance of 500Ω and full scale deflection of 10mA is available. (08 Marks)
- c. What are the errors encountered in measurement process? Explain all with suitable example. (05 Marks)

OR

- 6 a. Design modified multirange voltmeter with basic D'Arsonval movement with an internal resistance of 50Ω and full scale deflection of 2mA, with voltage ranges of 0-10V, 0-50V, 0-100V and 0-250V. Draw the schematic diagram and show all values after design. (07 Marks)
- b. Explain the various static characteristics of measuring instruments. (08 Marks)
- c. With neat diagram, explain the operation of isolated flyback converter. (05 Marks)

Module-4

- 7 a. With neat block diagram, explain the operation of Ramp type Digital voltmeter. (07 Marks)
- b. Explain the operation of Time measurement with neat block diagram. (08 Marks)
- c. Draw the schematic diagram of Wheatstone's bridge and derive an expression for calculating unknown resistance and explain. (05 Marks)

OR

- 8 a. Explain the operation inductance comparison bridge with necessary equations. (07 Marks)
- b. Discuss the operation of successive approximation type DVM with necessary diagram. (08 Marks)
- c. An unbalanced Wheatstone bridge shown in Fig.Q.8(c), calculate the current through the galvanometer. (05 Marks)

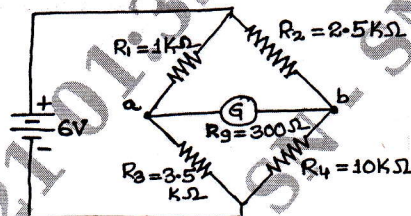


Fig.Q.8(c)

Module-5

- 9 a. Draw the schematic diagram to measure displacement using resistive transducer and explain. (07 Marks)
- b. Explain the operation of PLC with neat block diagram. (05 Marks)
- c. Explain the operation of Instrumentation amplifier using transducer bridge and derive equation for output voltage. (08 Marks)

OR

- 10 a. Explain the construction and working principle of LVDT with characteristic curve. (07 Marks)
- b. What are factors to be considered for selecting the transducer? (08 Marks)
- c. Illustrate working of analog weight scale. (05 Marks)
