

CBCS SCHEME

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18EC36

Third Semester B.E. Degree Examination, June/July 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

- 1 a. What is Power Electronic Converter System? Mention any four application of such system. (04 Marks)
- b. Using two transistor model, explain the operation of SCR and derive anode current and gate relation. (08 Marks)
- c. Explain different types of Power Electronic Converter Systems. Draw their Input / Output characteristics. (08 Marks)

OR

- 2 a. Mention different Thyristor turn – ON method. Mention the advantages of gate triggering. (04 Marks)
- b. Explain the operation of Self Commutation by LC Circuit {Class – B} with relevant circuit and waveforms. (08 Marks)
- c. With a neat circuit and waveforms, explain the operation of RC Full wave firing circuit. (08 Marks)

Module-2

- 3 a. Explain the effect of Free Wheeling Diode used in Controlled Rectifier. (04 Marks)
- b. With a neat circuit diagram and waveform, explain the principle operation of Step – down Chopper. Derive the expression for average and r.m.s output voltage. (08 Marks)
- c. A single phase half wave controlled rectifier has a purely resistive load of R and the delay angle is $\alpha = \pi/3$. Determine Efficiency, Form Factor, Transformer Utilization Factor and Ripple Factor. (08 Marks)

OR

- 4 a. A Step – up Chopper is used to deliver load voltage of 500V from a 220V d.c source. If the blocking period of the thyristor is $80\mu\text{F}$, compute the required pulse width. (04 Marks)
- b. With a neat circuit diagram and wave form, explain the operation of Step Up / Down Choppers. Derive the expression for average output voltage. (08 Marks)
- c. Explain with the help of neat circuit diagram, the operation of a single phase full converter with resistive load. Draw the associated waveform. Derive expression for r.m.s and average output voltage. (08 Marks)

Module-3

- 5 a. Define Inverters. Classify the inverts according to the input source. (04 Marks)
- b. What are Static Errors? Explain them in details. (08 Marks)
- c. Explain Multirange Ammeter and Multirange Voltmeter. (08 Marks)

OR

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.

- 6 a. Define the terms : i) Measurement ii) Resolution iii) Precision iv) Sensitivity. (04 Marks)
- b. Explain the Operation of Single Phase Half Bridge Inverter connected to resistive load with the help of circuit diagram and waveforms. Derive the r.m.s output voltage. (08 Marks)
- c. Explain with a neat circuit and waveforms, the Operation of Flyback Converters. (08 Marks)

Module-4

- 7 a. The wheat stone's bridge consists of following parameters $R_1 = 10k\Omega$, $R_2 = 15k\Omega$ and $R_3 = 40k\Omega$. Find the unknown resistance R_x . (04 Marks)
- b. With a neat block diagram, explain the working of Function Generator. (08 Marks)
- c. Explain with a block diagram, the Operating principle of Ramp type DVM. (08 Marks)

OR

- 8 a. A Wein bridge circuit consists of the following : $R_1 = 4.7k\Omega$, $C_1 = 5nf$, $R_2 = 20k\Omega$, $C_2 = 10nf$, $R_3 = 10k\Omega$, $R_4 = 100k\Omega$. Determine the frequency of the circuit. (04 Marks)
- b. Explain with a neat block diagram, the Operation of Successive Approximations type DVM. (08 Marks)
- c. Explain with a neat circuit inductance comparison bridge. Also find the equivalent series circuit off the unknown impedance. An inductance comparison bridge is used to measure inductive impedance at a frequency of 5KHz. The bridge constant at balance are $L_S = 10mA$, $R_1 = 10k\Omega$, $R_2 = 40k\Omega$ and $R_3 = 10k\Omega$. (08 Marks)

Module-5

- 9 a. Define Transducers. List the important parameters of Electrical transducer. (04 Marks)
- b. Explain Construction and Principle Operation of LVDT. (08 Marks)
- c. Explain the Operation of a Resistance thermometer and mention its advantages. (08 Marks)

OR

- 10 a. What are features of Instrumentation Amplifiers? How it differs from the Ordinary Op. Amp? (04 Marks)
- b. Explain with neat diagram the PLC structure. (08 Marks)
- c. Explain Instrumentation Amplifier using transducer bridge with the help of circuit diagram. (08 Marks)

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