USN

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 80µF, 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

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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