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18EC36

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Define power electronics. Mention the different power electronic circuits. **(04 Marks)**
   b. With the help of the static V-I characteristics, explain the three modes of operation of the SCR. **(10 Marks)**
   c. Explain class-B commutation with necessary circuit diagram and waveforms. **(06 Marks)**

OR

2 a. Define commutation. Differentiate between natural and forced commutation. **(06 Marks)**
   b. Explain the gate characteristics of the SCR. **(04 Marks)**
   c. Explain the working of a UJT fixing circuit for a full wave rectifier using SCR with necessary circuit diagram and waveforms. **(10 Marks)**

Module-2

3 a. Differentiate between uncontrolled and controlled rectifier. **(04 Marks)**
   b. Explain the operation of single-phase full converter with resistive load with necessary circuit diagram and waveforms. Derive the expression for the average and rms output voltage. **(10 Marks)**
   c. Explain the operation of step-up chopper. **(06 Marks)**

OR

4 a. With necessary circuit diagram and waveforms, explain the working of single phase half wave converter with inductive load. **(10 Marks)**
   b. Explain the working of step-down chopper. **(06 Marks)**
   c. Explain the effect of freewheeling diode. **(04 Marks)**

Module-3

5 a. Explain the working of single phase full bridge inverter with necessary circuit diagram and waveforms. **(08 Marks)**
   b. Define the following terms as applied to an electronic instrument:
      i)   Accuracy
      ii) Precision
      iii) Resolution **(06 Marks)**
   c. Sketch and explain the operation of a multirange ammeter. **(06 Marks)**

OR

6 a. Explain the working of isolated forward SMPS with necessary circuit diagram. **(08 Marks)**
   b. Calculate series connected multiplier resistance with D'Arsonal movement with an internal resistance of 50Ω and full scale deflection current of 2mA when converted into a multirange d.c. voltmeter with ranges from 0-20V, 0-40V, 0-150V and 0-200V. **(08 Marks)**
   c. Briefly explain the Gross error and absolute error with an example. **(04 Marks)**

Module-4

7   a.   Discuss the operation of dual slope integrating type DVM with the help of block diagram.
(08 Marks)

b.   Explain an unbalanced Wheatstone bridge circuit. Determine the amount of deflection due to unbalance of Wheatstone bridge.
(08 Marks)

c.   An inductance comparison bridge is used to measure inductive impedance at a frequency of 5Hz. The bridge constants at balance are $L_3 = 10mH$, $R_1 = 10K\Omega$, $R_2 = 40K\Omega$, $R_3 = 100K\Omega$. Find the equivalent series circuit of an unknown impedance.
(04 Marks)

OR

8   a.   Explain the working of a digital frequency meter with the help of a block diagram. **(10 Marks)**

b.   Explain the operation of the Wein's bridge with a neat circuit diagram. Derive an expression for the frequency.
(07 Marks)

c.   If the three arms of a Wheatstone's bridge have the resistances $R_1 = 2K\Omega$, $R_2 = 10K\Omega$ and $R_3 = 40K\Omega$. Find the unknown resistance.
(03 Marks)

Module-5

9   a.   Explain the construction, working principle and operation of LVDT. Show the characteristics curve.
(10 Marks)

b.   Mention the advantages and limitations of thermistor.
(04 Marks)

c.   Briefly explain the analog weight scale.
(06 Marks)

OR

10   a.   Explain the structure and operation of programmable logic controller.
(07 Marks)

b.   Explain the operation of resistive position transducer.
(05 Marks)

c.   Derive an expression for the gauge factor of bonded resistance wire strain gauge.
(08 Marks)

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