CBCS SCHEME

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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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