CBCS SCHEME

USN

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Power Electronics

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain any five types of power electronics converter system and also specify the form of input and output waveform. **(10 Marks)**
   b. With block diagram, explain the peripheral effects of power electronic equipments. **(06 Marks)**
   c. Discuss the major industrial applications of power electronic converter circuits. **(04 Marks)**

OR

2 a. Briefly explain the different types of power diodes. **(08 Marks)**
   b. With circuit diagram and waveform explain uncontrolled single phase full wave rectifier with RL load. **(08 Marks)**
   c. Compare the advantages and disadvantages of bridge rectifier and rectifier with center tapped transformer. **(04 Marks)**

Module-2

3 a. With neat circuit diagram, explain steady state and switching characteristics of power MOSFET. **(12 Marks)**
   b. A BJT is specified to have β in the range 8 to 40 load resistance $R_C = 11\Omega$, the DC supply voltage is $V_{CC} = 200$ volts and the input voltage to the base circuit is $V_{BB} = 10$ volts. If $V_{CE(sat)} = 1$ volt and $V_{BE(sat)} = 1.5$ volt, find :
      i)   The value of R_B that result in saturation with an ODF of 5.
      ii) The forced β value and
      iii) Power loss in the transistor. **(08 Marks)**

OR

4 a. With necessary waveform explain the switching characteristics of IGBT. **(06 Marks)**
   b. Discuss the importance of providing isolation of gate/base drive from power circuits and explain the two methods. **(06 Marks)**
   c. Sketch the structure of n-channel enhancement type MOSFET and explain its working principle. **(08 Marks)**

Module-3

5 a. Explain the V-I characteristics of SCR also define : i) Holding current ii) Latching current. **(06 Marks)**
   b. Explain different methods of turning ON of thyristor. **(08 Marks)**
   c. For the circuit shown in Fig.Q5(c). If the latching current is 4mA calculate the minimum width of gate pulse required properly turn ON the SCR. **(06 Marks)**
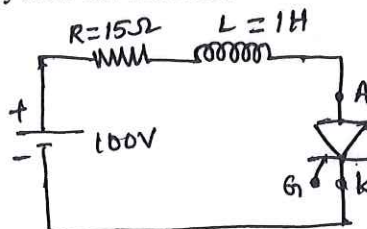

Fig.Q5(c)

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OR

6   a. Derive an expression for the anode current of thyristor with the help of two transistor
analogy. **(10 Marks)**

b. With circuit diagrams and waveforms, explain the methods of protection of SCR. **(10 Marks)**

Module-4

7   a. With the help of circuit diagram and wave forms, explain the working of single – phase full
converter with R–L load. **(10 Marks)**

b. A single phase full wave AC voltage controller has an input voltage of 230V and load
resistance of 10Ω. The firing angle is $45°$, calculate :
   i) RMS output voltage
   ii) The output power
   iii) The input power factor. **(10 Marks)**

OR

8   a. With circuit diagram and waveforms explain 1ϕ dual converter. **(10 Marks)**

b. With circuit diagram and waveform, explain the operation of 3ϕ full converters. **(10 Marks)**

Module-5

9   a. Explain the working of step-up chopper. Draw the relevant waveforms, derive an expression
for average output voltage. **(08 Marks)**

b. Write a note on performance parameters of chopper. **(04 Marks)**

c. A stepdown chopper with resistive load has a resistive load of 10Ω and the input voltage is
$V_S = 220V$. When the converter switch remains ON its voltage drop is 2V and the chopping
frequency is f = 1KHz, if the duty cycle is 50% determine :
   i) Average output voltage
   ii) RMS output voltage
   iii) Chopper efficiency
   iv) Effective input resistance. **(08 Marks)**

OR

10   a. With circuit diagram, explain the operation of a single phase–full bridge inverter suppling a
resistive load. **(10 Marks)**

b. Explain any two modulation technique available for voltage control of a single phase
inverter. **(10 Marks)**

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