



# CBCS SCHEME

15EC73

## Seventh Semester B.E. Degree Examination, Aug./Sept.2020 Power Electronics

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Give symbol, characteristic features of the following devices :  
i) GTO ii) TRIAC iii) MOSFET. (06 Marks)
- b. Explain different types of power electronic circuits with their input and output waveforms. (06 Marks)
- c. Explain peripheral effects of power converter system. (04 Marks)

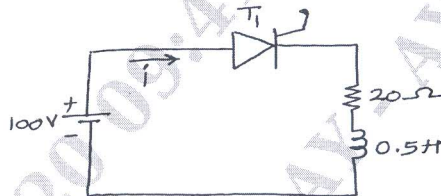
OR

- 2 a. Compare power MOSFET and bipolar junction transistor. (04 Marks)
- b. Draw the switching model of MOSFET and explain its switching characteristics with neat figure. (06 Marks)
- c. Explain output and transfer characteristics of IGBT. (06 Marks)

### Module-2

- 3 a. Explain the static anode – cathode characteristics of SCR. (06 Marks)
- b. Explain the two transistor model of SCR and derive an expression for anode current in terms of current amplification factor and leakage current. (06 Marks)
- c. The latching current of a thyristor circuit in fig.Q3(c) is 50mA. The duration of the firing pulse is 50 $\mu$ s. Will the thyristor get fired? (04 Marks)

Fig. Q3(c)



OR

- 4 a. Distinguish between natural and forced commutation with examples. (04 Marks)
- b. With a neat sketch, explain turn – off mechanism of SCR. (06 Marks)
- c. With the help of neat circuit diagram and waveforms, explain the UJT firing circuit. (06 Marks)

### Module-3

- 5 a. With a circuit diagram and waveforms, explain the working of a single phase full converter with a highly inductive load. Derive an expression for the average output voltage and rms output voltage. (08 Marks)
- b. With a neat diagram and waveforms, explain the principle of single phase dual converter. (06 Marks)
- c. Explain the role played by the free – wheeling diode in converters with R – L load. (02 Marks)

OR

1 of 2

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. Explain the principle of ON – OFF control, with the help of waveforms and derive an expression for rms output voltage. (06 Marks)
- b. An AC voltage controller has a resistive load of  $R = 10$  and the rms input voltage is 120V, 60Hz. The thyristor switch is ON for  $n = 25$  cycles and is OFF for  $m = 75$  cycles. Determine  
i) rms output voltage ii) the input power factor iii) the average and rms current of thyristor. (04 Marks)
- c. Explain the operation of a single phase bidirectional controller with resistive load. Derive an expression for rms output voltage. (06 Marks)

**Module-4**

- 7 a. Explain the operation of step – down converter with RL load. Also derive an expression for peak – to – peak load ripple current. (08 Marks)
- b. Explain with suitable circuit and waveforms, the principle of operation of step – up converter. Derive an expression for average output voltage of step-up converter. (08 Marks)

**OR**

- 8 a. Briefly explain the classification of the converter depending upon the directions of the current and voltage flows. (05 Marks)
- b. With the help of circuit diagram and waveforms, explain the working of a Buck regulator. Derive the expression for peak – to – peak ripple current of the inductor. (11 Marks)

**Module-5**

- 9 a. Explain the operation of single phase half bridge inverter with R - load. Derive the expression for rms output voltage. (08 Marks)
- b. Explain the performance parameters of inverters. (08 Marks)

**OR**

- 10 a. Explain the working of variable dc – link inverter. (08 Marks)
- b. With a circuit diagram and waveforms, explain the working of a single phase full wave switch. Also derive an expression for average current and rms current of each thyristor. (08 Marks)

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