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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Examination June 2022 (2019 Scheme)



Course Code: ECT322

Course Name: POWER ELECTRONICS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

		Marks
1	Distinguish between slow recovery diode and fast recovery diode	(3)
2	List the advantages of GTO over SCR	(3)
3	A MOSFET is switching a 20 A inductive load from a 100V DC source. The fall time of the device is 0.5 μ s. Calculate the shunt snubber capacitance value and its power dissipation if the switching frequency is 20KHz	(3)
4	Draw the circuit diagram of a single phase half wave fully controlled rectifier with RLE load. Draw the load voltage and current waveform	(3)
5	Illustrate the working of half bridge isolated converters	(3)
6	What is volt-second balance?	(3)
7	What are the advantages of PWM technique in inverters?	(3)
8	What are the advantages of space vector PWM?	(3)
9	What is dissipative braking scheme in induction motor drive?	(3)
10	How inverters are used in induction cooking?	(3)

PART B

Answer one full question from each module, each carries 14 marks.

Module I

- 11 a) Illustrate the static and dynamic characteristics of power MOSFET (7)
b) Explain the reverse recovery characteristics of power diode and deduce the expression for charge stored and reverse recovery time (7)

OR

- 12 a) Illustrate the turn on and turn off characteristics of SCR with necessary diagrams (6)
b) Draw the VI characteristics of SCR and explain various modes of operation (8)

Module II

- 13 a) Design any two base drive circuits for power BJT (6)
b) Illustrate the principle of operation of three phase diode bridge rectifier with circuit diagram and necessary waveforms (8)

OR

- 14 a) Explain series snubber with the help of a diagram and derive the expression for the value of capacitor and range of resistor. (6)
- b) Explain the principle of working of single phase centre tapped controlled rectifier with RL load with load voltage and load current waveforms along with voltage waveforms across power switch during ON and OFF states. (8)

Module III

- 15 a) Explain the operation of Buck-Boost converter and illustrate the operation with the inductor current and switching waveforms. (10)
- b) A buck converter is supplied with an input voltage that varies between 20 V and 30 V. the output is required to be regulated at 15 V. Find the duty cycle range (4)

OR

- 16 a) Describe the principle of operation of flyback converter and full bridge converter with circuit diagrams and waveforms (14)

Module IV

- 17 a) Illustrate the operation of a 3-phase inverter of 120° conduction mode with circuit diagram and waveforms (Phase voltage and line voltage) (7)
- b) Explain the operation of single phase push pull inverter (7)

OR

- 18 a) Illustrate the principle of space vector modulation in three phase inverter (7)
- b) Explain sinusoidal pulse width modulation in three phase inverters (7)

Module V

- 19 a) Explain the principle of adjustable speed DC drive using line frequency converter (7)
- b) Mention any two residential application of power electronics (7)

OR

- 20 a) Illustrate the principle of operation of variable frequency PWM – VSI Induction Motor Drive (7)
- b) Explain regenerative braking in induction motor drive (7)
