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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S4 (PT) (S) Examination January 2024 (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	The reverse recovery time of a diode is 3μs and rate of fall of diode is 30A/μs. Find stored charge and peak reverse current	(3)
2	Draw the static characteristics of SCR and define latching and holding current	(3)
3	What is the purpose of base drive circuit in power BJT?	(3)
4	For a single phase full wave controlled rectifier , draw the load voltage and current waveform for RLE load and give expression for average load voltage	(3)
5	What is the purpose of using freewheeling diode in converters?	(3)
6	What are benefits of isolated converters?	(3)
7	What is the significance of doing Fourier analysis in inverter output?	(3)
8	Distinguish between driven and self driven inverters	(3)
9	Illustrate the four quadrant operation of DC motor	(3)
10	How converters are used in electric welding ?	(3)

PART B

Answer onefull question from each module, each carries 14 marks.

Module I

11	a)	Explain the basic construction details , various modes of operation of GTO with its VI characteristics	(10)
	b)	Draw the gate current waveform of GTO and define backporch in GTO	(4)

OR

12	a)	Explain the principle of SCR with the help of its two-transistor model	(7)
	b)	Draw the basic structure and explain the working of IGBT	(7)

Module II

13	a)	Explain shunt snubber with the help of a diagram and derive the expression for the value of capacitor and range of resistor.	(7)
	b)	Design any two gate drive circuits for power MOSFET	(7)

OR

14 a) Illustrate the operation of a single phase, 2 pulse fully controlled rectifier for RL load with circuit diagram and output voltage and current waveforms. Also plot voltage across thyristors during their ON and OFF states. (10)

b) Derive the expression for average load voltage in the circuit (4)

Module III

15 a) Explain the operation of Buck convertor with the circuit diagram along with inductor and capacitor current waveform. (10)

b) The buck regulator has an input voltage of 12 V. the required average output voltage is 5V at R =500 ohm. The peak to peak output ripple voltage is 20mV.the switching frequency is 25Kz. If the peak-peak ripple current of inductor is limited to 0.8A. Find a) duty cycle b) filter inductance c) filter capacitance d) critical inductance (4)

OR

16 a) Illustrate the working of forward converter and push pull converter with suitable circuit diagram and necessary waveforms (14)

Module IV

17 a) Illustrate the operation of a 3-phase inverter of 180° conduction mode with circuit diagram and waveforms (Phase voltage and line voltage) (8)

b) Explain sinusoidal pulse width modulation in three phase inverters (6)

OR

18 a) What is space vector modulation in three phase inverters (7)

b) Explain the operation of full bridge inverter (7)

Module V

19 a) Explain the principle of adjustable speed DC drive using switched mode DC-DC converter (8)

b) Explain different braking mechanism in DC motor (6)

OR

20 a) Illustrate the principle of operation of variable frequency PWM – VSI Induction Motor Drive (7)

b) Mention the industrial application of power electronics (7)

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