# 1200ECT322122401

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# APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S4 (PT) (S, FE) Examination December 2024 (2019 Scheme)

# **Course Code: ECT322 Course Name: POWER ELECTRONICS**

Max. Marks: 100

**Duration: 3 Hours** 

Pages

	FART A	
	Answer all questions, each carries 3 marks.	Marks
	Compare power BJT, MOSFET and IGBT for switching applications.	(3)
	List different types of power diodes and its applications based on reverse recovery	(3)
	characteristics.	
	What is the purpose of base drive circuit in power MOSFET?	(3)
	Draw the circuit for three phase semi-converter with RLE load	(3)
	Explain different modes of operations of buck converter.	(3)
	What are benefits of isolated converters?	(3)
	Explain any three performance parameters of an inverter.	(3)
	Explain the working principle of the push-pull inverter	(3)
	Explain any two industrial applications of power electronics.	(3)
	Explain four quadrant operation of DC drive?	(3)
	PART B	
	Answer one full question from each module, each carries 14 marks.	
	Module I	
a)	Draw the structure of the power BJT and explain its operation with its switching	(7)
	characteristics.	
b)	Explain the principle of SCR with the help of its two-transistor model	(7)
	OR	
a)	With neat waveforms, explain the transfer and dynamic characteristics of the	(14)
	power MOSFET	
	Module II	
a)	Explain any two gate drive circuits for power MOSFET.	(7)
b)	Explain the working of snubber circuits with relevant waveforms.	(7)
	a) b) a) b)	TAKLE A      Answer all questions, each carries 3 marks.      Compare power BJT, MOSFET and IGBT for switching applications.      List different types of power diodes and its applications based on reverse recovery characteristics.      What is the purpose of base drive circuit in power MOSFET?       Draw the circuit for three phase semi-converter with RLE load      Explain different modes of operations of buck converter.      What are benefits of isolated converters?      Explain any three performance parameters of an inverter.      Explain the working principle of the push-pull inverter      Explain four quadrant operation of DC drive?      PART B      Answer one full question from each module, each carries 14 marks.      Module 1      a) Draw the structure of the power BJT and explain its operation with its switching characteristics.      b) Explain the principle of SCR with the help of its two-transistor model      OR      Module 1      a) With neat waveforms, explain the transfer and dynamic characteristics of the power MOSFET      Module II      a) Explain any two gate drive circuits for power MOSFET.      b) Explain the working of snubber circuits with relevant waveforms.

OR

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

#### Module III

- 15 a) With a neat diagram, explain the working principle of an isolated half-bridge DC- (7)
  DC converter
  - b) The buck regulator has an input voltage of 16 V. the required average output (7) voltage is 5V at R =800 ohm. The peak to peak output ripple voltage is 10mV.the switching frequency is 30Kz. If the peak-peak ripple current of inductor is limited to 0.6A. Find a) duty cycle b) filter inductance c) filter capacitance

#### OR

16 a) Draw and explain the circuit diagram of the buck- boost converter with inductor (14) current and switching waveform. Derive the output voltage, filter inductor, capacitor equation.

#### **Module IV**

- 17 a) Illustrate the principle of space vector modulation in three phase inverters (14) OR
- 18 a) Explain the principle of operation of switched-mode inverters. Draw the circuit of (14) a full bridge single-phase inverter circuit and explain its operation with relevant waveforms for RL load.

#### **Module V**

19	a)	Explain single phase full converter drives with necessary equations.	(7)
	b)	Explain two residential applications of power electronics	(7)

## OR

20 a) Explain the block diagram of induction motor speed drive circuit and closed loop (14) torque control.