Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S,FE) (FT)/(S4 PT) Examination December 2025 (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	List the different components of power loss in a power diode.	(3)
2	Draw the ideal reverse characteristics of a power diode showing the charge distribution during Turn OFF process.	(3)
3	Draw a typical MOSFET gate drive waveform and explain the role of negative peak current.	(3)
4	What are the differences of Turn OFF and Turn ON snubber circuits.	(3)
5	What are the benefits of Isolated converters using transformer interface.	(3)
6	What is the significance of demagnetizing winding forward converters.	(3)
7	Explain a Pulse Width Modulation waveform showing Duty Cycle and average DC value.	(3)
8	How an error voltage is produced in a closed loop DC-DC converter to stabilise the output voltage.	(3)
9	Explain any two industrial applications of power electronics.	(3)
10	Explain four quadrant operation of DC drive?	(3)

PART B

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

Module I

11	a)	Describe the dynamic Turn ON and Turn OFF characteristics of power BJT showing V_{CE}, I_C and I_B.	(7)
	b)	Draw the cross section of power MOSFET and explain the body diode formation and its applications.	(7)

OR

12	a)	Draw the cross section of a typical IGBT and draw the equivalent circuit containing BJTs and MOSFET.	(8)
	b)	Draw and explain the two-transistor model of SCR and how latch up is occurred in the device.	(6)

Module II

13	a)	How a BJT base drive current requirements are calculated based on a steady	(6)

state base current I_{bon}.

b) Describe a BJT drive circuit providing negative base current to improve performance. (8)

14 a) Draw a typical three phase bridge diode rectifier circuit and explain with relevant waveforms. (8)

b) Compare and explain the gate drive waveforms of MOSFETs and base drive waveforms of BJTs (6)

Module III

15 a) Describe a DC-DC buck converter circuit obtain the governing equations of output voltage for a given DC input. (9)

b) Explain Continuous and Discontinuous Conduction Modes in buck converters and compare its performance. (5)

OR

16 a) Draw and explain a forward converter circuit with demagnetizing winding with significance in winding polarities. (8)

b) Draw the primary side waveforms of the above converter showing the effect of demagnetization. (6)

Module IV

17 a) How a closed loop voltage mode controlled PWM circuit stabilises the output voltage a converter circuit. Explain its block diagram. (8)

b) Explain the significance of reference voltage source and error amplifier in the control circuit. (6)

OR

18 a) How the quasi-square waveforms are generated in full bridge inverter circuit. Draw and explain the generated forms. (7)

b) Draw and explain a quasi-square wave full bridge inverter circuit in detail. (7)

Module V

19 a) Explain the block diagram of induction motor drive circuit (7)

b) Explain with a block diagram, how induction cooker for residential use works. (7)

OR

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

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