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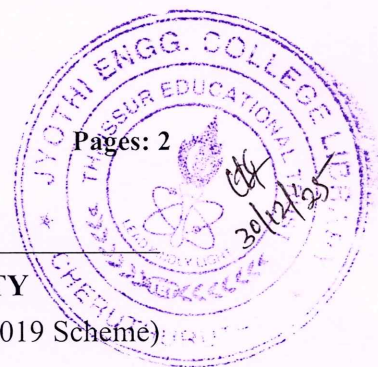
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Reg No.: _____

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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)
