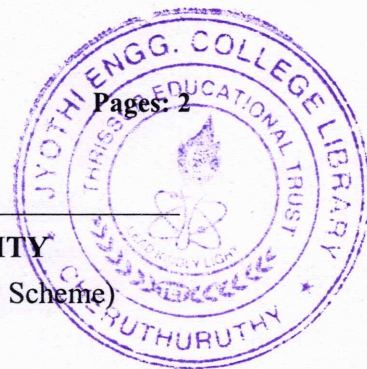


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R,S) / (WP), S4 (PT) Exam April 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 | How power diodes are classified based on the Turn OFF time. Give typical Turn OFF time values for each class. | (3) |
| 2 | Draw the ideal and practical charge distribution characteristics of a power diode during Turn OFF process. | (3) |
| 3 | Draw the basic BJT base drive circuit waveform and corresponding power dissipation curves. | (3) |
| 4 | Draw a typical Turn ON snubber circuit and explain its operation | (3) |
| 5 | Explain the working of a step-up chopper. | (3) |
| 6 | Explain the significance of flux walking capacitor in full bridge buck converters | (3) |
| 7 | Draw and explain a two level inverter topology to produce an AC waveform from DC voltage. | (3) |
| 8 | Define modulation index and harmonic indices of quasi square wave PWM signal. | (3) |
| 9 | Illustrate the forward motoring and forward generation mode in DC motor drives | (3) |
| 10 | How power converters are used in electric welding? | (3) |

PART B*Answer one full question from each module, each carries 14 marks.***Module I**

- | | | |
|----|---|-----|
| 11 | a) Draw the dynamic characteristics waveforms showing the Turn ON and Turn OFF of a power MOSFET and explain the waveforms. | (7) |
| | b) Show the cross-sectional structure of IGBT and explain its working as a BJT-MOSFET hybrid model. | (7) |

OR

- | | | |
|----|---|-----|
| 12 | a) Draw and explain the dynamic Turn ON and Turn OFF process of an IGBT power device. | (7) |
| | b) Explain the static characteristics of an SCR showing latching and holding current. | (7) |

Module II

- | | | |
|----|--|-----|
| 13 | a) Draw the circuit diagram of three phase full wave, controlled rectifier circuit | (7) |
|----|--|-----|

with resistor load.

- b) Draw a typical MOSFET gate drive circuit using CMOS ICs and draw its typical gate drive waveform. (7)

OR

- 14 a) Draw and explain the effect of base current magnitude in Turn ON process of a power transistor. (7)
- b) Draw and explain any typical MOSFET drive circuit using opto-isolator isolation. (7)

Module III

- 15 a) Draw and explain a push-pull buck converter circuit explaining the 2 loops of operations. (8)
- b) Draw the secondary side waveforms of the above push-pull converter circuit and explain how demagnetisation is effectively obtained in the circuit. (6)

OR

- 16 a) Explain the operation of a full bridge converter circuit using IGBTs using a circuit diagram. What is the role flux walking capacitor in the circuit? (8)
- b) Draw the waveforms of the above circuit in the primary side. (6)

Module IV

- 17 a) Explain how odd and even harmonics are identified in a quasi-square wave PWM. Write the expression for modulation index and harmonic indices. (7)
- b) Describe the space vector representations in coplanar space. (7)

OR

- 18 a) With neat sketch, explain in detail, different types of PWM techniques. Narrate the significance of each technique. (14)

Module V

- 19 a) Explain the operation of an induction cooker for residential applications. (7)
- b) Write a short note on VSI Induction motor drive. (7)

OR

- 20 a) Explain any two industrial applications of power electronics. (7)
- b) Illustrate the principle of adjustable-speed DC drive. (7)
