

Reg. No. :

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Question Paper: U1401

M.E. DEGREE EXAMINATION, NOV/DEC 2024

First Semester

Power Electronics and Drives

21PPE101- POWER ELECTRONIC CONVERTERS

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1. (a) Demonstrate the switching characteristics of a MOSFET in a buck converter circuit, detailing the impact of switching frequency on efficiency. CO1-App (20)
Or
(b) Create a comparative analysis of base drive strategies for power BJTs in low-power vs. high-power applications, emphasizing practical implementation. CO1-App (20)
2. (a) Design a single-phase fully controlled converter for an RL load. Explain how the circuit operates and determine the output voltage waveform. CO2-App (20)
Or
(b) Design a dual converter for a DC motor drive application. Explain its working with and without circulating current mode. CO2-App (20)
3. (a) Design a step-down DC chopper for an RL load operating at a given frequency and duty cycle. Derive the expressions for output voltage and current. CO3-App (20)
Or
(b) Design a buck converter for a specific load, input voltage, and desired output voltage. Calculate the inductor and capacitor values for continuous conduction mode. CO3-App (20)

4. (a) Design a three-phase voltage source inverter for an RL load. CO4-Ana (20)
Analyze how the pulse width modulation strategy used for switching.

Or

- (b) Design a current source inverter for a motor drive application. CO4-Ana (20)
Discuss how the current source configuration affects the operation and performance.

5. (a) Design a single-phase bidirectional controller for an R-L load with a firing angle of 45 degrees. Calculate the RMS output voltage and current for given load parameters CO3-App (20)

Or

- (b) Implement a single-phase matrix converter to generate a variable frequency output. Discuss its working and advantages over traditional converters. CO3-App (20)