



R22 Regulation

Subject code: E121PC1

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

M.Tech I Semester Regular/Supplementary Examinations, March 2024

**ADVANCED POWER ELECTRONIC CONVERTERS-I
(POWER ELECTRONICS)**

Maximum Marks: 60

Date: 04.03.2024

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x1M=10 Marks)

- 1.a) Draw the equivalent circuit of IGBT?
- b) List out the applications of MOSFET.
- c) Give the power factor improvements techniques in single phase converter.
- d) Give the applications of three phase converters.
- e) Define Sinusoidal PWM.
- f) What is Multi PWM?
- g) What is 60-degree PWM?
- h) List out harmonic reductions techniques in three phase inverters.
- i) What is purpose of a DC link capacitor?
- j) Give one difference between diode clamped & Improved diode Clamped multi-level inverter.

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 2 Briefly explain the power integrated circuits & comparison of their features. [10M]
OR
- 3 Explain the operation of integrated gate bipolar thyristor (IGBT) with neat sketch. [10M]
- 4 Explain the single-phase half-controlled converter & calculate the input power factor and harmonic factor. [10M]
OR
- 5 Explain the continuous & discontinuous load current in single phase converter. [10M]
- 6 Compare different PWM techniques in detail. [10M]
OR
- 7 Explain the principle operation of Single-phase bridge inverter with neat waveforms. [10M]
- 8 a) What is a three-phase inverter? Explain its working for 180° conduction. [5M]

b) The full-bridge inverter has an RLC load with $R = 5 \Omega$, $L = 15 \text{ mH}$, and $C = 30 \mu\text{F}$. The inverter frequency, $f_o = 300\text{Hz}$, and the dc input voltage, $V = 220\text{V}$. Express the instantaneous load current in a Fourier series and calculate the rms load current at the fundamental frequency. [5M]

OR

9 Explain Voltage control of three phase inverters. [10M]

10 Draw the circuit diagram of Cascaded multilevel inverters and explain its working. [10M]

OR

11 a) Discuss about reactive power compensation in multilevel inverter. [5M]

b) Write short notes on DC-link capacitor voltage balancing. [5M]