| Reg. No. | | | | | | | | | | | | | | | |
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| Question Paper Code | 12817 |
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**M.E. / M.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024**

First Semester

**M.E - Power Electronics and Drives**

**20PPEPC104 - ANALYSIS AND DESIGN OF INVERTERS**

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

| | | Marks | K – Level | CO |
|---|---|---|---|---|
| 1. | Define commutation. How they are generally classified?. | 2 | K1 | CO1 |
| 2. | Why IGBT is preferred for inverters? | 2 | K1 | CO1 |
| 3. | Define amplitude and frequency modulation index. | 2 | K1 | CO2 |
| 4. | Define PWM inverter | 2 | K1 | CO2 |
| 5. | What is a six step thyristor Inverter? | 2 | K1 | CO3 |
| 6. | What are the advantages of CSI when compared to VSI ? | 2 | K1 | CO3 |
| 7. | Mention the disadvantages of a modified diode-clamped multilevel inverter. | 2 | K1 | CO4 |
| 8. | List out the advantages and disadvantages of cascaded inverters. | 2 | K1 | CO4 |
| 9. | What are the advantages of resonant inverters? | 2 | K1 | CO5 |
| 10. | Mention the advantages and limitations of class E resonant inverter. | 2 | K1 | CO5 |

**PART - B (5 × 13 = 65 Marks)**

Answer ALL Questions

| | | | Marks | K – Level | CO |
|---|---|---|---|---|---|
| 11. | a) | Describe the operation of half phase full bridge inverter with RL Load and derive the expression for fundamental component of RMS output voltage. | 13 | K2 | CO1 |
| | | **OR** | | | |
| | b) | Explain the modified Mc-Murray full bridge inverter with appropriate voltage and current waveforms. Derive suitable expressions for commutating components of L and C. | 13 | K2 | CO1 |
| 12. | a) | Explain the principle of operation of three phase operating at $180^{O}$ conduction mode with star connected load, with neat waveforms and circuit diagram. | 13 | K2 | CO2 |
| | | **OR** | | | |
| | b) | A 3φ bridge inverter delivers power to a resistive load from a 450V dc source. For a star connected load of 10Ω/phase, determine for both $180^{O}$ and $120^{O}$ mode operation.<br>(i) RMS value of load current.<br>(ii) RMS value of thyristor current.<br>(iii) Load power. | 13 | K2 | CO2 |

13. a) Explain the operation of three phase auto sequentially commutated current source inverter in detail. *13 K2 CO3*

**OR**

b) A single phase bridge inverter fed from 230V dc is connected to RL load with R= 20 Ohm and L= 0.06H. Determine power delivered to laid in case inverter is operating at 50Hz with
(i) Square wave output.
(ii) Quasi square wave output with on period of 0.5
Two Symmetrically spaced pulses per half cycle on period of 0.5 of cycle. *13 K2 CO3*

14. a) Explain the different waveforms of diode-clamped multilevel inverter with necessary equations. *13 K2 CO4*

**OR**

b) Explain the operation of a flying capacitor multilevel inverter with necessary details and also discuss its features, advantages and disadvantages. *13 K2 CO4*

15. a) Describe the operation of Class E resonant inverter with neat wave forms. *13 K2 CO5*

**OR**

b) Explain the step by step procedure for the design of zero-voltage switching resonant converter. *13 K2 CO5*

**PART - C (1 × 15 = 15 Marks)**

16. a) Discuss in detail the different PWM techniques used for single phase multilevel inverters. *15 K2 CO4*

**OR**

b) Explain the principle of series resonant inverter. *15 K2 CO5*