Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2724502 **Date: 24/05/2016**

Subject Name: Power Electronics – II

Time:10:30 am to 01:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) In a 1-phase diode-bridge rectifier; a large capacitor is connected across the resistive load in order to minimize the ripple in the DC-link voltage. Assume utility voltage as sinusoidal. Draw the following waveforms and comment on distortion in supply current: **07**

(i) Waveform-1: Output voltage and output current

(ii) Waveform-2: Supply voltage, supply current, fundamental frequency component of supply current

(b) Neatly draw the output current (I_O) waveform of a 1-phase inverter from the description tabulated below. Calculate: (i) RMS output current $I_{O(RMS)}$ and (ii) Fundamental frequency component of output current $I_{O1(RMS)}$. **07**

Calculate only %THD of the output current waveform using $I_{O(RMS)}$ and $I_{O1(RMS)}$.

Positive half-cycle of output current (I_O) waveform:

θ (radian)	0	0	π/4	π/4	3π/4	3π/4	π	π
I_O (A)	0	2	2	5	5	2	2	0

Negative half-cycle of output current (I_O) waveform:

θ (radian)	π	π	5π/4	5π/4	7π/4	7π/4	2π	2π
I_O (A)	0	-2	-2	-5	-5	-2	-2	0

Q.2 (a) Explain 3-phase 5-level cascaded H-bridge multilevel inverter. How 5 level is generated? **07**

(b) What is redundancy in case of multilevel inverter? Is it desirable or not? Justify. **07**

OR

(b) Explain the application of multilevel inverter as reactive power compensator with circuit diagram and vector diagram. **07**

Q.3 (a) Explain 12-pulse converter with neat diagram and waveforms. **07**

(b) Compare ZVS and ZCS and clarify which one is better? **07**

OR

Q.3 (a) What are the advantages of resonance converter with respect to conventional PWM converter? **07**

(b) Draw only the circuit diagram of a Class-E resonant inverter. It is having supply voltage = 50V, load = 30Ω, switching frequency = 25kHz and Q-factor = 5. Determine the optimum values of input inductor, input capacitor, resonance inductor and resonance capacitor. **07**

Q.4 (a) Explain the principle of operation of electronic ballast. **07**

(b) What is multilevel inverter? Enlist the advantages and limitations of multilevel inverter with respect to conventional 2-level inverter. **07**

OR

Q.4	**(a)**	Draw the schematic of 1-phase 5-level capacitor clamped multilevel inverter. Explain each redundancy in detail.	**07**
	(b)	Explain the series resonance inverter circuit with bidirectional switch with conduction mode and waveform.	**07**
Q.5	**(a)**	Explain resonance charging.	**07**
	(b)	Explain ZVS resonance converter with 5 different modes and waveform.	**07**

OR

Q.5	**(a)**	Discuss class E-resonance rectifier.	**07**
	(b)	Explain matrix converter.	**07**

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