Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER-1 (NEW) EXAMINATION – WINTER 2016

Subject Code: 2712908 **Date:04/01/2017**

Subject Name: POWER CONVERTERS-I

Time: 2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Notations/Symbols used have usual meaning.**

Q.1 **(a)** Enlist factors responsible for un-reliable operation of a thyristor. Discuss remedies for any two of them. **08**

(b) Compare: (i) Converter grade thyristor with Inverter Grade thyristor. (ii) Power MOSFET with IGBT. **06**

Q.2 **(a)** A single phase semi-converter is operated from 120V,50Hz ac supply. The load resistance is 10Ω.If the average output voltage is 25% of the maximum possible average output, determine (i) firing angle (ii) rms & average output current (iii) rms & average thyristor current. **07**

(b) Derive an expression for (i) average load voltage and (ii) rms load voltage for a fully controlled bridge circuit with R-L load. **07**

OR

(b) A single – phase bridge inverter delivers power to a series connected RLC load with R= 3 Ω and wL = 12Ω. The periodic time T = 0.2 msec. What value of C should the load have in order to obtain load commutation for the SCRs? The Thyristor turn-off time is 12 μ sec. Take circuit turn-off time as 1.5 t_q. Consider load current contains only fundamental components. **07**

Q.3 **(a)** Describe in detail the operation of dual converter without circulating current. **07**

(b) Analyse performance of the circuit shown in Fig.1 **07**

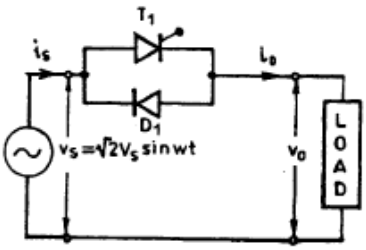

Fig.1

OR

Q.3 **(a)** Explain 3-Ø, phase controlled rectifier with inductive load using necessary waveforms for α = 45°. **07**

(b) Discuss the following concepts w.r.t AC controller: (i) Integral cycle control & (ii) Phase angle control. **07**

Q.4 **(a)** With waveforms, explain the operation of 3-Ø cycloconverter. State applications of cyclo-converter. **07**

(b) Describe operation of a Sepic converter. State its advantages. **07**

OR

Q.4 **(a)** With waveforms, explain the operation of a 1-Ø to 1-Ø cyclo-converter with R-L load. **07**

	(b)	Discuss Cuk converter operation with equivalent circuit for both switch - on and switch-off conditions.	**07**
Q.5	**(a)**	Describe the operation of a full bridge inverter with resistive load. Why it is preferred over half bridge inverter?	**07**
	(b)	Draw and explain basic series inverter. What are its limitations?	**07**

OR

Q.5	**(a)**	Describe the operation of a 3-Ø bridge inverter for 180° conduction for star connected resistive load.	**07**
	(b)	State various types of PWM techniques & describe any one of them in detail.	**07**

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