Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. Sem. – II[nd] - Examination – June/July- 2011

Subject code: 1722901

Subject Name: Advanced Power Converters & Control

Date:22/06/2011 **Time: 10:30 am – 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.**
4. **Notations used have usual meaning.**

Q.1 **(a)** Explain zero voltage switch topology based buck converter with necessary waveforms. **07**

(b) Write a brief note on clamped voltage topology for resonant converter with neat diagram. **07**

Q.2 **(a)** Explain flying capacitor type multi-level inverter. **07**

(b) For ZCS buck converter, V_{in} = 30 V, V_o = 14.5 V, I_o=1 A and resonant frequency f_o = 600 kHz. Calculate, **07**

(i) value of L and C

(ii) value of peak inductor current

(iii) Time period for mode-I operation.

Assume normalize load Q=1.

OR

(b) Design boost converter with ZCS for following specifications, **07**

V_{in} = 25 V, P_o = 30 W, I_o = 0.5 A and switching frequency f_s = 100 kHz. Assume normalized load Q = 6 and normalized switching frequency f_{ns} = 0.58 kHz. What will be the value of capacitor C if ripple in output voltage is restricted to 0.2%. Make necessary assumption if required.

Q.3 **(a)** Discuss high frequency link integral cycle control converter. **07**

(b) Discuss venturini control method for matrix converter in brief. **07**

OR

Q.3 **(a)** Discuss cascaded multi-level converter topology. **07**

(b) Write detailed note on commutation and protection issues for matrix converter **07**

Q.4	**(a)**	Discuss voltage mode control of DC-DC converters in closed loop.	**07**
	(b)	Explain averaging model of DC-DC converter with appropriate example.	**07**

OR

Q.4	**(a)**	Explain bipolar link configuration of HVDC transmission with advantages and disadvantages.	**07**
	(b)	Two six pulse converters are used in bipolar HVDC transmission system. The ac systems are 3-phase, 11 kV, 50Hz. The input transformers have a leakage inductance of 10mH per phase. The current in dc line is 300 A. the inverter marginal angle is 20°. Resistance of each dc transmission line is 1 ohm. Calculate firing angle of the rectifier, its output voltage and DC link voltage.	**07**

Q.5	**(a)**	Explain series loaded resonant converter with neat diagram.	**07**
	(b)	Write a short note on reactive power drawn by the converters in HVDC.	**07**

OR

Q.5	**(a)**	Discuss need of multi-pulse converters. Explain transformer configurations for multi-pulse converter.	**07**
	(b)	Discuss control characteristics of converter for HVDC	**07**

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