Time: 3 Hours **Marks: 80**

Note :

- **Question No.1 is compulsory.**
- Solve **ANY THREE** questions from the **remaining** five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

			Marks
Q. 1		Solve **ANY FOUR** questions from following. (Each question carries 5 marks)	**20**
	a)	Compare HVAC and HVDC Transmission w.r.to Technical parameters of system.	
	b)	Illustrate the need and operation of VDCOL, voltage dependent current order limit in HVDC control	
	c)	Illustrate with neat diagram the features of HVDC link which has both positive and negative polarity conductors	
	d)	Operation of the bridge converter with overlap angle between 60° and 120° is abnormal. Justify	
	e)	Explain the additional control characteristics in HVDC inverter side used under abnormal operation.	
Q. 2	**a)**	Illustrate with neat diagram the Component of HVDC Converter Station.	**10**
	c)	Derive the expression for direct current of a three phase rectifier with grid control and overlap angle less than 60 degree	**10**
Q.3	**a)**	Demonstrate the IPC scheme used in HVDC and mention its advantages and disadvantages	**10**
	b)	Illustrate the control characteristics of HVDC system	**10**
Q.4	**a)**	What are the different protection methods used in HVDC system. Exemplify with neat diagrams.	**10**
	b)	Illustrate with neat waveform the effect of single commutation failure and double commutation failure	**10**
Q.5	**a)**	Illustrate with neat diagram and waveforms the operation of a twelve pulse converter	**10**
	b)	What is the need of seventh valve in HVDC system and explain with circuit diagram and waveform the operation of seventh valve in rectifier operation	**10**
Q.6	**a)**	Illustrate in detail the effect of harmonics and the various means of reducing it.?	**10**
	b)	Develop the equivalent circuit of the inverter side of an HVDC system	**10**

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