UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: EHV AC and DC Transmission (ELEG 482)
Semester: VIII
Program: B Tech (Electrical Engineering)
Time: 03 hrs. **Max. Marks: 100**
Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Draw and explain about thyristor controlled series compensator used in FACTS for control operation in power sector.	4	CO1
Q 2	Discuss clearly about the technological developments and modern trends in HVDC.	4	CO3
Q 3	Explain the power frequency overvoltage factors required in 220kV transmission line and draw the characteristics of power frequency over voltage characteristics.	4	CO2
Q 4	Explain about Surge Impedance Loading on a high voltage line and draw the capability curve.	4	CO4
Q 5	Discuss briefly about corona effects on a HVDC line.	4	CO2
	SECTION B		
Q 6	Briefly describe the DC harmonics produced by the converters and characteristics of filters used to minimize their adverse effects.	10	CO4
Q 7	Draw and explain the block diagram of system control hierarchy structure in HVDC link.	10	CO3
Q 8	Explain about the over voltages in a converter station	10	CO2
Q 9	Draw and explain the simplified analysis of CCC with necessary assumptions and commutated equivalent circuit.	10	CO4
	(OR)		
Q10	Explain in detail about the problems associated with DC systems connected to weak AC systems and methods of dealing with such problems.		
	SECTION-C		
Q 11	Explain about capacitive commutated converter (CCC) which is installed in Garabi in South America. Discuss its major advantages, disadvantages and limitations of CCC.	20	CO5

Q 12 Q13	Explain with the help of neat diagrams, about the FACTS controller circuits and system performance characteristics to confirm the network load flow conditions and the operations are within the bench mark limitations. **(OR)** Draw the general scheme for implementing control in high voltage DC transmission	**20**	**CO2**

Name: **Enrolment No:**	UPES

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SECTION A

S. No.		Marks	CO
Q 1	Discuss the power transmission limitations and constrains which may involve power transfer between areas or regions.	**4**	**CO1**
Q 2	Draw the basic circuit of static Var compensator sharing voltage characteristics and role in power factor voltage control utility.	**4**	**CO3**
Q 3	Briefly describe the AC harmonics produced by the converters and characteristics of filters used to minimize their adverse effects.	**4**	**CO2**
Q 4	Explain in detail about non – characteristic harmonics and effects due to harmonics in HVDC lines.	**4**	**CO4**
Q 5	Explain in detail about energizing and de-energizing of a bridge at a converter station.	**4**	**CO2**
	SECTION B		
Q 6	Explain with a neat sketch about the various phases of power system studies for FACTS installation projects.	**10**	**CO4**
Q 7	Discuss the operating problems and major difficulties in the adoption of HVDC technology by system planners.	**10**	**CO3**
Q 8	Draw and explain about selective harmonic elimination techniques used in FACTS.	**10**	**CO2**
Q 9	Draw and Explain the single line diagram of a voltage source converter based HVAC converter station based in Sasaram 220 kV line designed by GE	**5**	**CO4**

Q10	**(OR)** a) Mention the various sources of harmonic generation in HVDC systems and suggest methods to eliminate them. b) Explain the need of filters on the DC side with HVDC voltage source converter schemes.	**5**	
SECTION-C			
Q 11	Explain about capacitive commutated converter (CCC) which is installed in Garabi in South America. Discuss its major advantages, disadvantages and limitations of CCC.	**20**	**CO5**
Q 12 Q13	Explain in detail about the solution to stability problems associated in FACTS and HVDC transmission lines. **(OR)** An HVDC link delivers DC power at 500kV at the inverter end with constant current controller at rectifier end set at 1000A. The equivalent resistance of the rectifier and inverter station are 15Ω and 18Ω respectively. The DC resistance of the line is 20Ω. If the AC voltage at the rectifier is 400kV, find the percentage of the tap changer required to maintain the current constant in the DC link without gate control. Also find the value of delay angle of the rectifier to maintain the above current in the absence of a tap changer.	**20**	**CO2**