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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Eighth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; July / August - 2022

HVDC Power Transmission

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Comparison of DC transmission with respect to AC transmission, Historical sketch, DC links, recent trends & Applications of DC transmission.

CO2: Discussion on valve characteristics, Properties and analysis of converters.

CO3: Analysis of Gratez circuit without overlap & with overlap (<60°) (rectification & inversion).

CO4: To interpret the control strategies in reversal, manual control, Actual control characteristics, Stability & MTDC systems.

CO5: To study about the converter faults and its protection, Characteristic / Uncharacteristic harmonics, their Troubles & filters.

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
I a.	Mention the types of DC links.	2	L1	CO1	PO1
b.	Define pulse number.	2	L1	CO2	PO1
c.	Write the expression for direct current Id for gratiz circuit with overlap condition.	2	L2	CO3	PO1
d.	What are MTDC systems?	2	L1	CO4	PO1
e.	Define characteristic and non- characteristic harmonics.	2	L1	CO5	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	Explain the difference between AC and DC transmission system from the perspective of system planner.	9	L2	CO1	PO2
b.	i) Explain the applications of DC transmission system.	5	L2	CO1	PO2
	ii) With neat sketches, explain the different types of DC links and in DC transmission system.	4	L2	CO1	PO2
c.	With neat sketch, explain the working of typical HVDC converter station.	9	L2	CO1	PO2
	UNIT - II	**18**			
2 a.	With neat circuit diagram, explain three phase one way rectifier and derive as expression for V_d.	9	L2	CO2	PO2
b.	Explain the analysis of a twelve pulse converter.	9	L2	CO2	PO2
c.	Explain the properties of converter circuits.	9	L2	CO2	PO2

Contd... 2

	UNIT - III	**18**			
3 a.	Explain the analysis of Gratiz circuit with overlap less than 60º also obtain the expression for average direct voltage in each case.	9	L2	CO3	PO2
b.	Explain V_d-I_d characteristics of inversion.	9	L2	CO3	PO2
c.	A Graetz bridge operates with a delay angle of 150. The leakage reactance of the transformer is 10 Ω. The line to line AC voltage is 85 KV. Compute the overlap angle and DC voltage for, i) I_d = 2000 A ii) I_d = 4500 A	9	L3	CO3	PO2
	UNIT - IV	**18**			
4 a.	Explain the two configurations of MTDC systems and mention its limitation of manual control.	9	L2	CO4	PO2
b.	Explain the actual characteristics of converter control and its significance of current margin and its range.	9	L2	CO4	PO2
c.	Explain the basic principles of controlling the voltage at any point on the DC line and the current and also mention the considerations influencing the selection of control characteristics.	9	L2	CO4	PO2
	UNIT - V	**18**			
5 a.	Explain the troubles caused by harmonics and functioning of harmonics filters.	9	L2	CO5	PO2
b.	Explain the phenomenon of telephone interference and the factors affecting it.	9	L2	CO5	PO2
c.	Explain the procedure for clearing the line faults and re-energizing the line.	9	L2	CO5	PO2

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