Code No: 157BY **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, February -2025

HVDC TRANSMISSION

(Electrical and Electronics Engineering)

Time: 3 Hours **Max.Marks:75**

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	List the types of DC Links.	[2]
b)	List out the merits of 6 pulse converter over 12 pulse converter.	[3]
c)	What is the function of synchronous condenser?	[2]
d)	What is the principal operation of HVDC Link control?	[3]
e)	Draw the model of DC Converter.	[2]
f)	Differentiate between Simultaneous and sequential methodologies.	[3]
g)	List the different converter faults.	[2]
h)	What is the effect of radio interference in DC systems?	[3]
i)	Define Characteristic of harmonics.	[2]
j)	What factors need to be considered in the design of high pass filters?	[3]

PART-B

(50 Marks)

2.a) Draw the layout of a Bi-polar HVDC substation and briefly discuss about various components present.

b) Discuss about the recent trends in DC transmission. [5+5]

OR

3. With the help of a neat circuit diagram, explain the operation of a 3-phase, 6-pulse, Graetz's circuit when operating with a firing angle of 30^0. Also draw the following waveforms to scale when working as a rectifier with $\alpha = 30^0$.

a) Output d.c voltage

b) Valve current

c) Secondary phase current of the converter transformer. [3+3+4]

4.a) With the help of a block diagram, explain the hierarchical control structure for a DC link.

b) Discuss the various sources of reactive power. [5+5]

OR

5. Draw converter controller characteristics and explain why it is desirable to have current control at rectifier side and CEA control at inverter station. [10]

6. Obtain the mathematical model of DC network and DC converter with necessary equations. [10]

OR

7.a) Explain the simultaneous method for the AC-DC load power flow solution.
b) Explain the per unit system for DC quantities. [5+5]

8.a) Explain about corona effects in DC line.
b) Explain the necessity of Surge arresters. [5+5]

OR

9. Write about functions of smoothening reactor and dc circuit breaker. [10]

10.a) What are the objectives of filters in HVDC? Discuss the design and operation of Single tuned filter.
b) Why are harmonics generated in HVDC converter and what are the problems associated with the harmonics. [5+5]

OR

11. Explain in detail various types of filters used in HVDC systems. [10]

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