Code No: 137DG **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, January/February - 2023

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)	What is the necessity of HVDC systems?	[2]
b)	What are the assumptions are made to simplify the analysis of Graetz circuit with overlap angle?	[3]
c)	What is mean by firing angle control?	[2]
d)	List out the sources of reactive power.	[3]
e)	What is the need of P.U. System for DC quantities?	[2]
f)	How you need of solution of AC-DC Power flow?	[3]
g)	Explain the corona effects HVDC line.	[2]
h)	What are the various types of Converter faults?	[3]
i)	What are the sources of generation of Harmonics?	[2]
j)	What are the different types of AC filters?	[3]

PART – B

(50 Marks)

2.a) State the merits of HVDC transmission over EHVAC transmission for bulk power transmission.

b) Explain the different types of DC links with necessary diagrams and list out its merits and demerits. [4+6]

OR

3.a) Explain the Characteristics of 12 Pulse converters with necessary diagram.

b) A bipolar DC line± 100 kV is delivering 100 MW on the DC side. The p.f on the AC side of line is 0.9. Estimate the AC side voltage (3-phase) and the corresponding current ratio. Assume the insulation levels are the same. [6+4]

4.a) Describe the operation of a converter when working as an inverter, and state the necessary conditions required for inverter operation.

b) Show that in a 3-phase rectifier operating with no delay and with 60^0 overlap, the direct current is one-half of the peak value of line to line short circuit on the secondary side of the transformer secondary. [5+5]

OR

5.a) Describe the thyristor-controlled reactor with necessary diagrams and expressions.

b) Explain the reactive power control during transients with necessary diagram. [5+5]

6. Obtain the modelling of DC Links, DC Network and DC Converter, including converter controller. [10]

OR

7.a) Draw the flow chart of AC/DC power flow.
b) Explain the Simultaneous method of solution for DC load flow. [5+5]

8.a) Discuss the basic principles of over current protection.
b) Explain the principle of current interruption in DC circuit breakers. What are the various types of possible circuit breakers? [4+6]

OR

9.a) Explain the smoothing reactors with necessary diagrams and expressions.
b) Describe the Radio interference in HVDC system. [5+5]

10.a) Discuss the factors responsible for generation of characteristic and non-characteristic harmonics? How each can be reduced to a minimum?
b) Explain the effect of Pulse number on harmonics. [6+4]

OR

11.a) Explain the need to employ filter circuit in HVDC systems. Derive an expression for minimum cost of tuned AC filters used in HVDC systems.
b) Describe the design of high pass filter with diagram and expressions. [5+5]

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