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10EE751

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
HVDC Transmission

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. With relevant figure, explain the constitution of EHV-AC and DC links. **(10 Marks)**

b. With a neat diagram, explain different kinds of DC links. Explain the necessity of back – to –back HVDC link. **(10 Marks)**

2 a. Summarize the advantages and disadvantages of HVDC transmission system. **(08 Marks)**

b. Compare HVAC and HVDC transmission for economic of operation, stability limit and reactive power limit. **(12 Marks)**

3 a. Draw the schematic diagram of a typical HVDC converter station and explain the function of each component. **(08 Marks)**

b. Explain the three – phase one-way rectifier circuit with wave form and obtain.
i) Average direct voltage
ii) Peak – to –peak ripple
iii) PIV
iv) Aggregate valve rating
v) VA rating of transformer primary and secondary. **(12 Marks)**

4 a. Explain the three – phase two-way rectifier (Graetz bride) circuit with waveform and obtain:
i) Average direct voltage
ii) Peak – to –peak ripple
iii) PIV
iv) Aggregate valve rating
v) VA rating of transformer primary and secondary. **(12 Marks)**

b. 'Best converter circuit for the HVDC transmission is 3-phase bridge' Justify the statement by explain advantages of a 3-phase graetz bridge configuration. **(08 Marks)**

PART – B

5 a. With relevant figures and waveforms, derive the expression for average DC output voltage of the bridge converter without overlap. Assume converter firing angle as α. Also obtain the relation between $\cos \phi$ and $\cos \alpha$. **(10 Marks)**

b. With relevant waveform, derive an expression for average DC voltage in a bridge converter with an overlap of less than 60 degrees. **(10 Marks)**

6 a. Explain the basic means of control. **(05 Marks)**

b. Explain the limitations of manual control. **(05 Marks)**

c. Discuss constant current verses constant voltage alternatives for a DC transmission system. **(05 Marks)**

d What are the desired features of control of DC lines? **(05 Marks)**

7 a. Describe the actual control characteristics. **(08 Marks)**

b. Explain and draw the schematic circuit of analog computer for C.E.A (Current – Excitation-Angle) control with voltage waveform. **(12 Marks)**

8 a. Describe the current oscillations and anode dampers. **(10 Marks)**

b. The following data pertain to a certain converter :

Commutating voltage	$= E_C$	= 113KV rms phase to phase
Stray capacitance across valve	= C	= 100pF
Stray inductance of the valve	= L	= 100μH
Excitation current	= 50A	
Commutating inductance	$= 2L_C$	= 42.2mH phase to phase stray resistance is assumed to be negligible

Find the undamped natural frequency and amplitude of the oscillation of current in the incoming valve at the beginning of commutation under the most severe condition. **(10 Marks)**

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