

Roll No.

Total Pages : 03

BT-7/M-20

37183

HVDC TRANSMISSION

EEN-415N

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. Unless stated otherwise, the Symbols have their usual meanings in context with the Subject. Assume suitably and state, additional data required, if any.

Unit I

1. (a) With a neat schematic diagram, state the various apparatus required for HVDC station and explain the purpose of each. **9**
- (b) What are the advantages and disadvantages of homopolar HVDC links over other types of links ? **6**
2. (a) Why are thyristors (SCRs) used as converter elements in HVDC valves ? Explain. **8**
- (b) What are the advantages of using IGBTs over SCRs for HVDC converters ? **7**

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Unit II

3. (a) State the difference in power control in HVDC and HVAC systems and explain the necessity of power control in an HVDC link. **8**
- (b) State the important circuit parameters which control power in an HVDC link. State the advantages and disadvantages of control of power using each parameter. **7**
4. (a) Mention the various sources of harmonic generation in HVDC systems and suggest methods to eliminate them. **8**
- (b) Explain the working of band-pass and high-pass filters used in HVDC systems. Explain the term detuning and state its importance in the design of filters for HVDC systems. **7**

Unit III

5. (a) What are the different types of faults that can occur in HVDC systems ? Discuss their nature and occurrence. **10**
- (b) Give the protection scheme for DC line overcurrent faults. **5**

6. (a) Discuss the nature and type of faults on the DC side of converter stations. How are the faults sensed and cleared ? **8**
- (b) Give the principle of different types of DC circuit breaker schemes. Why is a surge diverter needed across DC circuit breaker ? **7**

Unit IV

7. (a) How are the power transfer capabilities of AC lines improved by using parallel HVDC-VSC system ? **8**
- (b) Explain the factors affecting the corona loss. Compare corona loss for HVDC and HVAC systems. **7**
8. What are corona losses ? Discuss its significance and permissible limit. Explain Peek's and Peterson's formula for calculating the corona loss. How to reduce corona loss ? **15**