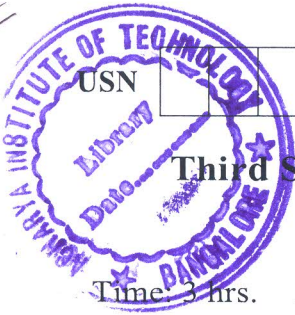


# CBCS SCHEME

18EPS31



## Third Semester M.Tech. Degree Examination, Dec.2019/Jan.2020 HVDC Power Transmission

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Explain the merits and limitation of HVDC power transmission system. (10 Marks)
- b. Describe the various types of DC links in DC transmission systems. List out the advantages and disadvantages of each type. (10 Marks)

OR

- 2 a. With neat diagrams, discuss about the converter unit of a HVDC transmission system. Elaborate on the different configuration of the converter transformer. (10 Marks)
- b. Develop the equivalent circuit of a 3 phase converter working as rectifier with an overlap angle  $\mu$  delay angle ' $\alpha$ '. Hence show that the equivalent resistance of the converter is  $\frac{3WLC}{\pi}$ . (10 Marks)

### Module-2

- 3 a. Calculate the secondary line voltage of the transformer for 3-phase bridge rectifier to provide a DC voltage of 120KV. Assume  $\alpha = 30^\circ$ ,  $\mu = 15^\circ$ . What is the effective reactance  $X_L$  if the rectifier gives 800A of DC output current? (10 Marks)
- b. Explain how the IPC scheme of firing angle control is implemented using constant ' $\alpha$ ' and inverse cosine control for a HVDC converter. (10 Marks)

OR

- 4 a. What is an active power filter? Explain. (10 Marks)
- b. What are HVDC control functions? (10 Marks)

### Module-3

- 5 a. Explain the method of over voltage protection used for voltage source CONVERTERS. (10 Marks)
- b. Explain the functions of DC smoothing reactor in HVDC link. (10 Marks)

OR

- 6 a. Discuss the salient features of reactive POWER sources at a HVDC converter BUS. (10 Marks)
- b. Explain in detail, the faults that occur due to malfunctions of valves and controllers. (10 Marks)

### Module-4

- 7 a. Mention the types of cable used in HVDC system. Explain the design of any one cable. (10 Marks)
- b. Explain the suitable equations, the modeling of DC system including DC link, converter and controller. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. Explain radial and MESH type MTDC systems. (10 Marks)  
b. How HVDC overhead lines are classified. (10 Marks)

**Module-5**

- 9 a. Explain the steps involved in design of AC filter to eliminate the harmonics on the AC side of HVDC converters. (10 Marks)  
b. Describe the DC system model for lower flow analysis in AC-DC system. (10 Marks)

OR

- 10 a. Explain the control and protection schemes used in multi-terminal HVDC systems. (10 Marks)  
b. Explain the solution procedure for power flow analysis of AC-DC system. (10 Marks)

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