

TIME: 3HRS

MAX MARKS 80

NOTE:

- 1.Question number 1 is compulsory
- 2.Attempt any three from the remaining
- 3.Figures to right indicate full marks
- 4.Assume suitable data if necessary and mention the same

- Q1 Attempt Any Four **20**
- a. Compare HVAC and HVDC Transmission.
  - b. Explain the classification of HVDC links.
  - c. Draw a six pulse SCR circuit and compare with IGBT based circuit.
  - d. Explain the protection methods used in HVDC system.
  - e. Explain the types of filters used in HVDC Converter Station.
- Q2 a. Explain different causes of Harmonics, types of Harmonics and its effect. **10**
- b. A bipolar two terminal HVDC link is delivering 1000 MW at  $\pm 500$  kV at the receiving end. The total losses in the DC circuit are 50 MW. Calculate the following **10**
- a. Sending end power
  - b. Sending end voltage
  - c. Power in the middle of the line
- Voltage at the middle of the line
- Q3 a. Explain in details the operation of A SIX PULSE IGBT converter circuit. **10**
- b. Define the Valve rating, Transformer rating & Utilization Factor. **10**
- Q4 a. Explain IPC types of Firing Scheme. **10**
- b. Explain different types of faults takes place in converter station. **10**
- Q5 a. With the waveforms ,Explain 12-Pulse Converter operation. **10**
- b. Explain with characteristics power reversal and the importance of current margin . **10**
- Q6 a. Write down the Components of HVDC Converter Station. **10**
- b. Derive the equation for direct current  $I_d$  for a six pulse converter with grid control and overlap angle less than 60 degrees. **10**

\*\*\*\*\*