

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

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| Q1 | Attempt Any Four  | <b>20</b> |
|    | 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.  | <b>10</b> |
|    | 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 | <b>10</b> |
|    | 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.  | <b>10</b> |
|    | b. Define the Valve rating, Transformer rating & Utilization Factor.  | <b>10</b> |
| Q4 | a. Explain IPC types of Firing Scheme.  | <b>10</b> |
|    | b. Explain different types of faults takes place in converter station.  | <b>10</b> |
| Q5 | a. With the waveforms ,Explain 12-Pulse Converter operation.  | <b>10</b> |
|    | b. Explain with characteristics power reversal and the importance of current margin .   | <b>10</b> |
| Q6 | a. Write down the Components of HVDC Converter Station.   | <b>10</b> |
|    | b. Derive the equation for direct current $I_d$ for a six pulse converter with grid control and overlap angle less than 60 degrees.                                   | <b>10</b> |

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