30-Dec-2023 10:30 am - 01:30 pm 1T00837 - B.E.(Electrical Engineering)(SEM-VII)(Choice Base Credit Grading System ) (R- 19) ('C' Scheme) / 42274 - HVDC Transmission Systems (DLOC - III)
QP CODE: 10036377

**Time: 3 Hours** **Marks: 80**

**Note :**

- **Question No.1 is compulsory.**
- Solve **ANY THREE** questions from the **remaining** five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

| | | | **Marks** |
|---|---|---|---|
| **Q. 1** | | Solve **ANY FOUR** questions from following. (Each question carries 5 marks) | **20** |
| | **a)** | Illustrate with block diagram the equidistant pulse generation scheme used in HVDC system | |
| | **b)** | Show that for a converter with overlap angle less than 60° the inversion starts before 90° | |
| | **c)** | What are the reasons for maintaining high power factor in an HVDC system | |
| | **d)** | What are the causes of arc back? Explain its impact on HVDC converter operation. | |
| | **e)** | With complete control characteristics, show how power reversal is attained in HVDC system | |
| **Q. 2** | **a)** | Illustrate with neat diagram the different links in HVDC system. | **10** |
| | **c)** | Show that replacing 6-pulse converter with 12-pulse converter eliminate 5th and 7th order current harmonics from AC side. Explain harmonic mitigation techniques. | **10** |
| **Q3** | **a)** | Demonstrate the IPC scheme used in HVDC system and derive the mathematical expression to find the instant of firing. Also show how the equation is modified to find the instant of firing in CEA control. | **10** |
| | **b)** | From ideal control characteristics, show the various step involved in developing the control characteristics of an actual HVDC system. What is current margin and what is its impact. | **10** |
| **Q4** | **a)** | What are the different protection methods used in HVDC system | **10** |
| | **b)** | Illustrate with neat waveform the effect of single commutation failure. | **10** |
| **Q5** | **a)** | Develop the equivalent circuit of a three phase fully controlled rectifier with grid control and overlap angle less than 60 degree. | **10** |
| | **b)** | Show with neat waveform how the current transfer occurs from faulty rectifier to the bypass valve. Explain the sequence followed to transfer current from bypass valve to rectifier. | **10** |
| **Q6** | **a)** | Illustrate the causes and effect of harmonics in HVDC system | **10** |
| | **b)** | Draw and explain the various component of HVDC Converter station | **10** |

**********