

Reg. No. :

Question Paper Code : 11235

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023

Third Semester

Power Electronics and Drives

PS 4351 — HVDC AND FACTS

(Common to: M.E. Power Systems Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need of HVDC system.
2. Differentiate bipolar and homopolar HVDC scheme.
3. What is meant by power oscillation damping?
4. What are the advantages of controlled series compensation over uncontrolled series compensation?
5. What are the factors to be considered for choice of converter configuration?
6. How harmonics are generated? Mention its effects on system stability.
7. State the merits and demerits of series and shunt compensation.
8. How power oscillations are damped by FACTS controllers?
9. List the application of VSC based HVDC.
10. What are modular multilevel converters?

PART B — (5 × 13 = 65 marks)

11. (a) Analyze an uncompensated AC transmission line and control of power in AC transmission line.

Or

- (b) Draw the layout of HVDC (LCC and VSC) system and brief about LCC and VSC HVDC system.

12. (a) Explain the phenomenon of voltage regulation by SVC and enhancement in stability when SVC is connected at the mid-point of the line.

Or

- (b) Discuss about operation of TCSC and modelling of TCSC for power flow and stability studies.

13. (a) Draw the schematic of Graetz circuit converter and explain its operation with necessary analysis.

Or

- (b) Explain about the concept of power oscillation damping controller and frequency controller in LCC HVDC.

14. (a) Compare STATCOM and SSSC in terms of operation and power flow control.

Or

- (b) Explain about power flow control and oscillation damping using UPFC.

15. (a) Explain about the operation of HVDC under AC and DC network fault contingencies.

Or

- (b) Explain the operation of VSC based HVDC and its model for steady state and dynamic studies.

PART C — (1 × 15 = 15 marks)

16. (a) Analyse the modelling and simulation of MMC based MTDC. Brief about the fault recovery characteristics.

Or

- (b) Explain in detail with neat diagram Arm-Balancing control and vector output current control of HVDC with an application.