Roll No.:

B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2011

ELECTRICAL & ELECTRONICS ENGINEERING BRANCH

SIXTH SEMESTER

EE9045 – HIGH VOLTAGE DIRECT CURRENT TRANSMISSION

(REGULATIONS 2008)

Time: 3 hr Max. Marks: 100

Answer ALL Questions

PART-A (10 X 2 = 20 Marks)

1. What are the limitations of HVDC transmission system?
2. Name the existing HVDC systems in India with their power rating.
3. What are the advantages of mono polar HVDC link?
4. Define commutation.
5. What are the merits of higher pulse number?
6. What is the necessity of higher-level controller for HVDC link?
7. What are the drawbacks of individual phase control scheme?
8. Explain the significance of voltage dependent current limit in control characteristics of a DC link.
9. List the various types of filters used in AC and DC side.
10. What are the requirements of good simulation tool?

PART – B (5 x 16 = 80 Marks)

11(a). A 3-phase, 12-pulse rectifier is fed from a transformer with nominal voltage ratings of 220 kV/110 kV.

i) If the primary voltage is 240 kV and the effective turns ratio T is 0.48, determine the dc output voltage when the ignition delay angle α is 25° and the commutation angle μ is 15°. (4)

ii) Draw the waveform of voltage across any one thyristor for one complete cycle with the system condition in part (i). (4)

iii) If the direct current delivered by the rectifier is 2,000 A, calculate the effective commutating reactance Xc, RMS fundamental component of alternating current, power factor and reactive power at the primary side of the transformer. (4)

iv) Compute the rms values of the 11-th and 15-the order harmonic current in the primary side of the transformer feeding the rectifier. (4)

12(a). State the merits and demerits of HVDC as compared to HVAC Transmission. (16)

(Or)

(b)(i). Mention the different types of HVDC links and compare them. (8)

(ii). Draw a typical HVDC layout and explain their basic components. (8)

13(a)(i). Explain by means of a schematic diagram and equations, how power flow through the HVDC link is controlled. (10)

(ii). Draw the converter characteristics of a HVDC link and explain the different modes of operation. (6)

(Or)

(b). Explain the individual phase control and equidistance pulse control schemes for firing angle control of HVDC link. (16)

14(a). What are characteristic and non-characteristic harmonics generated by HVDC converters? Obtain the characteristic harmonics on AC network side with 6-pulse and 12-pulse converter operation. (16)

(Or)

(b)(i). Explain the following:
Harmonic distortion, Telephone influence factor, Telephone harmonic form factor and IT product. (8)

(ii). With the aid of an equivalent circuit, outline the design procedure of a single tuned filter used in the AC side of a HVDC link. (8)

15(a). Compare and contrast the different types of tools available for HVDC simulation. (16)

(Or)

(b)(i). What is simulation? Explain the modern trends in the simulation of HVDC systems. (10)

(ii). Explain the steps involved in HVDC transmission planning. (6)