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Total number of printed pages – 2

B. Tech
PEEE 5403

Seventh Semester Examination – 2011

HIGH VOLTAGE DC TRANSMISSION

Full Marks – 70

Time : 3 - Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
 - (a) What is breakeven distance ?
 - (b) Why bipolar link is more commonly used ?
 - (c) Define the term transient reliability as applied to transmission line.
 - (d) What is the importance of surge impedance loading ?
 - (e) Explain the operation of converter, when overlapping angle is greater than 60° degree.
 - (f) What is commutating emf ?
 - (g) Give the steady state characteristic of rectifier and inverter, also indicate the operating point.
 - (h) Explain Voltage Dependend Current Order Limit.
 - (i) What is the function of smoothing reactor ?
 - (j) Show that power transmitted by a bipolar line is same as that of 3-phase AC Line for same maximum system voltage and same size of conductor.
2. Compare DC and AC Transmission based on the following factors : 3+4+3
 - (a) Economics of transmission
 - (b) Technical performance.
 - (c) Reliability.
3.
 - (a) What are different types of HVDC Links ? 5
 - (b). What are differnet components of HVDC station ? Explain purpose of each. 5

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4. (a) Explain two and three valve operation of 3-phase converter with delay angle α and overlapping angle μ . 5
- (b) Derive the expression for average direct voltage for 6-pulse converter. 5
5. (a) Give the complete equivalent circuit of HVDC Link. State the important parameters which control power in HVDC Link. 5
- (b) For a 3-phase bridge rectifier circuit, the secondary voltage on transformer side is 400 KV rms with the reactance $X=40\Omega$. Find the DC output voltage, Overlap angle if output current is 2000 A and firing angle $\alpha = 15^\circ$ degree. 5
6. (a) How harmonics are suppressed in HVDC transmission system? 5
- (b) A DC link has a loop resistance of 5Ω and is connected to transformers at both ends having 110 KV secondary voltage. The bridge connected converters operate as follows : 5
- Rectifier: $\alpha=15^\circ$, $X=10\Omega$
- Inverter: $\mu=10^\circ$, $\gamma=15^\circ$.
- Determine the direct current delivered if the inverter operates on constant β control.
7. Show that the harmonics content in the current waveforms of converter transformer are of the order $h = pk \pm 1$, where k is integer and p is the pulse number. 10
8. Write the short notes on any two : 5×2
- (a) 12-pulse converter
- (b) Converter Faults
- (c) MTDC
- (d) Generation of Harmonics by converters