

Tiet Lib.



Name :

Roll No. :

Invigilator's Signature :

**CS/B.TECH (EE-New)/SEM-7/EE-702/2009-10
2009**

POWER SYSTEMS III

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following :

10 × 1 = 10

- i) The characteristics impedance of a 250 km long overhead line is 400 ohms. For a line of 200 km length of the same line, the characteristics impedance will be
- a) 50 ohms b) 400 ohms
c) 200 ohms d) 800 ohms.
- ii) The transient phenomenon lasts in a power system for a period ranging from
- a) few ms to 1s
b) 1s to 2s
c) 2s to 3s
d) greater than 3 seconds.

- iii) Unit of regulation of speed governor is
- a) Hz/MW
 - b) MW/Hz
 - c) Unit less
 - d) km/sec.
- iv) An overhead transmission line is provided with earth wire for protection against
- a) switching surge
 - b) lightning surge
 - c) power frequency over voltage
 - d) none of these.
- v) A valve type lightning arrester in a substation should be placed
- a) close to the circuit breaker
 - b) close to the transformer
 - c) away from the transformer
 - d) none of these.
- vi) The unit of transmission loss coefficient is
- a) MW
 - b) $(MW)^{-1}$
 - c) $(MW)^{-2}$
 - d) unit less
 - e) none of these.
- vii) If penalty factor of a plant is unity, its incremental transmission loss is
- a) 1.0
 - b) - 1.0
 - c) 0.0
 - d) 2.0.
- viii) The highest transmission voltage used in India is
- a) 400 kV
 - b) 220 kV
 - c) 132 kV
 - d) 765 kV.
- ix) In AGC, the voltage and frequency is controlled by
- a) excitation control
 - b) turbine control
 - c) turbine speed control and turbine speed control respectively
 - d) excitation control and turbine speed control respectively.

- x) The generating station suitable to operate as peak load plant is
- Thermal Power Station
 - Nuclear Power Station
 - Pumped Storage Power Station
 - none of these.
- xi) Ferranti effect happens in transmission line when the line is
- short and loaded
 - long and loaded
 - long and unloaded
 - none of these.
- xii) A synchronous condenser is a
- Synchronous generator
 - Paper condenser
 - Synchronous motor
 - none of these.

GROUP - B**(Short Answer Type Questions)**

Answer any *three* of the following. $3 \times 5 = 15$

- Explain how the location of a valve type lightning arrester from a transformer in a substation affects its protection.
- The reactive power supplied by a synchronous generator to an infinite bus can be varied by varying the excitation. Explain.
- What is incremental cost criteria ? How is the incremental cost calculated ?
- Explain Bewby's Lattice diagram.
- A surge of 100 kV travelling in a line of natural impedance 600 ohms arrives at a junction of two lines of impedances 800 ohms and 200 ohms respectively. Find the surge voltages and currents transmitted into each of the branch lines.

GROUP - C**(Long Answer Type Questions)**

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Discuss the basic concept of initiation of transients in power system. What are the different causes of switching over-voltages ? $2 + 3$
- b) Deduce the expression for current and voltage across the capacitor when a capacitor is switched on in line and prove that the transient over voltage appearing across an unloaded cable may rise to 5 times the system per phase voltage. 5
- c) A 132 kV transmission line having a surge impedance of 450 ohm terminates at a 7.5 MVA, 132/33 kV transformer which may be represented by a lumped inductor of 15 H and lumped capacitance of 0.003 μ F in parallel. A rectangular surge of 1500 kV travels along the line towards the transformer. Calculate the refracted voltage into the transformer when the incident wave reaches the transformer terminals. 5
8. What is an exciter ? What is its role in AVR loop ? Show the complete block diagram of an AVR loop taking into account modern static excitation system of the alternator.
9. What is hydro-thermal scheduling ? What do you mean by long term and short term hydrothermal scheduling ? How do you justify for the cost of water ?
10. What is passive compensation ? Compare series and shunt compensators. Write notes on SVC and STATCOM.
11. Write short notes on any *three* of the following : 3×5
- Necessity of restructuring in electricity market
 - FACTS
 - Reactive power and voltage control
 - Pumped storage plants
 - Environmental aspects of electric power generation.