

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0676

Roll No.

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B.Tech.

(SEM VIII) EVEN SEMESTER THEORY EXAMINATION,
2009-2010

POWER SYSTEM OPERATION & CONTROL

Time : 3 Hours

Total Marks : 100

Note : Attempt ALL questions.

1. Attempt any four parts of the following : (4x5=20)

- Explain the term Voltage Stability. How can it be overcome ?
- Explain "Security" in relation to power system operation.
- What are energy control centers ? Explain.
- Explain Level Decomposition in power system.
- Explain SCADA system.
- What do you understand by the term "power quality" ? Explain.

2. Attempt any four parts of the following : (4x5=20)

- Draw and explain I/p - O/p characteristic curves for thermal and hydro units.
- What is a penalty factor in economic scheduling? Explain its significance.
- How is generation scheduled among various generators when transmission losses are neglected in thermal system? Explain.
- Explain in brief about optimal operation of hydro-thermal system.
- A power system with two generating stations supplied a total load of 300 MW. Neglecting transmission losses the economic schedule for the plant generation is 175 MW and 125 MW. Find the savings in the production cost in Rs/hr. due to this economic schedule as compared to equal distribution of the same load between the two units. The incremental cost characteristics are

$$\frac{d C_1 (P_1)}{d P_1} = 30 + 0.3 P_1$$

$$\frac{d C_2 (P_2)}{d P_2} = 32.5 + 0.4 P_2$$

- Explain short term hydro-thermal scheduling.

3. Attempt any two parts of the following : (2x10=20)

- Derive the model of a speed governing system and represent it by block diagram.
- Explain Tie-line power model for a two area system, how tie-line power deviation can be incorporated in two area system block diagram.

- Two control areas have the following characteristics :

$$\text{Area 1 } R_1 = 0.011 \text{ P.u.}$$

$$D_1 = 0.85 \text{ P.u.}$$

$$\text{Base MVA} = 1000$$

$$\text{Area 2 } R_2 = 0.018 \text{ P.u.}$$

$$D_2 = 0.95 \text{ P.u.}$$

$$\text{Base MVA} = 1000$$

A load change of 200 MW occurs in area 1.

- Determine the new steady-state frequency.
- Determine the tie-line power-flow deviation.

4. Attempt any two parts of the following : (2x10=20)

- Draw schematic and block diagram of alternator voltage regulator scheme and explain.
- Draw schematic diagram of a A.C. - static type excitation system and explain.
- Two substations A and B operating at 11 kV - 3 phase are connected by two parallel lines 1 and 2. Each line has a 11/132 kVA transformer and a 132/11 kV substation. Each line has an equivalent impedance of $Z_1 = 0.2 + j 0.4$ ohms/phase and $Z_2 = 0.2 + j 0.6$ ohms per phase which includes both the transformers and the line, referred to 11 kV side.

If the bus bar A is at 11 kV and is sending 30 MW at 0.8 Pf leading, find the individual currents into each transformer and the powers at the station A.

5. Attempt **any two** parts of the following : (2x10=20)
- (a) What is state estimation ? What is the significance of it in power system operation ?
 - (b) What are FACTS controllers ? Explain different types of FACTS controllers.
 - (c) Define the following :
 - (i) Static Var Compensator (SVC)
 - (ii) Unified Power Flow Controller (UPFC)

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