Printed Pages – 4 TEE – 703

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

PAPER ID : 0676 Roll No. | | | | | | | | | | |

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)**

(a) Explain the term Voltage Stability. How can it be overcome ?

(b) Explain "Security" in relation to power system operation.

(c) What are energy control centers ? Explain.

(d) Explain Level Decomposition in power system.

(e) Explain SCADA system.

(f) What do you understand by the term "power quality" ? Explain.

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

(a) Draw and explain I/p - O/p characteristic curves for thermal and hydro units.

(b) What is a penalty factor in economic scheduling ? Explain its significance.

(c) How is generation scheduled among various generators when transmission losses are neglected in thermal system ? Explain.

(d) Explain in brief about optimal operation of hydro-thermal system.

(e) 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

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

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

(f) Explain short term hydro-thermal scheduling.

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

(a) Derive the model of a speed governing system and represent it by block diagram.

(b) Explain Tie-line power model for a two area system, how tie-line power deviation can be incorporated in two area system block diagram.

(c) Two control areas have the following characteristics :

Area 1 $R_1 = 0.011$ P.u.

$D_1 = 0.85$ P.u.

Base MVA = 1000

Area 2 $R_2 = 0.018$ P.u.

$D_2 = 0.95$ P.u.

Base MVA = 1000

A load change of 200 MW occurs in area 1.

(i) Determine the new steady-state frequency.

(ii) Determine the tie-line power-flow deviation.

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

(a) Draw schematic and block diagram of alternator voltage regulator scheme and explain.

(b) Draw schematic diagram of a A.C. - static type excitation system and explain.

(c) 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 Vor Compensator (SVC)

(ii) Unified Power Flow Controller (UPFC)

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