SEVENTH SEMESTER B.Tech DEGREE EXAMINATION.

BRANCH : ELECTRICAL AND ELECTRONICS ENGINEERING.

Model Question Paper.

SUBJECT: 13.706.3- POWER SYSTEM OPERATION AND CONTROL (E).

Time :3 Hours. Maximum: 100 marks.

PART.A (Answer all questions; 10x 2 = 20marks).

1. Briefly explain what is meant by load curve, load duration curve and load factor of a generating station. How does the cost of energy depend on load factor?.
2. Briefly write on heat rate curve and incremental fuel cost curve of a thermal power station.
3. What is meant by base point and participation factor in connection with power system operation?
4. Write a brief note on power pools.
5. Discuss briefly on a hydro electric plant model.
6. What is meant by cascade tripping in a power system and what are its consequences?
7. 'Security and Economy are conflicting requirements in power system operation'- comment on this.
8. Write a note on Security Constrained Optimal Power Flow.
9. Discuss briefly on features of Automatic Generation Control .
10. Write a note on Area Control Error (ACE).l

PART.B (Answer one question from each module; 4x20 = 80 marks).

MODULE-I

11. (a) Giving a flow chart explain the λ- iteration technique for the economic dispatch of the generating units in a power system. (10)

(b) The fuel cost of two units in a power station are given as

$F_1 = F_1(P_g) = (1.5 + 20\ Pg_1 + 0.01\ Pg_1^2)$R/h,

$F_2 = F_2\ (Pg) = (1.9 + 30\ Pg_2 + 0.015 Pg_2^2)$R/h.

If the total demand is 200MW and the maximum and minimum generation limits of both units are 20MW and 150MW , obtain the economic generation schedule. Also calculate the savings compared to sharing the load equally by the two units. (10)

OR

12.(a)Write a detailed note on ‘ take- or- pay fuel’ contract. (8)

(b) What is meant by a composite generation cost function of a thermal station?. Explain how a composite generation cost function of a group of generators can be obtained. Give a flow chart for the same. (12).

MODULE-II

13. (a) Explain clearly what is meant by short term and long term hydro thermal scheduling. (8)

(b) Using standard notations derive the coordination relations for the short term optimal scheduling of a hydro thermal system with one equivalent hydro station and one equivalent thermal station. Assume constant head for the hydro unit and negligible system losses. (12)

OR

14.(a) Discuss the situation where a pumped storage hydro plant is suitable. (5)

15.(b) An interconnected power system has four areas A, B,C and D. The Area demands are $P_A = 400$MW, $P_B = 350$MW, $P_C = 550$MW and $P_D = 450$MW. All the interconnecting lines are capable to transfer any amount of power required in the areas. The composite input output characteristics of the generating units in the areas are

$F_A = 200 + 2Pg_A + 0.005\ Pg_A^2$ R/h,

$F_B = 325 + 3Pg_B + 0.003Pg_B^2$ R/h,

$F_C = 275 + 2.5\ Pg_C + 0.0025\ Pg_C^2$ R/h,

$F_D = 190 + 3.1\ Pg_D + 0.0022Pg_D^2$ R/h.

The generation limit in all the areas : $140\text{MW} \leq Pg_i \leq 700\text{MW}$.

Assuming the areas operate in coordination to supply the total system load find (i)the cost of generation in each area and

(ii) the total saving compared to the case when each area individually meets its loads without any area interchange. (15)

MODULE-III

15 (a) Explain what is meant by a secure power system and what are the factors affecting system security. (8).

(b) What is meant by overload performance index (PI) of a power system ? Explain with the aid of a flow chart how a PI- priority ranking list is prepared for contingency selection. (12)

OR

16.(a) Define and explain the following in connection with contingency analysis a power system.(i) generation shift factors (ii) line outage distribution factors. (10).

(b) Explain clearly the necessity for state estimation in power systems . Which are the state variables in a power system.
Differentiate between static and dynamic state estimation.
(10)

MODULE-IV

17. Develop the block diagram of an Automatic Generation Control system of an isolated power system.
Obtain an expression for the steady state frequency deviation for a change in load on the system. (20)

OR

18 (a) Examine the various methods of voltage control in a power system and explain any two of them in detail. (10)

(b) An isolated power system has a generator with a capacity of 1000MVA with a speed regulation ratio of 5%. Its turbine time constant is 0.4sec and governor time constant is 0.2sec .The generator is delivering a load of750MW.If the load now changes by 75MW, what will be the steady state frequency deviation and the steady state frequency if (i) the load is frequency independent (ii) the load varies by 1.5% with 1% change in frequency. (10)

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