PVP 12

Code: EE7T1

IV B.Tech - I Semester – Regular / Supplementary Examinations
November 2016

POWER SYSTEM OPERATION & CONTROL
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

Answer any FIVE questions. All questions carry equal marks

1.

a) A thermal power plant has three units with the following fuel cost characteristics. 9 M

$F_1(P_1) = 570 + 7.5P_1 + 0.0017\ P_1^2$ Rs/Hr $\quad 600MW \leq P_1 \leq 150$ MW

$F_2(P_2) = 380 + 7.8P_2 + 0.002\ P_2^2$ Rs/Hr $\quad 500MW \leq P_1 \leq 125$ MW

$F_3(P_3) = 200 + 7.9P_3 + 0.005\ P_3^2$ Rs/Hr $\quad 600MW \leq P_1 \leq 150$ MW

Obtain the economic operation schedule for these units for a total load demand of 750MW

i) without considering generator limits

ii) considering generator limits

iii) total cost of operation for the above two cases and hence comment on the results.

b) Derive Transmission Loss Formula. 5 M

2.

a) What is Hydro-Thermal scheduling? What do you mean by short-term and long-term hydro-thermal scheduling? 4 M

b) Consider a fundamental hydro-thermal system feeding a common load. In a day, the load varies in three steps of 8 hours each as 7 MW, 10 MW and 5 MW respectively. There is no water inflow into the reservoir of the hydro plant. The initial water storage in the reservoir is 100 m^3/sec. The final water storage in the reservoir should be 40 m^3/sec. Basic head is 20 m. Water head correction factor is 0.005 and does not change with water storage. The non-effective water discharge is 2 m^3/sec. The incremental fuel cost of the thermal plant is

$$\frac{dC}{dP_{GT}} = 1.0 P_{GT} + 25.0 \text{ Rs/Hr}$$

For a typical day with load variation as detailed above, show the step-by-step procedure of obtaining the optimal generation schedule for at least one iteration. Neglect transmission losses. 10 M

3.

a) From the fundamentals develop the functional block diagram of a steam turbine with and without a reheater. 8 M

b) What is a swing equation and explain how it is useful to investigate the stability of the machine. 6 M

4.

a) With a neat schematic, explain the operation of turbine speed governing system and hence deduce the mathematical model of the same. 10 M

b) A 100 MVA synchronous generator operates on full load at a frequency of 50 Hz. The load is suddenly reduced to 50 MW. Due to time lag in speed governor system, the steam valve begins to close after 0.4 seconds. Determine the change in frequency that occurs in this time. Assume H = 5 kW-sec / kVA of generator capacity. 4 M

5.

a) "The excitation control and load frequency control are non-interactive". Explain with a neat schematic. 6 M

b) Obtain the dynamic response of a single area LFC system giving the change in frequency as function of time for a step change in load. 8 M

6.

a) Explain the role of Load Frequency Control and Economic Dispatch Control in the operation of power system. 4 M

b) Develop a mathematical model for two-area load frequency control system. 10 M

7.

a) List the practical conditions need to be considered for a Load Compensator. 6 M

b) Obtain the voltage and current profiles of 8 M
i) uncompensated loss less transmission line on open-circuit.
ii) uncompensated loss less symmetrical line at no-load.

8.

a) What is an Independent System Operator (ISO) in a deregulated power system? Enlist its various functions in the new environment. 7 M

b) Discriminate the Spot market and Forward market with relative merits and demerits. 7 M