

1108  
M.E. Electrical Engineering (Power Systems)  
First Semester  
EE-8102: Power system Operation and Control

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt any five questions.

x-x-x

- Q.1 Consider the system given below where a load of 600 MW is being supplied by two generators. Each transmission line has losses which are given by equations below.

$$P_{loss\ 13} = 0.0001P_1^2 ; P_{loss\ 23} = 0.0002P_2^2$$

The cost functions are as given

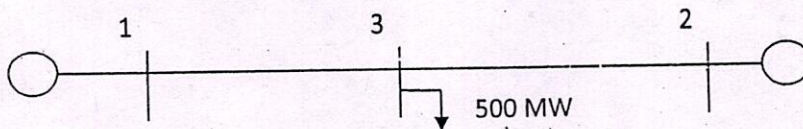
$$F_1(P_1) = 500 + 8P_1 + 0.002P_1^2$$

$$50MW \leq P_1 \leq 500MW$$

$$F_2(P_2) = 400 + 7.9P_2 + 0.0025P_2^2$$

$$50MW \leq P_2 \leq 500MW$$

Find the economic load dispatch and power flow in each line.



(10)

- Q.2 Calculate the optimal hydrothermal schedule using  $\lambda$  iterative scheme for the two plants supplying a load connected at steam plant whose characteristics are given below:

Steam Plant:  $H = 400 + 7.9P_1 + 0.0025P_1^2$  ( $\frac{MBtu}{h}$ )  $150MW \leq P_1 \leq 1500MW$

and the fuel cost is 1.15\$/MBtu

Hydro Plant:  $q = 330 + 4.97P_H$  Acre - ft/h  $0 \leq P_H \leq 1000MW$

$$q = 5300 + 12(P_H - 100) + 0.05(P_H - 1000)^2 \text{ Acre - ft/h} \quad 1000 \leq P_H \leq 1100MW$$

The hydro plant is located at a distance from the load and the losses are given by

$$P_{Loss} = 0.00008P_H^2 \text{ MW. The hydro unit's reservoir is limited to 100000 acre-ft/day. Neglect inflow to the plant. The schedule of the load is 12 AM-12 PM =1200 MW and 12 PM-12AM=1500MW.}$$

(10)

- Q.3. How is economic load dispatch different from that of a unit commitment? Develop a mathematical model for unit commitment solution for a system using forward dynamic programming approach.

(10)

Q.4. Derive an expression for tie-line power flow in a two area connected power system following a perturbation. Hence develop a linearized block diagram model for two area system for load frequency control. (10)

Q. 5 Give the mathematical modeling of a pumped storage unit. Hence explain the role of pumped storage unit as load management plant. (10)

Q. 6. a) Discuss the importance of following terms in context to a power system

i) Diversity factor

ii) Load factor

iv) Spinning Reserves

(5)

b) What is the importance of load forecasting in power system operation? How many techniques are used to forecast load of a plant? Hence discuss any one if them. (5)

Q.7 Describe the hardware configuration of a energy control center. Hence discuss the SCADA and EMS function in it. (10)

Q.8. Write short Notes on;

i) Load sharing between two synchronous generators in parallel

ii) Economic dispatch controller added to LFC control

(2\*5=10)

x-x-x