

**Electrical & Instrumentation Engineering Department**

**Session : Jan. – May, 2007**

**End Semester Examination**

**M.E. (Power systems & Electric Drives)**

**PS-006 Optimal Operation of Power Systems**

**Note:** (i) Attempt any five questions.

**Time: 3.00 hrs.**

(ii) Assume the missing data if any. **Please do mention it.**

**M.M.: 72**

1. (a) What is the significance of interchange of power in the present day scenario?  
(b) What are the different strategies implemented for the interchange of power?  
[4, 8]
2. What is loss formula? Derive the exact loss formula. How can Kron's loss formula be deduced from it?  
[10]
3. What is short term hydro-thermal scheduling? Derive the optimality conditions of scheduling in discrete interval of time using Newton Raphson method.  
[10]
4. (a) List the objectives of Automatic generation controller. Develop a block diagram representation of an automatic frequency controller used for hydro generator set. Start from the fundamentals principles. Clearly indicate the assumptions taken. Obtain its equivalent transfer function also.  
(b) What is the concept of frequency bias tie line control? What is the basis of selection of bias factors?  
[15,5]
5. For the load to be supplied from a hydro plant and a steam plant whose heat rate characteristics are given as:

Steam unit Fuel cost is 1.15 Rs./Mbtu	$H=500+8.0P_T+0.0016P_T^2$ Mbtu/hr	$150MW \leq P_T \leq 1500MW$
Hydro plant	$q=330+4.97 P_h$ acre-ft/hr.	$0 \leq P_h \leq 1000MW$
Hydro plant is located at a good distance from the load	$q=5300+12(P_h-1000)+0.05(P_h-1000)^2$ acre-ft/hr	$1000 \leq P_h \leq 1100MW$
Electrical losses	$P_L = 0.00008P_h^2$ MW.	
Load schedule	2400-1200 : 1200MW ; 1200-2400 : 1500MW	

The hydro's unit reservoir is limited to a draw down of 1,00,000 acre-ft over the entire 24hr. period. Assuming the reservoir is large. Determine the optimum schedule for hydro and thermal unit for a day Process one iteration and indicate the initial data for second iteration. (Use Classical Technique).

Also write the algorithm of the technique used.

[15,5]

**Luck favors the Brave**

The evaluated answer books of the end semester examination in the course PS-006 may be seen on June 05, 2007 at 10.00 am in room no. C-104.