



# COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Control Engineering

Lecturer : Dr. Mostafa Abdel-Geliel

Course : Control Application in Power system

Course Code: EE 513

Time : 2 hours

Date : 27 / 5 / 2015

Marks: 40

## Final Exam

(Q1) [A4,A12,B1] (10 marks)

- Discuss the functional block diagram of excitation system control of a synchronous generator.
- Explain how a LFC loop and AVR loop interact on each other. In addition, discuss methods of solution in this case. **Note**, define each variable and parameter.
- Explain how to reduce frequency deviation in multi-area power system.

(Q2) [A15,A31,B2,B3,B14 , C3,C6] (20 marks)

- The data for an isolated power system consists of two generating units (AREA 1), rated at 800 and 1000MVA, and with speed regulation of 5% and 5% based on their respective ratings. The units are operating in parallel, sharing 1000MW. Unit 1 supplies 400MW and units 2 supplies 600 MW at scheduled frequency of 50 Hz. If the load is increased to be 1000 Mw, find the steady state frequency deviation and the new generation scheduling of each units. Find also the maximum power that can be feed by both generators in parallel.
- For the above power system, the specification of the LFC system rated at 1000MW and 50Hz is given as follows:

Governor Time Constant	=	0.2 sec
Turbine Time Constant	=	0.5 sec
Generator Inertia Constant	=	5 sec

If the droop characteristic is adjusted so that total nominal load at scheduled frequency 50Hz is 1500MW and the load varies 0.8% for every 1% frequency deviation

- Working on a base of 1000MW and 50 Hz find steady state frequency deviation in Hz when a sudden load change (decrease) of 100MW occurs, total generated power and load power.
- Design an AGC to reduce steady state error. Find the range of  $K_I$  for stable system? Find the total transfer function of the system with AGC.
- Design state feedback system so that the closed loop system has a settling time less than 4 s and the damping ration 0.5 and zero steady state error.

Members of course Examination Committee:	Signature:	Date:
Lecturer: Dr. Mostafa Abdel-Geliel		17/5/2015
Course Coordinator : Dr. Ahmed Elshenawy		17/5/2015
Head of Department: Prof. Hamdy Ashour		17/5/2015

