[06 – 4210]

IV/IV B.E. DEGREE EXAMINATION.

Second Semester

Electrical and Electronics Engineering

POWER SYSTEM OPERATION AND CONTROL

(Common with M.S.)

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

1. (a) What is meant by sparsity?

   (b) Name some thermal constraints in unit commitment problem.

   (c) What is "SCADA"?

   (d) Define load curve.

   (e) Define the term "maximum demand".

   (f) What are the types of automatic load frequency control for interconnected power system?

   (g) Define 'Network topology' in power system.

2. Draw the flow chart for obtaining optimal scheduling of generating units by neglecting the transmission losses.

3. (a) Derive the transfer function of speed governing system.

   (b) Explain turbine model with block diagram.

4. A two area system connecting by a tie-line has following parameters on 1000 MVA base :

   $R_1 = 4.5\ \%\ B_1 = 0.6\ \ H_1 = 4.5$

   $R_2 = 6\%\ \ B_2 = 0.85\ \ H_2 = 5.0$.

   The units are running in parallel at a frequency of 50 Hz the synchronizing power coefficients is 1.9 P.U at the initial operating angle. A load change of 150 MW occurs in area *l*. Determine the new steady state frequency and change in tie-line power flow.

5. Show the steady state frequency error can be reduced to zero if the proportional and integral controller is used in single area load frequency control.

6. A single area consists of three generating units with the following characteristics

Unit	Rating (MVA)	Speed droop (R) (per unit on units)
1	100	0.01
2	500	0.015
3	500	0.015

The units are loaded as $P_1 = 80$ MW; $P_2 = 300$ MW; $P_3 = 400$ MW (a) assume B = 0; what are the new generations on each unit for a 50 MW load increase? (b) if $B = 1.0$ P.U (i.e. 1.0 P.U on load base) what are the new generations on each unit for a 60 MW load increase?

7. For an isolated power system with integral control has the following data :
Rating of the generator $P_r = 100$ MW
Nominal operating load $P_D = 50$ MW
Intertia constant H = 5.0 sec.
Speed regulation of the governer R = 2.5 Hz/PU MW if the load would increase 1 P.U for 7% frequency increases and area is controlled by an integral controller estimate the critical magnitude of the gain when the load is increased by 10 MW.

8. Enumerate the various operating states and the control strategies of a power system.
