Registration No. :

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Seventh Semester Examination – 2013

POWER SYSTEM OPERATION AND CONTROL

BRANCH : ELECTRICAL

QUESTION CODE : C-248

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

    (a) Write down two advantages of PU representation of power system.

    (b) What is load flow analysis in a power system ? Explain in brief.

    (c) Define ITL with reference to economic dispatch.

    (d) Write down two advantages of Newton Raphson method.

    (e) What is sparsity of a matrix ?

    (f) What is the function of speed changer in a turbine speed governing system ?

    (g) What is the function of load frequency control ?

    (h) Write any two methods for improvement of transient stability of power system.

    (i) What do you mean by stiffness factor of synchronous machine ?

    (j) What do you understand by reactive power compensation ?

2. (a) Two loads connected in parallel are supplied from a single-phase 240 V r.m.s. source .The two loads draw a total real power of 500 kW at a power factor 0.8 (lag). One of the loads draw 150 kW at power factor of 0.96 (lead). Find the complex power of other load. 5

P.T.O.

(b) Three Generators are rated as follows :

Generator 1 - 100 MVA   33KV   Reactance 10%

Generator 2 - 150 MVA   32KV   Reactance 8%

Generator 3 - 110 MVA   30KV   Reactance 12%

Determine the reactaces of all generators corresponding to base values of 200 MVA, 35 KV.   5

3. (a) A power system is supplied by only two plants, both of which operate on economical dispatch. At the bus of plant 1, the incremental cost is '55/MWh and plant 2 is '50/MWh. Which plant has the higher penalty factor ? What is the penalty factor of plant 1 if the cost per hour of increasing the load on system by 1 MW is ' 75/MWh ?   5

(b) What are the co-ordination equations ? Give their physical significance.

5

4. (a) Considering a four bus system the Line impedances are given as below :

Bus 1 to Bus 2 j0.2 Ω

Bus 2 to Bus 4 j0.25 Ω

Bus 3 to Bus 4 j0.3 Ω

Bus 3 to Bus 1 j0.5 Ω

Bus 4 to Bus 1 j0.8 Ω

Draw the configuration of the system and also find the bus Admittance matrix.   5

(b) Discuss Various advantages using Y Bus model of the power system network for load flow analysis.   3

(c) Discuss the classification of various type of buses.   2

5. (a) Determine the power system parameter (K_p & T_p) for a control area having the following data : Frequency f = 60 Hz, Rated capacity Pr = 2000 MW, Normal operating load P_D^0 = 1000 Mw, Inertia constant H = 5.0 sec, Regulation R-2.4 Hz/pu Mw.   5

(b) What do you understand by Area control error and also explain its significance.   5

6. (a) A round rotor generator delivers steady power to an infinite bus through a transmission line of reactance of 0.4 p.u voltage behind the synchronous reactance is 1.8 p.u. in magnitude and that of infinte bus is 1.0 p.u. Synchronous machine $H = 5$ seconds $X_d = X_q = 1.0$ p.u. Find the frequency of power angle oscillations if a small disturbance is created when the steady power flow was 0.5 p.u. 5

   (b) Derive the swing equation for the stability of a synchronous generator starting from first principle. 5

7. (a) Develop the block diagram of LFC of a single area system. 5

   (b) Two generators of rating 180 MW and 300 MW are operated with a droop characteristic of 6% from no load to full load .Determine the load shared by each generator, if a load of 240 MW is connected across the parallel combination of those generators. 5

8. Write short notes any **two** : 5×2

   (a) Regulating Transformer

   (b) Steady state and transient stability

   (c) Tie line bias control

   (d) The Power angle Equation.