Code No: M0223/R07

Set No. 1

IV B.Tech I Semester Regular Examinations, November 2012
POWER SYSTEM OPERATION AND CONTROL
(Electrical & Electronics Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) What is the need of optimal operation of power systems?
   (b) The fuel costs for two plants are given by $C_1 = 0.15\ P_1{}^2+30P_1+25$, $C_2= 0.17\ P_2{}^2 +28P_2+20$ where C is in Rs/Hr and P is in MW. If both units operate at all time and maximum and minimum load on each unit are 100 MW and 20 MW respectively determine the economic operating schedule of the plant for loads of 40 MW, 120 MW. [12+4]

2. A power system consists of two 100 MW units whose input cost data are represented by equations below:
   $C_1 = 0.04\ P_1{}^2 + 22\ P_1 + 800$ Rupees/hour
   $C_2 = 0.045\ P_2{}^2 + 15\ P_2 + 1000$ Rupees/hour
   If total received power $P_R = 150$ Mw. Determine the load sharing between units for most economic operation. [16]

3. Explain hydro-thermal scheduling problem. [16]

4. A 125 MVA turbo alternator operator on full load at 50 Hz. A load of 50 MW is suddenly reduced on the machine. The steam valves to the turbine commence to close after 0.5 sec. due to the time lag in the governor system. Assuming inertia constant H= 6 kW- sec per kVA of generator capacity, calculate the change in frequency that occurs in this time. [16]

5. A Generator in single area load frequency control has the following parameters:
   Total generation capacity = 2500 MW
   Normal operating load =1500 MW
   Inertia constant=5 kW-seconds per kVA; Load damping constant, B=1 %; frequency, f=50 Hz; and Speed regulation, R=2.5 Hz / p.u MW. If there is a 1.5 % increase in the load, find the frequency drop
   (a) without governor control
   (b) with governor control. [8+8]

6. (a) What are the features of the dynamic response of a two area system for step load disturbances?
   (b) What are the considerations in selecting the frequency bias parameters? [8+8]

7. Draw the block diagram of a power system showing the governor, turbine and synchronous generator, indicating their transfer functions. For a step disturbance of ΔP_D, obtain the response of "increment in frequency", making suitable assumptions.

(a) Without proportional plus integral controller and

(b) With proportional plus integral control. [16]

8. A 3ϕ feeder having a resistance of 3Ω and reactance of $10\ \Omega$ supplies a load of 2 MW at 0.85 p.f. lag. The receiving end voltage is maintained at 11 kV by means of static condenser drawing 2.1 MVAr form the line. Calculate the sending end voltage and power factor. What is the regulation and efficiency of the feeder? [16]

⋆⋆⋆⋆⋆

Code No: M0223/R07

Set No. 2

IV B.Tech I Semester Regular Examinations, November 2012
POWER SYSTEM OPERATION AND CONTROL
(Electrical & Electronics Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A power system consists of two 100 MW units whose input cost data are represented by equations below $C_1 = 0.04\ {P_1}^2 + 22P_1 + 800$ Rs/hr
   $C_2 = 0.045\ {P_2}^2 + 15P_2 + 1000$ Rs/hr
   If total received power $P_R = 150$ MW. Determine
   (a) The load sharing between units for most economic operation
   (b) The corresponding costs of operations. [8+8]
2. (a) Discuss the general problem of economic operation of large interconnected areas.
   (b) What are the factors that can be taken in to consideration for scheduling of generators in a plant. [8+8]
3. Discuss the combined hydro- electric and steam station operation. [16]
4. A 80 MVA synchronous generator operates on full load at a frequency of 50Hz. The load is suddenly reduced to 40 MW. Due to time lag in the governor system, the steam valve begins to close after 0.3 secs. Determine the change in frequency that occurs in this time. H=4 KW-s/KVAof generator capacity. [16]
5. An isolated generator and its control have the following parameters:
   Generator inertia constant = 5 second
   Governor time constant $\tau_g = 0.25$ seconds
   Turbine time constant $\tau_T = 0.6$ seconds
   Governor speed regulation = 0.05 p.u
   Load damping constant B = 0.8
   The turbine rated output is 200 MW at 50 Hz. The load suddenly increases by 50 MW. Find the steady state frequency deviation. Plot the frequency deviation as a function of time. [16]
6. Two control areas connected by a tie line have the following characteristics.

Area 1	Area 2
R=0.01 pu	R=0.02 pu
D=0.8 pu	D=1.0 pu
Base MVA=2000	Base MVA=500

   A load change of 100 MW (0.2 pu) occurs in area 2. What is the new steady state frequency and what is the change in the tie flow? Assume both areas were at nominal frequency (60 Hz) to begin. [16]

7. Explain the effect of integral gain on the performance of load frequency control in two area load frequency control. [16]

8. (a) A single-phase motor connected to a 230 V, 50 Hz supply takes 30 A at a p.f of 0.7 lag. A capacitor is shunted across the motor terminals to improve the p.f to 0.9 lag. Determine the capacitance of the capacitor to be shunted across the motor terminals.
   (b) Explain the specifications of load compensation. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: M0223/R07

Set No. 3

IV B.Tech I Semester Regular Examinations, November 2012
POWER SYSTEM OPERATION AND CONTROL
(Electrical & Electronics Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Describe in detail, with suitable examples, the methods of optimum scheduling of Generation of power from a thermal station. [16]

2. 100 MW, 150 MW and 280 MW are the ratings of three units located in a thermal power station. Their respective incremental costs are given by the following equations:
dc1/dp1 = Rs(0.15p1 + 12);
dc3/dp3 = Rs(0.21p3 + 13)
dc2/dp2 = Rs(0.05p2 + 14)
Where P_1, P_2 and P_3 are the loads in MW. Determine the economical load allocation between the three units, when the total load on the station is 300 MW. [16]

3. Determine the daily water used by hydro plant and daily operating cost of thermal plant with the load connected for total 24 hrs from the given data.
The load connected, P_D = 400MW
Generation of thermal plant, P_{GT} = 200MW
Generation of hydro plant, P_{GH} = 300MW. [16]

4. Explain in detail general configuration of excitation system? [16]

5. Show that the steady change in frequency in load frequency control of an isolated power can be reduced to zero if the change in controlling force applied to the speed changer is equal to the change in load demand. [16]

6. Two control areas of 1000MW and 2000MW capacities are interconnected by a tie line. The speed regulations of the two areas respectively are 4 Hz / Pu MW and 2.5 Hz / Pu MW. Consider 2% change in load occurs for 2% change in frequency in each area. Find steady state change in frequency and tie-line power of 10MW change in load occurs in both areas. [16]

7. Obtain the dynamic response of load frequency controller with integral control action in two area load frequency control system. [16]

8. Three supply points A, B and C are connected to a common bus bar D as depicted in figure 8. Supply point A is maintained at a nominal voltage of 400 kV and is connected to D through 400/132kV transformer and a 132 kV line of reactance 50 ohms. Supply point B is nominally at 132kV and is connected to D through a 132 kV line of 50ohms reactance. supply point C is nominally at 400kV and is connected to D by a 400/132 kV transformer and a 132 kV line of 100ohms

reactance. If at a particular load, the line voltage at D falls below its nominal value by 5 kV, calculate the value of the reactive volt-ampere injection required at D to re-establish the original voltage. [16]

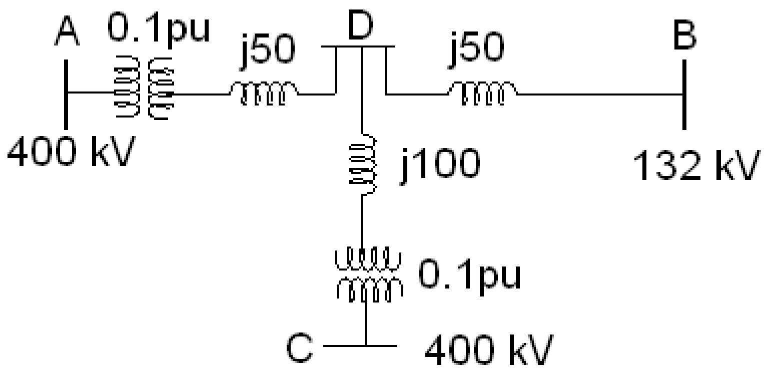

Figure 8

⋆ ⋆ ⋆ ⋆ ⋆

Code No: M0223/R07

Set No. 4

IV B.Tech I Semester Regular Examinations, November 2012
POWER SYSTEM OPERATION AND CONTROL
(Electrical & Electronics Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Derive optimum generation allocation of thermal plant when line losses neglected and write an algorithm. [8+8]

2. (a) Discuss the general problem of economic operation of large interconnected areas.
   (b) What are the factors that can be taken in to consideration for scheduling of generators in a plant. [8+8]

3. Write algorithm for Mathematical Formulation for Hydro thermal scheduling. [16]

4. Draw the schematic diagram showing the speed changer setting, Governor and steam admission valve and indicate how steam input is regulated with the change in load. Derive the T.F. of the above system. [16]

5. Discuss in detail the dynamic response of load frequency control of an isolated power system with a neat block diagram. [16]

6. (a) What are the advantages of inter connected operation of power systems? Explain.
   (b) Two areas of a power system network are interconnected by a tie-line, whose capacity is 500 MW, operating at a power angle of 35^0. If each area has a capacity of 5000 MW and the equal speed regulation of 3 Hz/Pu MW, determine the frequency of oscillation of the power for step change in load. Assume that both areas have the same inertia constants of H = 4 sec. [8+8]

7. (a) Explain economic dispatch control problem in detail.
   (b) Explain how the frequency error in the load frequency control problem is reduced to zero. [8+8]

8. Two 11 0.4 kV, 3-phase transformers A and B are connected to in parallel on HV and LV sides. The HV side is supplied at 11 kV and the LV side supplies a total load current of 180 A at 0.8 p.f. power factor lagging (relative to the voltage on HV side). Transformer A has a rating of 50 kVA and pu impedance 0.015+j0.04; Transformer B has a rating of 75 kVA and pu impedance 0.026+j0.07 and is fitted with $\pm 2\frac{1}{2}$ % and ± 5 % tapping on its HV winding. If the transformer B is set to 0 % tapping, find the current carried by each transformer. Determine the tapping to minimize the over load-load of the transformers and currents in each when this tapping is in use. [16]

⋆ ⋆ ⋆ ⋆ ⋆