Elect

College of Engineering, Pune 411 005

Electrical Engineering Department T.Y.Electrical

Power Systems_II – ESE-- May 2013 Time-3.00Hrs --Max. Marks 50

Instructions to candidates:

1. All questions are compulsory.
2. Figures to the right indicate maximum marks.
3. Draw necessary diagrams wherever necessary.
4. **Assume suitable data if necessary.**

Q.1a) What are the requirements of a secured power systems? With a suitable state transition diagram explain in brief the important constraints and controls for normal state operation of Integrated power Systems. 05

b) With a suitable diagram explain in brief "Turbine speed governing system" OR " Control area load frequency and economic dispatch control". 05

Q.2a) Draw suitable diagrams to show how protection is provided to capacitor when 'Series capacitive compensation' is provided in Electrical Transmission system? 05
A 50Hz, 750kV line with L= 0.9mH per km is 600km long. It is provided with 40% series compensation connected in the middle of the line. The power delivered by the line is 2.5MW, 3phase per circuit at unity power factor. Neglect shunt capacitance and line resistance, and assume the line inductance to be lumped. Calculate

i) The reactance and capacitance of series capacitor, and
ii) the voltage drop across the capacitor at full load
iii) The current flowing through the capacitor and the voltage across it during a sustained short circuit occurring on the source side terminal and then on load side terminal of the capacitor.

b) The IFC of two units in a generating station are as given below 05

$dC_1/dP_{G1} = 0.15\ P_{G1} + 36.0$ Rs. / MWh

$dC_2/dP_{G2} = 0.20\ P_{G2} + 30.0$ Rs. / MWh

Determine

i) the most economical division of load between the generators for a constant load of 150MW
ii) the saving in Rs./day thereby obtained compared to equal load sharing between machines
iii) Also find the loading and IFC for 50MW and 300MW if minimum and maximum loading for both the generators is 25MW and 150MW. Comment on the results.

Q.3a) An industrial customer has maximum demand of 270kVA and contract demand of 300kVA. The average power factor is 0.85lagging. A capacitor bank is installed to improve the p.f. to unity. The industry works for 16 hours a day with the average load of 150kVA. Calculate the savings in the monthly electricity bill due to reduction only in the demand charge. Also calculate the payback period of the capacitor. **Assume suitable tariff and capacitor cost.** 05

b) Explain CIA and CEA control in HVDC system. 05

OR

What is the need of ' FACTS' in the Modern Electrical Power Industry ? How power flow is controlled using UPFC ?

Q.4 Attempt only two out of three (third sub-question will not be assessed)

a) What is the importance of "State estimation" in Modern Power Systems ? Explain the WLS Algorithm in brief. 05

b) What are the advantages of SCADA over PLCC ? Draw and explain the block diagram of SCADA for a typical power system. 05

c) What was the cause of " Grid failure in North India on 30th and 31st July2012"? Analyze this event giving reasons and plausible remedies. 05

Q.5a) ABT Tariff has been instrumental in improvement of frequency profile in the Indian Power Systems. Justify the statement. 05

b) Suggest a suitable "Time of the Day Tariff" so as to reshape the load-curve to help "Demand Side Management (DSM)" and to defer generation capacity addition in immediate future. The existing load-curve of the system is as given in Fig. 1 below. (Assume average Energy charge as Rs. 5.00 per kWh) Also suggest a suitable TOD tariff for demand charge assuming appropriate tariff. Also suggest and draw a suitable load-curve for a "Water Pumping Station" so as to flatten the load curve and to minimize the monthly electricity bill. 05