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Question Paper Code : 31409

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Seventh Semester

Electrical and Electronics Engineering

EE 2401/EE 71/10133 EE 701 — POWER SYSTEM OPERATION AND CONTROL

(Regulation 2008/2010)

(Common to PTEE 2401 – Power System Operation and Control for B.E. (Part-Time) Fifth Semester – Electrical and Electronics Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define plant capacity factor.

2. List out the various needs for frequency regulation in power system.

3. Give two conditions for proper synchronizing of alternators.

4. What is the function of load frequency control?

5. What are the various functions of excitation system?

6. What are the advantages and disadvantages of synchronous compensators?

7. What is meant by FLAC?

8. Write the condition for the optimal power dispatch in a lossless system.

9. What are the functions of SCADA?

10. Define state estimation.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) A generating station has a maximum demand of 50,000 kW. Calculate the cost per unit generated from the following data. (12)

Capital cost = Rs. 95×10^6

Annual load factor = 40%

Annual cost of fuel and oil = Rs. 9×10^6

Taxes, wages and salaries, etc. = Rs. 7.5×10^6

Interest and depreciation = 12%

(ii) (1) Define 'Diversity factor'.

(2) Define 'Plant use factor'. (4)

Or

(b) (i) Define the following:

(1) Hot reserve

(2) Cold reserve

(3) Spinning reserve. (6)

(ii) A generating station has the following daily load cycle:

Time (Hours)	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW)	20	25	30	25	35	20

Draw the load curve and calculate

(1) Maximum demand

(2) Units generated per day

(3) Average load

(4) Load factor. (10)

12. (a) Two synchronous generators operating in parallel. Their capacities are 300 MW and 400 MW. The droop characteristics of their governor are 4% and 5% from no load to full load. Assuming that the generators are operating at 50 Hz at no load, how would be a load of 600 MW shared between them. What will be the system frequency at this load? Assume free governor action. (16)

Or

(b) What are the components of speed governor system of an alternator? Derive its transfer function with an aid of a block diagram. (16)

13. (a) Describe various methods of voltage control and explain any three in detail. (16)

Or

(b) Draw the diagram of a typical automatic voltage regulator and develop its block diagram representation. (16)

14. (a) State the unit commitment problem. With the help a flow chart, explain forward dynamic programming solution method of unit commitment problem. (16)

Or

(b) The fuel inputs per hour of plants 1 and 2 are given as

$F_1 = 0.2P_1^2 + 40P_1 + 120$ Rs/hr

$F_2 = 0.25P_2^2 + 30P_2 + 150$ Rs/hr

Determine the economic operating schedule and the corresponding cost of generation. The maximum and minimum loading on each unit is 100 MW and 25 MW. Assume the transmission losses are ignored and the total demand is 180 MW. Also determine the saving obtained if the load is equally shared by both the units. (16)

15. (a) (i) What is EMS? What are its major functions in power system operation and control? (6)

(ii) Draw a block diagram to show the hardware configuration of a SCADA system for a power system and explain the application of SCADA in monitoring and control of power system. (10)

Or

(b) Explain the security monitoring using state estimation with necessary diagrams. (16)
