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ANNA UNIVERSITY

B.E. DEGREE EXAMINATIONS, NOVEMBER 2013

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VI SEMESTER , (R 2008)

EE 9353 : POWER SYSTEM OPERATION AND CONTROL

Time: 3 hrs. Maximum marks:100

ANSWER ALL QUESTIONS

PART-A (10 x 2 = 20 Marks)

1. What are plant and system level controls implemented in power system?
2. Compare the functions of "Speed Governor" and "Speed Changer" in a speed governing system of a turbine-generator set.
3. Explain the use of static shunt capacitor for voltage control.
4. Derive the relationship between $\partial Q/\partial V$ and short-circuit current by considering a two-bus system.
5. What is the significance of economic dispatch controller added to load frequency control ?
6. What are base-point and participation factors with respect to economic dispatch?
7. What are the advantages multi-area power systems?
8. Draw the typical load and load duration curves.
9. What is the need for state estimation?
10. How the network topology is determined?

PART – B (5 x 16 = 80 Marks)

11 (i). Explain the following terms:

Installed reserve, Spinning reserve, cold reserve and hot reserve. (8)

(ii). A diesel station supplies the following loads to various consumers:

Industrial consumer = 1500 kW
Commercial load = 850 kW
Domestic power = 150 kW
Domestic light = 650 kW

If the maximum demand on the station is 2800 kW and the number of kWh generated per year is 55×10^5, determine the diversity factor and annual load factor. (8)

12.(a) Derive the transfer function model and draw the block diagram for a single control area provided with governor system. From the transfer function derive the expression for steady state frequency error for a step load change. (16)

different control actions that can be taken to improve the security level of the system. (16)

15(a)(i). What is an unit commitment problem? Discuss the constraints that are to be accounted in unit commitment problem. (6)

(ii). Explain priority list method of solving unit commitment problem. State merits and limitations of this method. (10)

[OR]

15(b) (i) Formulate the economic dispatch problem by considering the transmission loss and derive the co-ordination equations. (8)

(ii) The fuel-cost functions for three thermal plants in $/h are given by

$$F_1 = 0.004\, P^2_{g1} + 5.5\, P_{g1} + 500$$

$$F_2 = 0.006\, P^2_{g2} + 5.5\, P_{g2} + 400$$

$$F_3 = 0.009\, P^2_{g3} + 5.8\, P_{g3} + 200$$

where P_{g1}, P_{g2}, and P_{g3} are in MW. Find the optimal dispatch and the total cost when the total load is 975 MW with the following generator limits:

$$100 \text{ MW} \le P_{g1} \le 450 \text{ MW}$$

$$100 \text{ MW} \le P_{g2} \le 350 \text{ MW}$$

$$100 \text{ MW} \le P_{g3} \le 225 \text{ MW}$$ (8)