

BTECH
(SEM VII) THEORY EXAMINATION 2018-19
POWER SYSTEM OPERATION & CONTROL

Time: 3 Hours

Total Marks:100

Notes: Assume any Missing Data.

SECTION-A**1. Answer ALL parts of this section.****[2X10=20]**

- a) What is the function of energy control centre?
- b) Discuss the problem of voltage stability in power systems.
- c) What is level decomposition in power system?
- d) What is meant by incremental cost curve?
- e) What do you understand by the term unit commitment?
- f) What is booster transformer?
- g) What is penalty factor?.
- h) What is the role of AVR in power system?
- i) Highlight the role of FACTS devices in ever expanding electrical power system network.

SECTION-B**2. Attempt any THREE questions from this section.****[3x10=30]**

- a) With the help of diagram explain communication between control centres for SCADA. Write the function of SCADA.
- b) Discuss the importance of combined load frequency control and economic dispatch control with a neat block diagram.
- c) Two generating stations having cost functions are

$$C_1(P_{G1}) = 0.0008P_{G1}^2 + 0.002P_{G1} + 5 \text{ ₹/hr.}$$

$$C_2(P_{G2}) = 0.0005P_{G2}^2 + 0.003P_{G2} + 4 \text{ ₹/hr.}$$

Calculate the value of P_{G1} , P_{G2} and incremental cost for

load $P_D = 500$ MW using economic dispatch.

- i) Calculate total cost of generation of economic dispatch solution.
 - ii) Calculate total cost of generation using equal load sharing condition. Compare the results.
- d) Draw input-output and incremental fuel cost curve for steam turbine plant and hydroelectric plant and write their characteristics equations.
 - e) Two synchronous generators are operating in parallel. Their capacities are 300 MW and 400 MW. Their droop characteristics of their governor are 4% to 5% from no load to full load. Assuming that the generators are operating at 50 Hz at no load to full load, how would be a load of 600 MW shared between them. What is the system frequency at this load? Assume free governor action.

SECTION-C

Attempt all the question.

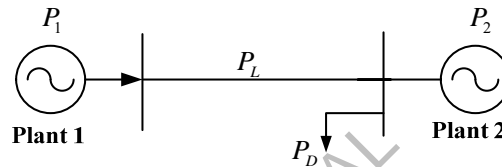
[10*5=50]

3. Attempt any one part

- a) Explain economic dispatch load center and its application
- b) Draw input output curve for thermal power plant and hydro power plant.

4. Attempt any one part

- a) Develop the complete block diagram representation of load frequency control of an isolated power system. Show the relation between change in frequency and change in power.
- b) For a two bus system shown in figure,



The incremental costs for the two plants are

$$\frac{dC_1}{dP_1} = 0.08 P_1 + 15 \text{ ₹/MWh}; \quad \frac{dC_2}{dP_2} = 0.1 P_2 + 13 \text{ ₹/MWh}$$

The transmission line loss formula indicates that for a transfer of 150 MW, a loss of 15 MW occurs. If $\lambda = 25 \text{ ₹/MWh}$.

Find (i) S_{11} , (ii) P_1 and P_2 for minimum fuel cost, (iii) Power supply to the load and (iv) Loss in transmission line (v) ITL (vi) Penalty factor

5. Attempt any one part

- a) How power system security is performed. Explain with the help of block diagram.
- b) Explain different type of compensating equipment for transmission.

6. Attempt any one part

- a) What are the different kinds of excitation systems? Describe any two.
- b) Mention the various methods of voltage control. Describe any three.

7. Attempt any one part

- a) What do you mean by “FACTS” controllers? Explain following “FACTS” controllers:
 - (i) STATCOM (ii) SSSC (iii) UPFC (iv) TC-PAR
- b) What do you mean by “State Estimation” in power system environment? Also mention its advantages, disadvantages and importance in power system environment