



Printed Pages : 3

TEE-703

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 0676**

Roll No.

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## B. Tech.

(SEM. VIII) EXAMINATION, 2007-08

### POWER SYSTEM OPERATION & CONTROL

Time : 3 Hours]

[Total Marks : 100

- Note :**
- (1) Attempt all questions.
  - (2) All questions carry **equal** marks.
  - (3) Be precise in your answer.
  - (4) No second answer book will be provided.

**1** Attempt any **four** parts of the following: **4×5=20**

- (a) How the real time monitoring and controlling of an electric power system is done? Discuss.
- (b) Discuss the various tasks performed by an energy control center for optimal operation of a power system.
- (c) Discuss how the voltage collapse can be avoided in a typical power system.
- (d) What do you understand by the term 'secure system'? Discuss various power system static security levels.
- (e) What is the difference between power pools and national grid? Discuss merits and demerits of a grid.
- (f) Draw a schematic diagram of a coal fired steam plant.



2 Attempt any **four** parts of the following : 4×5=

- (a) What do you mean by merit commitments. Explain various constructivity in unit commitment problem.
- (b) Derive the exact coordination equation for optimal thermal generation scheduling.
- (c) Incremental fuel costs in rupees per MWh for a plant consisting of **two** units are:

$$\frac{dC_1}{dP_{G1}} = 0.20 P_{G1} + 40$$

$$\frac{dC_2}{dP_{G2}} = 0.40 P_{G2} + 30$$

and the generator limits are:

$$30 \text{ MW} \leq P_{G1} \leq 175 \text{ MW}$$

$$20 \text{ MW} \leq P_{G2} \leq 125 \text{ MW}$$

Assume that both units are operating at all times. How will the load be shared between the units as the system load varies over the full range of the load values? What are the corresponding values of the plant incremental costs?

- (d) Derive water availability equation for optimal scheduling of a hydrothermal system.
- (e) What is OPF? Discuss various objectives, limits and constraints of OPF. What are different methods used to solve OPF problem.
- (f) Describe input-output operational characteristics of hydro power plants. How the incremental water rate can be obtained from input-output curve?



- 3 Attempt any **two** parts of the following:  $2 \times 10 = 20$
- (a) What are the different reasons to keep the system frequency in strict limits? Discuss.
  - (b) What is 'droop'? How the steady analysis of load frequency control system is done?
  - (c) A 100 MW unit with 0.07 p.u. turbine regulation operates in parallel with a 600 MW unit of identical turbine regulation. For a specific amount of power demand increase, find the ratio of sharing of the load by the units; system frequency is 50 Hz.
- 4 Attempt any **two** parts of the following :  $2 \times 10 = 20$
- (a) What is an exciter? What is its role in AVR loop? Show the complete block diagram of an AVR loop taking into account modern static excitation system of the alternator.
  - (b) Explain series and shunt compensation of transmission lines and their effect on the surge impedance loading of the lines. If shunt compensation is 100%, what happens to SIL and voltage profile.
  - (c) How the On load tap Changing transformers regulate bus voltage? Discuss.
- 5 Attempt any **two** parts of the following:  $2 \times 10 = 20$
- (a) Discuss any one technique for bad data detection.
  - (b) Differentiate between FACTS and FACTS Controller. Compare V-I and T-Q characteristics of STATCOM and SVC.
  - (c) Discuss basic operating principle of UPFC.

