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

PAPER ID : 2729   **Roll No.** ☐☐☐☐☐☐☐☐☐☐☐

B.Tech.

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2012-13

POWER SYSTEM OPERATION AND CONTROL

Time : 3 Hours   *Total Marks : 100*

Note : *(1) Attempt all questions.*

           (2) Each question carries equal marks.

1. Answer "any **TWO**" parts of the following : **(10×2=20)**

   (a) What do you mean by "VOLTAGE STABILITY" in power system environments ? What are the various causes of voltage collapse in power system environments ? Also mention "ANY FIVE" examples of voltage collapse in all over world.

   (b) Define "FREQUENCY COLLAPSE" in power system networks. Also mention its importances and limitations.

   (c) Explain the following :

       (i) POWER SYSTEM STABILITY

       (ii) POWER SYSTEM SECURITY.

   Also mention their importances and limitations.

2. Answer "any **TWO**" parts of the following : **(10×2=20)**

   (a) What do you mean by "SCADA" system ? Also mention its advantages and disadvantages. Explain why "SCADA" systems are more preferred as compared to conventional systems ?

(b) Write short notes on the following :

    (i)   POWER SYSTEM CONTROL CENTER

    (ii) REAL TIME COMPUTER CONTROL.

    Also mention their advantages and disadvantages.

(c) Draw and explain with neat diagram the structure of power system environments. Explain the different voltage levels used from generating station to utilization point. Discuss the various operational stages of power system environments. Explain using state transition diagram.

3.   Answer "any **TWO**" parts of the following :   **(10×2=20)**

(a) What do you mean by "Equality" and "Inequality" constraints in economic dispatch ? Also mention their relevant expressions.

(b) The fuel input to two plants are given by :

$$F_1 = 0.015P_1^2 + 16P_1 + 50$$
$$F_2 = 0.025P_2^2 + 12P_2 + 30$$

The loss coefficients of the systems are given by :

$B_{11} = 0.005$; $B_{12} = -0.0012$; and $B_{22} = 0.002$.

The load to be met is 200 MW, determine the economic operating schedule and the corresponding cost of generation if :—

    (i)   the transmission line losses are coordinated,

    (ii) the transmission line losses are included but not coordinated.

(c) What do you understand by "PENALTY FACTOR METHODS" in economic dispatch ? What are the advantages and disadvantages of "PENALTY FACTOR

METHOD" ? Also mention its importances in optimal power from load dispatch in power system environments.

4. Answer "any **TWO**" parts of the following : **(10×2=20)**

(a) What do you mean by "LOAD FREQUENCY CONTROL SYSTEM" in power system environments ? Also mention the advantages and disadvantages of single area and double area load frequency control systems in power system environments.

(b) A single-area load frequency control system has the following data :

Speed Regulation, R	= 4 Hz/p.u. MW
Damping coefficient, B	= 0.1 p.u. MW/Hz
Power system time constant, T_p	= 10 sec.
Power system gain, K_p	= 75 Hz/p.u. MW

When 92% load change occurs, determine the area frequency response characteristic (AFRC) and the static frequency error. What is the value of the steady-state frequency error if the governor is blocked ?

(c) Develop the mathematical model of following :

(i) GOVERNOR MODEL

(ii) SPEED TURBINE MODEL

(iii) GENERATOR-LOAD MODEL.

Also mention their importances and limitations.

5. Answer "any **FOUR**" parts of the following : **(4×5=20)**

(a) What do you mean by "FACTS" controllers ? What are the advantages and disadvantages of FACTS controllers ? Discuss the different generations of FACTS controllers with help of suitable examples.

(b) Explain the following "FACTS" controllers as follows :

   (i) STATCOM

   (ii) UPFC

   (iii) TC-PAR

   (iv) IPFC

   (v) HPFC or S³C

(c) What are the basic parameters controlled by FACTS controllers in power system networks ? What are the advantages and disadvantages of UPFC over SVC or TCSC ?

(d) What do you mean by "O.L.T.C." in power system networks ? Also mention its basic role in power systems networks with help of suitable diagrams.

(e) What do you mean by "STATE ESTIMATION" in power system environments ? Also mention its advantages/ disadvantages and importances in power system environments.

(f) Explain the following :

   (i) SERIES COMPENSATION

   (ii) SHUNT COMPENSATION

   (iii) PHASE ANGLE COMPENSATION.

Also mention their advantages/disadvantages and utilities in power system networks.