Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(EE)(SEPARATE SUPPLE)/SEM-8/EE-801B/2011

2011

POWER SYSTEM DYNAMICS & CONTROL

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) What is the value of inter-area oscillation for a system ?

a) 0.5 Hz b) 1.0 Hz

c) 1.5 Hz d) 2.0 Hz.

ii) Stability of power system can be improved by using

a) AVR b) PSS

c) FACTS devices d) all of these.

iii) UPFC is a

a) series device b) shunt device

c) series-shunt device d) none of these.

iv) Machine parameter k1 is related to

a) $\Delta\delta$ b) $\Delta\omega$

c) ΔE_{FD} d) ΔV_R .

v) The value of steady state stability index L for stability is

a) $L > 0$ b) $L = 0$

c) $1 < 0$ d) none of these.

vi) Expression of complex power is

a) VI b) VI^*

c) I^*V d) none of these.

vii) Voltage stability limit is obtained when

a) the Jacobian of load flow equation is singular

b) the Jacobian of load flow equation is non-singular

c) the Jacobian of load flow equation is monotonic

d) the Jacobian of load flow equation does not signify anything.

viii) The deficit in reactive power can be encountered by

a) local reactive power support

b) generator terminal voltage increase

c) series capacitor installation

d) any of these methods.

ix) The intertia constant H of a machine of 200 MVA is 2·0 p.u. Its value corresponding to 400 MVA will be

a) 4.0 b) 2.0

c) 1.0 d) 0.5.

x) The intertia constant of two groups of machines which swing together are M_1 and M_2 . The intertia constant of the system is

a) $\frac{M_1 M_2}{M_1 + M_2}$ b) $| M_1 + M_2 |$

c) $M_1 + M_2$ d) $\frac{M_1 + M_2}{M_1 M_2}$.

xi) Which of the following is constant impedance load ?

a) Fluorescent lamp b) Incandescent lamp

c) Induction motor d) Synchronous motor.

xii) Type of surge impedance loading is

a) resistive b) inductive

c) capacitive d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Discuss about the models for different types of load, i.e. constant current type, constant power type and constant impedance type. Give example for each of them. 3 + 2

3. What is voltage stability ? Find out the receiving end voltage at stability limit. 1 + 4

4. What is small signal stability and what are various modes of oscillation ? 2 + 3

5. Why do small oscillations appear in power system network ? What are the main governing factors in generating small oscillations ? 2 + 3

6. What are the components of load compensation ? What is the principle of power factor correction ? 3 + 2

GROUP – C

(Long Answer Type Questions)

Answer the following. 3 × 15 = 45

7. a) Describe the Heffron-Phillips model of single machine infinite bus problem in a power network of an SMIB system. 10

   b) What are the implications of k_1 – k_6 parameters in Heffron-Phillips model ? 5

8. a) What are the compensating devices used for the improvement of voltage stability ? How do they work ? 3 + 5

   b) Describe the performance characteristics of static VAR controllers with reference to range of control and speed of response. 7

9. What is voltage regulation in a transmission system ? What is the importance of knowing voltage regulation ? Find out the relation between voltage regulation and reactive power in a transmission system and comment from the relation how voltage depends on reactive power in a power system. Find out the expression for reactive power requirement for an uncompensated transmission line. 1 + 2 + 6 + 6