Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (EE)/SEM-7/EE-702/2012-13

2012

POWER SYSTEM-III

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 the following :

$10 \times 1 = 10$

i) The incremental cost characteristics of the two units in a plant are given by $I_{c1} = Rs\ (0{\cdot}1P_1 + 8{\cdot}0)$ per MWh and $I_{c2} = Rs\ (0{\cdot}15P_2 + 3{\cdot}0)$ per MWh .

The optimum sharing of load by two generators when the total load is 100 MW, are

a) $P_1 = 60$ MW and $P_2 = 40$ MW

b) $P_1 = 33{\cdot}3$ MW and $P_2 = 66{\cdot}7$ MW

c) $P_1 = 40$ MW and $P_2 = 60$ MW

d) $P_1 = 66{\cdot}7$ MW and $P_2 = 33{\cdot}3$ MW.

ii) An overhead transmission line having inductance L H/km and capacitance C F/km, the characteristic impedance of the line is given by

a) $\sqrt{LC}$

b) $\sqrt{L/C}$

c) $\sqrt{C/L}$

d) $\sqrt{1/LC}$.

iii) Tie-line bias control is used to

a) increase power exchange capacity through tie-line

b) decrease power exchange capacity through tie-line

c) minimize steady state frequency deviation

d) both (a) and (c).

iv) In terms of plant power P_n and P_m and loss coefficient B_{mn} , the total transmission loss P_L is

a) $\sum_{m=1}^{N} \sum_{n=1}^{N} B_{mn} P_n$

b) $\sum_{m=1}^{N} \sum_{n=1}^{N} B_{mn} P_m$

c) $\sum_{m=1}^{N} \sum_{n=1}^{N} B_{mn} P_n P_m$

d) $\sum_{m=1}^{N} \sum_{n=1}^{N} 2B_{mn} P_m$.

v) Unit of regulation for AGC is

a) M W/Hz

b) unit-less

c) Hz/MW

d) r.p.s.

vi) AGC is done by taking

a) feedback of frequency from o/p generator

b) feedback of excitation

c) feedback of frequency from i/p generator

d) feedback of frequency from load.

vii) The transient phenomenon lasts in a power system for a period ranging from

a) few ms to 1s

b) 1s to 2s

c) 2s to 3s

d) greater than 3 seconds.

viii) A power system needs injection of VARs

a) at peak load

b) at off peak load

c) both at peak load and off peak load

d) when the load is neither too high nor too low.

ix) Shunt compensation in an EHV is resorted to

a) improve the stability

b) reduce the fault level

c) improve the voltage profile

d) as a substitute for synchronous phase modifier.

x) The penalty factor

a) is always less than 1

b) is always more than 1

c) may be more or less than 1

d) is equal or less than 1.

GROUP – B

(Short Answer Type Questions)

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

2. Why is it necessary to consider the transmission loss in optimum scheduling ?

3. What are power system transients ? Discuss the sources of over-voltages in power system.

4. What are different environmental aspects on power generation ?

5. For a 2 per cent drop in frequency, if the load power factor is 0·8, prove that (with detailed derivation) the increase in load will be 1·44 per cent.

6. State the advantages of static VAR compensation systems over other methods of voltage control.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Derive the condition for economic operation of multi-generator system considering network losses. 6

b) What is Penalty Factor ? 2

c) A two-bus system has load 400 MW at Unit-1 and 100 MW at Unit-2. The loss of the line connected between Unit-1 and Unit-2 is given by

$P_L = 0{\cdot}0008 \left(P_{g1} - 100 \right)^2$.

The cost function of the two units are given as

$F_{c1} = 500 + 4P_{g1} + 0{\cdot}003\, P_{g1}^2$ and

$F_{c2} = 600 + 4P_{g2} + 0{\cdot}0035\, P_{g2}^2$. Find optimal generation for each plant and total power loss in line.

7

8. a) Explain AGC in two-area system and formulate the expression of steady state frequency deviation for a certain load change in area-1. 10

b) A two-area system connected by a tie-line and operating in parallel at 60 Hz frequency at 1000 MVA base has the following parameters :

Parameter	***Area-1***	***Area-2***
Speed regulation	$R_1 = 0{\cdot}05$	$R_2 = 0{\cdot}0625$
Frequency sensitive load coefficient	$D_1 = 0{\cdot}6$	$D_2 = 0{\cdot}9$
Turbine time constant	$\tau_{T1} = 0{\cdot}5$	$\tau_{T2} = 0{\cdot}6$
Governor time constant	$\tau_{G1} = 0{\cdot}2$	$\tau_{G2} = 0{\cdot}3$
Inertia constant	$H_1 = 5{\cdot}0$	$H_2 = 4{\cdot}0$

Find tie-line power flow for a load change 187·5 MW occurred in Area-1. 5

9. What is passive compensation ? Compare series and shunt compensators. Write short notes on SVC and STATCOM.

3 + 4 + 8

10. What is Hydro-thermal Scheduling ? What do you mean by long term and short term hydro-thermal scheduling ? How do you justify for the cost of water ?

11. Write short notes on any *three* of the following : 3 × 5

a) Necessity of restructuring in electricity market

b) FACTS devices

c) Reactive power and voltage control

d) Pumped storage plants

e) Unit Commitment.