Student Exam No:-_____

GANPAT UNIVERSITY
B.TECH SEM-VII (ELECTRICAL)
REGULAR EXAMINATION NOV-DEC 2014
2EE701:-INTERCONNECTED POWER SYSTEM

Time: 3 Hours **Total Marks:-70**

Instructions: - 1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

SECTION-I

Que-1 **(A)** A double circuit line feeds an infinite bus from a power station. If a fault occurs on one of the lines and the line is switched off, derive an expression for the critical clearing angle. **[07**

(B) The transfer reactance between a generator and infinite bus bar operating at 200 KV under various condition on the interconnector are : **[05**
Prefault :150 Ω per phase ; During fault: 400 Ω per phase; Post fault: 200 Ω per phase
If the fault is cleared when the rotor has advanced 60 degrees electrical from its prefault position, determine the maximum load that could be transferred without loss of stability.

OR

Que-1 **(A)** A 50 Hz, 4-pole, turbo generator rated 20 MVA, 13.2 kV has an inertia constant of H=9 kW-sec/kVA. Determine K.E. stored in the rotor at synchronous speed. Determine the acceleration if the mechanical input is suddenly raised to 18.6 MW for an electrical load of 15 MW. If the acceleration computed for the generator is constant for a period of 15 cycles, determine the change in torque angle in that period and rpm at the end of 15 cycles. **[06**

(B) Discuss the procedure for solving the swing equation using point by point method. **[06**

Que- 2 **(A)** Explain the algorithm of load flow solution using Newton- Raphson method for all type of buses with necessary equation. **[06**

(B) Discuss advantages and limitations of Gauss-Siedel and Newton- Raphson methods and which method is generally preferred for solving load flow problem? **[05**

OR

Que- 2 **(A)** Draw the network and obtain the load flow solution at the end of first iteration of the system data as given below. The solution is to be obtained for the all buses except bus 1 are PQ Buses **[07**

Bus data:

Bus no	Pi (pu)	Qi (pu)	Vi	angle
1	-	-	1.04	0
2	0.5	-0.2	-	-
3	-1.0	0.5	-	-
4	-0.5	-0.3	-	-

Line data:

Bus From	Bus To	R	X
1	2	0.05	0.15
1	3	0.10	0.30
2	3	0.15	0.45
2	4	0.10	0.30
3	4	0.05	0.15

(B) Explain the importance of load flow studies. What is the need for a slack bus? Explain. **[04**

Que-3 **Attempt following Question** [12]

(A) Discuss the various factors affecting the transient stability of the system.

(B) Explain the formation of Y-bus by direct inspection method.

(C) Define swing curve. Derive the power angle equation for salient pole synchronous machine.

SECTION-II

Que-4 (A) Derive the expression for B-coefficients in case of two generating plants connected to an arbitrary number of loads through a transmission network. [06]

(B) What are B- coefficients? Derive the matrix form of transmission loss equation. [06]

OR

Que-4 (A) Explain: (i) Generator model (ii) load model employed in multi machine stability studies. [06]

(B) Explain the method of equal incremental cost for the economic operation of generators with transmission loss considered. [06]

Que- 5 (A) A power station has two generating plants and the power is being dispatched economically with P_1=150MW and P_2=275 MW. [06]

The loss coefficients are:

$B_{11}=0.1\text{x}10^{-2}$ MW^{-1}, $B_{12}=-0.01 \text{ x } 10^{-2}$ MW^{-1}, $B_{22}=0.13\text{x}10^{-2}$ MW^{-1}

To raise the total load on the system by 1 MW will cost an additional Rs. 200 per hour.

Find (a) Penalty factor for plant-1 and (b) the additional cost per hour to increase output of plant 1 by 1 MW.

(B) With the help of block diagram explain simplified representation of a speed governor. [05]

OR

Que- 5 (A) Explain linear sensitivity factors, generation shift factor and line outage distribution factor for power system security. [05]

(B) The fuel cost in \$/hr for two 800 MW plant is given by [06]

$F_1=400+6.0\,P_{G1}+0.004\,P_{G1}^2$ $F_1=500+b_2\,P_{G2}+c_2\,P_{G2}^2$

Where P_{G1}, P_{G2} are in MW

(a) The incremental cost of power is \$ 8/MWh when the total demand is 550 MW, Determine optimal generation scheduled neglecting losses

(b) The incremental cost of power is \$ 10 /MWh when the total demand is 1300 MW, Determine optimal scheduled neglecting losses

(c) From (a) and (b) find the coefficients b_2 and c_2.

Que-6 **Attempt following Question** [12]

(A) Write a note on automatic voltage regulators.

(B) Draw diagrams of input – output curve and Heat rate curve. Also derive the quadratic equation of fuel cost and incremental fuel cost.

END OF PAPER