Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER– VII • EXAMINATION – SUMMER 2014

Subject Code: X70902 **Date: 30-05-2014**

Subject Name: Inter connected Power System

Time: 02.30 pm to 05.00 pm **Total Marks: 70**

Instructions:

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

Q.1

(a) Derive static load flow equations and hence explain classification of buses (7)

(b) Describe the turbine speed governing system for controlling the real power flow in the power system (7)

Q.2

(a) Explain equal area criteria of stability (7)

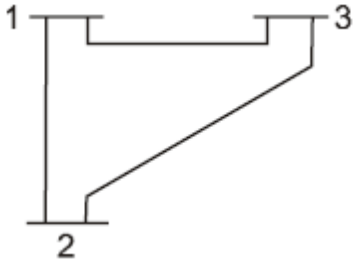
(b) What is the criterion for economic distribution of load between different units of a plant when transmission losses are neglected. (7)

OR

(b) Explain cascade tripping and network islanding in brief (7)

Q.3

(a) Find Y_{BUS} for the system shown in fig below (7)



Bus Code i-k	Impedance Z_{ik}	Line Charging Admittance $y'_{ik}/2$
1-2	0.02+j0.06	j0.03
1-3	0.08+j0.24	j0.025
2-3	0.06+j0.18	j0.02

(b) Short note on Gauss Seidel method for load flow (7)

OR

Q.3

(a) Derive the transmission loss formula explaining current distribution factors. State clearly all the assumptions made (10)

(b) On a system consisting of two generating plants, the incremental costs in Rs/MWhr with P_1 and P_2 in MW are (4)

$$dC_1/dP_1 = 0.16P_1 + 32$$

$$dC_2/dP_2 = 0.24P_2 + 36$$

The system is operating on economic dispatch with $P_1 = P_2 = 100$ MW and $\delta P_L/\delta P_2 = 0.2$. Find the penalty factor of plant 1

Q.4

(a) What is synchronizing coefficient? How does it help in determining system stability? (7)

(b) A 50 Hz generator of reactance 1.0 pu is connected to an infinite bus through line of reactance 0.5 pu, E = 1.1 pu and V = 1.0 pu. The inertia constant is 5 MW-sec/MVA. Find the frequency of natural oscillations if generator is loaded to (i) 60% and (ii) 75% of its maximum power transfer capability (7)

OR

Q.4

(a) A synchronous generator delivers power to an infinite bus. Suddenly the fuel input to the system is increased. Explain using the equal area criteria as to how the system would respond to this disturbance. Hence find the maximum limit to which fuel input can be increased without the system going out of synchronism (7)

(b) Discuss the methods for improving stability (7)

Q.5

(a) A synchronous generator delivers power to an infinite bus through a transformer and transmission line. Suddenly a fault occurs near the generator end which reduces the power transfer to zero. When the fault is cleared the original conditions are regained. Derive the formula for critical clearing angle and critical clearing time. (8)

(b) A two pole 50 Hz, 11 kV turbo alternator has a rating of 100 MW, power factor of 0.85 lagging. The rotor has moment of inertia of 10,000 kg-m^2. Calculate M and H (6)

OR

Q.5

(a) Discuss in detail all the steps involved in formulation of Z_{BUS} matrix (10)

(b) Answer the following in short (4)

(i) NR method is preferred over GS method in load flow studies

(ii) Bus admittance matrix is a sparse matrix.

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