13.605 Power System Analysis and Stability
B Tech Degree Examination
Sixth Semester (2013 Scheme)
Model Question Paper (Kerala University)

Time :3 Hrs Max Marks:100

PART-A

Answer all questions (2*10=20 Marks)

1. The neutral grounding impedance Zn appears as 3Zn in the zero sequence equivalent circuit.
2. Establish the relation between symmetrical components and phase components.
3. Sketch the zero sequence network for a of as two winding transformer for the following configuration (a) star- star transformer with star point grounded (b) delta-delta
4. Compare the Gauss-Siedel method and Newton Raphson method for load flow analysis.
5. Explain the principle of dc load flow study.
6. Why is the bus admittance matrix a sparse matrix.
7. Determine the incremental cost of received power and the penalty factor of the plant with the following incremental production cost dF1/dP1=0.1P1+3.0 Rs/ MWh
8. Classify the types of bus in load flow study. What is the significance of slack bus?
9. Explain any one method of improving the stability limit.
10. Differentiate between steady state, dynamic and transient stability using suitable example.

PART-B (20*4= 80 marks)

(Answer any one question from each module)

Module I

11.(a) Derive the necessary equation to determine the fault current for a single line to ground fault. Establish the relation between sequence currents. Draw a diagram showing the interconnection of sequence networks. (10)

(b) An alternator has the following sequence impedances: Z1=0+j1.0 , Z2=0.1+j0.2, Z0=0+j1.0 ohm. The line to neutral voltage at the generator terminal is 1000V. A fault

between yellow and blue phases occurs. Find the fault current and line-neutral voltage of healthy phase (10)

OR

12.(a) A generating station has four identical 3-phase alternators A,B,C and D each of 20,000kVA,11 kV having 20% reactance . They are connected to a bus-bar which has a bus bar reactor of 25 % reactance on the basis of 20,000 KVA base inserted between B and C. A 66 kV feeder is taken off from the busbar through a 10,000 kVA transformer having 5% reactance. A short circuit occurs across all the phases at the HV terminals of the transformer. Calculate the magnitude of current fed into the fault.

(10)

(b) A generating station having 'n'- section busbar each rated Q- kVA with 'x'% reactance is connected on the tie-bar system through busbar reactances of 'b'%. Determine the short circuit kVA if a 3 –phase fault take place on one section. Determine the short circuit kVA when 'n' is very large. (10)

Module II

13. (a) The parameters of a 4 – bus system are as follows. Draw the network and find the bus admittance matrix.

Bus Code	Line Impedance(Z)	Charging Admittance
1-2	0.2+j0.8	j0.02
2-3	0.3+j0.9	j0.03
2-4	0.25+j1.0	j0.04
3-4	0.2+j0.8	j0.02
1-3	0.1+j0.4	j0.01

(10)

(b) Explain the Fast Decoupled Load Flow (FDLF) algorithm. (10)

14. (a) Explain the algorithm for load flow study using Newton Raphson method. How does the method get modified when PV buses are also present. (12)

(b) Starting from first principles develop the equations for real and reactive powers.

(8)

Module III

15. (a) The fuel cost of two units are given by

$C1=0.2P_1^2+ 25P_1+ 1.0$ Rs/hr

$C2=0.2P_1^2+ 35P_1+ 1.50$ Rs/hr

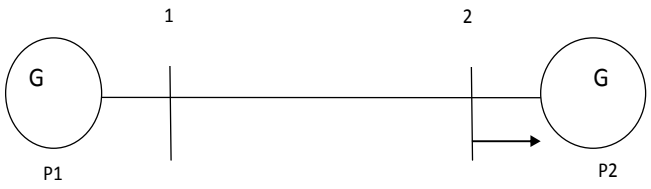
If the totals demand on the generators is 200 MW. Find the economic load scheduling of the two units. (10)

(b) Define the economic dispatch problem considering the transmission losses and derive the expression for penalty factor. (10)

16.(a) A two bus system is shown in figure. If a load of 125 MW is transmitted from plant 1 to the load a loss of 15.625 MW is incurred. Determine the generation schedule and load demand if the cost of received power is Rs 24/MWh. Solve using co-ordination equation and penalty factor method. The incremental production cost of the plant are

$dF_1/dP_1=0.025P_1+15$ and (10)

$dF_2/dP_2=0.05P_2+20$



(b) Define Unit Commitment. Explain the thermal constraints and hydro-constraints in Unit commitment. (10)

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Module IV

17(a). From the fundamentals, develop the block diagram of the Load Frequency control (LFC) loop of a two area system system. (10)

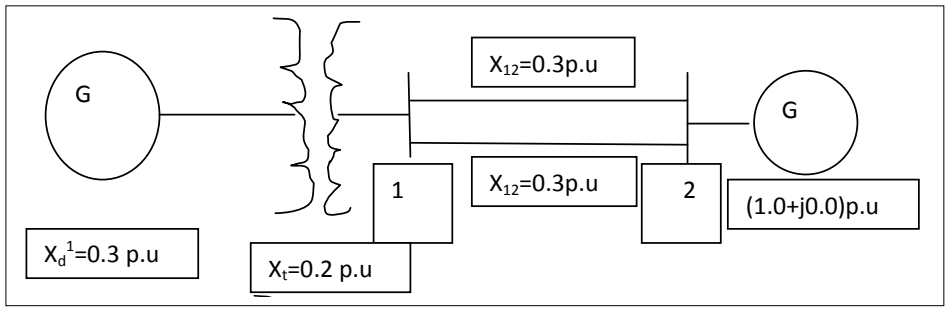
(b) The generator of the given system is delivering 0.6 pu, 0.8 pf lagging to the infinite bus at a voltage of V=(1.0+j 0.0)p.u. Calculate the generator emf behind the transient reactance. Find the maximum power that can be transferred under the following conditions:

(i) System healthy

(ii) one line shorted (3phase) in the middle

(iii) One line open

Plot the power angle curve for all the above cases. (10)



18(a) Derive the Swing equation of a synchronous machine. Explain its significance in stability analysis.

(10)

(b) Elucidate the concept of equal area criterion. How can it be used to study transient stability? (10)