# SATHYABAMA UNIVERSITY

**(Established under section 3 of UGC Act, 1956)**

Course & Branch: B.E – EEE
Title of the paper: Power system Analysis
Semester: V — Max.Marks: 80
Sub.Code: 414504-514504 — Time: 3 Hours
Date: 02-05-2009 — Session: AN

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PART – A (10 x 2 = 20)

Answer All the Questions

1. The reactance of a generator designated A is given as 0.25 per unit based on the generators nameplate rating of 18 kV, 500 MVA. The base for calculations is 20 kV, 100 MVA. Find A on the new base.

2. What is bus admittance matrix?

3. What is Acceleration factor in GS method?

4. What are the constraints to be satisfied to solve load flow equations?

5. Name the main differences in representation of power system for load flow and short circuit studies.

6. Draw the oscillogram of short circuit current when an unloaded generator is subjected to symmetrical fault, clearly marking subtransient, transient and steady state regions.

7. What are the works involved in power flow study?

8. Write the load flow equation of Gauss and Gauss-Seidel method.

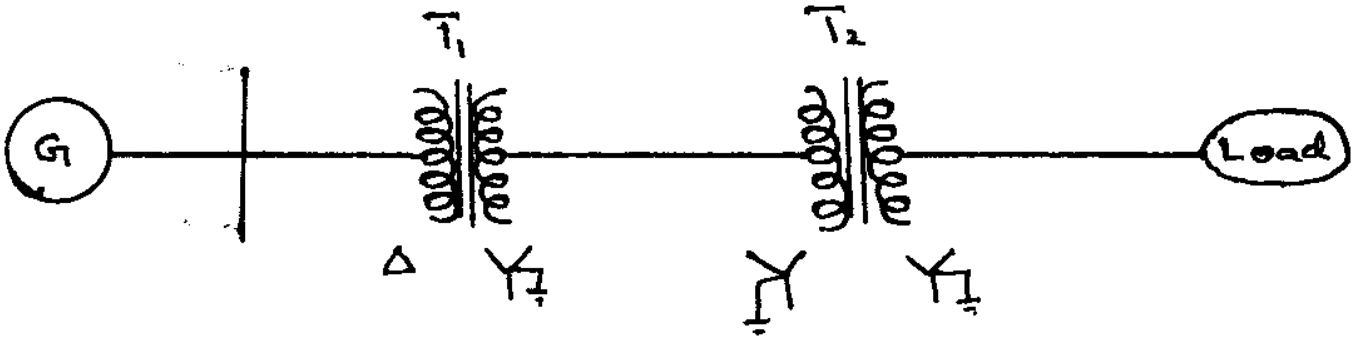
9. Brief the tariff structure for electrical energy in Tamilnadu.

10. Write the co-ordination equation.

PART – B (5 x 12 = 60)

Answer All the Questions

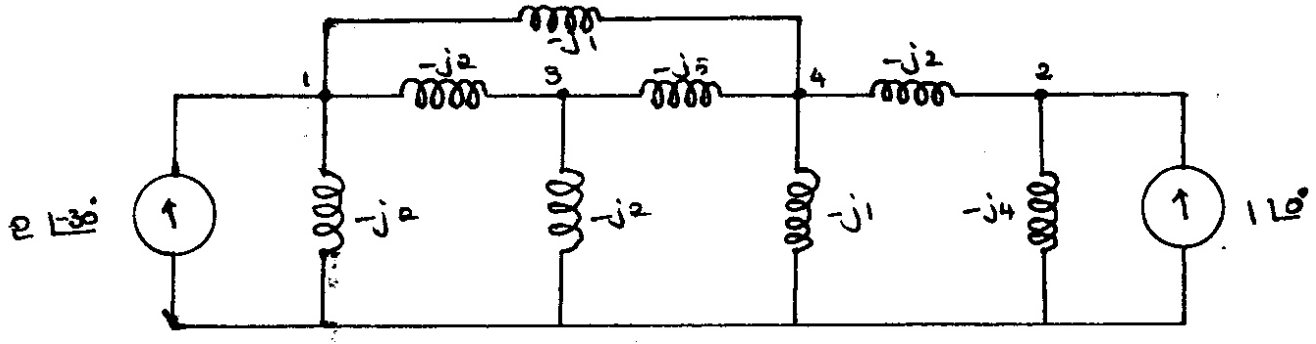
11. Obtain the per unit impedance (reactance) diagram of the power system shown in figure.




Generator (3 phase) : 15 MVA, 8.5 kV, X" = 30%
Transformer $T_1$ (3 Phase) : 6600kVA. 10/100 kV, X" = 10%
Transformer $T_2$ (3 Phase) : 6600kVA. 10/100 kV, X" = 10%
Load : 10 MVA, 12.5 kV, 0.8 p.f.lagging.
Transmission line: 100 ohms/phase.
Choose a Common base of 10 MVA. 12.5kV.

(or)

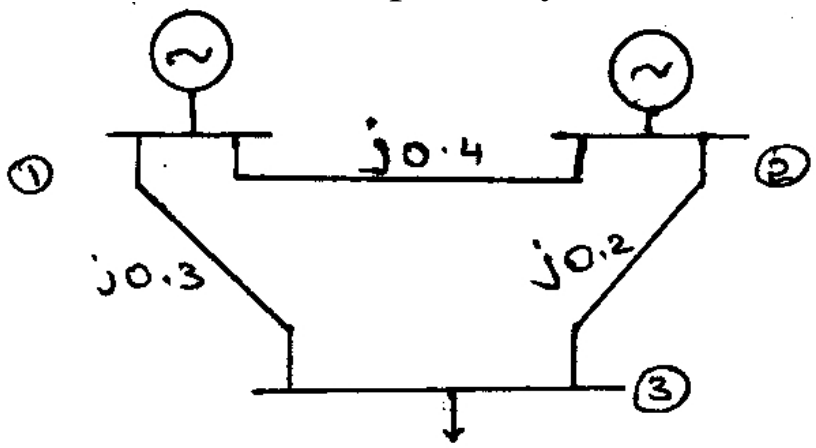
12. Determine the bus admittance matrix of the system whose reactance diagram is shown in figure. The currents and admittance are given in p.u. Determine the reduced bus admittance matrix after eliminating node – 3.



13. With neat flow chart, explain the NR methods of load flow solution when the system contains voltage controlled buses in addition to swing bus and load bus.

(or)

14. The figure shows a three bus power system




Bus 1 : Slack bus, V = 1.05L 0° p.u.
Bus 2 : PV bus, |V| = 1. p.u., $P_g$ = 3 p.u.
Bus 3 : PQ bus, $P_L$ = 4 p.u. $Q_L$ = 2 p.u.
Carryout one iteration of load flow solution by Gauss-Seidel method. Neglect limits on reactive power generation.

15. Derive an expression for the positive sequence current Ia 1 of an unloaded generator when it is subjected to ground fault.

(or)

16. A 15MVA, 6.6 KV three phase alternator connected through a 5 cycle oil circuit breaker has sub transient, transient and synchronous reactance of 10%, 15% and 80% respectively. It is running on no load with rated voltage developed across just beyond the circuit breaker. Determine.
(a) The steady short circuit current.
(b) The initial symmetrical current that can be broken on all poles
(c) The maximum possible DC component of the short circuit current.
(d) The making capacity of the breaker in KA.
(e) The RMS value of the symmetrical breaking current.
(f) The asymmetrical breaking current.

(g) The interrupting capacity in MVA.

17. Describe the equal area criterion for transient stability analysis of a system.

(or)

18. Mentioning the assumptions clearly and developing necessary equations, describe the step by step solution of swing bus.

19. The following data were collected from the daily load curves of a power system during a year:

| Load kw | Duration hours |
|---|---|
| 15,000 | 87 |
| 12,000 and over | 876 |
| 10,000 and over | 1,752 |
| 8,000 and over | 2,628 |
| 6,000 and over | 4,380 |
| 4,000 and over | 7,000 |
| 2,000 and over | 8,760 |

Construct the annual load duration curve and find the load factor of the system.

(or)

20. Explain about tariff and types of tariff and also explain the types of consumers and their tariff.