NANDHA ENGINEERING COLLEGE, ERODE – 52
(AUTONOMOUS)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
Subject Code & Name: 17EEC15-POWER SYSTEM ANALYSIS
QUESTION BANK
UNIT – I

PART A-2MARK

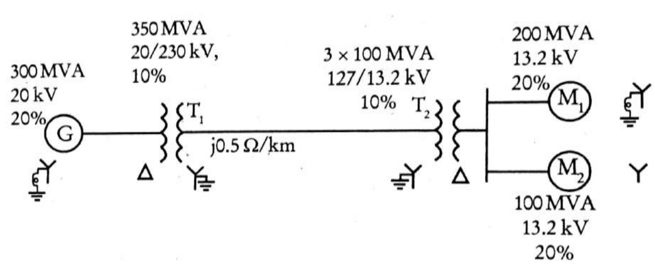
1. Write the equation for converting the per unit impedance expressed in one base to another.
2. Define single line diagram
3. Define per unit value.
4. State the importance of single line diagram.
5. Mention the components of power syatem.
6. What is bus admittance matrix?

PART B – 4 MARK

1. State the per unit analysis and give the advantages of per unit system.
2. Write the approximations made in impedance diagram.
3. Write the approximations made in reactance diagram.
4. List out the application of Y bus matrix.
5. Narrate the equations for transforming base KV on LV side to HV side of transformer and vice-versa.
6. Write the need for base values.

PART C -12MARK

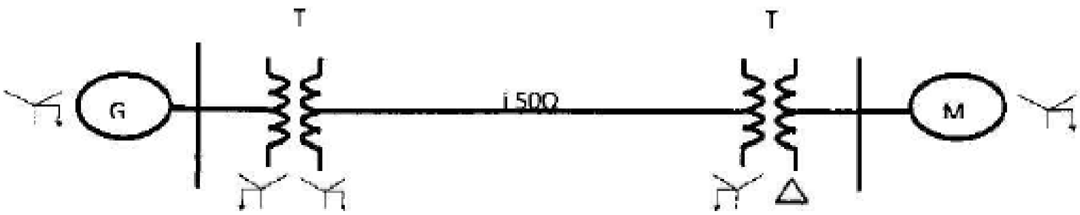
1. A 300 MVA, 20KV, 3Φ generator has a subtransient reactance of 20%.The generator supplies 2 synchronous motors through a 64 km transmission line having transformers at both ends as shown in below figure. In this T_1 is a 3Φ transformer and T_2 is made of 3 single phase transformer of rating 100MVA,127/13.2KV,10% reactance .Series reactance of the transmission line is 0.5Ω/km.Draw the reactance diagram with all reactances marked in p.u. Select the generator rating as base values.(12)



2. (i)Describe the need for system analysis for the planning and operation of power system.(8)

   (ii) Draw symbols used to represent various components in power system.(4)

3. Draw the reactance diagram for the power system shown in figure. Neglect resistance and use a base of 100MVA, 220KV in 50 ohm line. The ratings of the generator, motor and transformer are given below.(12)



Figure

Generator : 40MVA,25KV,X" = 20%

Synchronous motor : 50MVA,11KV,X" = 30%

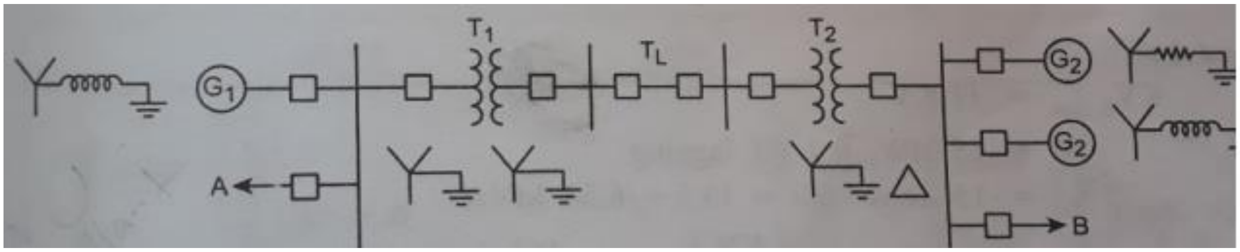
Y-Y Transformer: 40MVA,33/220KV,X = 15%

Y-Δ Transformer: 30MVA,11/220KV(Δ/Y),X = 15%

4. The parameters of 4 bus system are shown in table.Draw the network and find the bus admittance matrix.(12)

Line No.	Line Starting bus	Line ending bus	Line impedance (p.u.)	Line Charging Admittance in (p.u.)
1	1	2	0.2+j0.8	j0.02
2	2	3	0.3+j0.9	j0.03
3	2	4	0.25+j1.0	j0.04
4	3	4	0.2+j0.8	j0.02
5	1	3	0.1+j0.4	J0.01

5. obtain the per unit impedance and reactance diagram of the power system shown in figure.(12)



   a. Generator No.1 : 30 MVA, 10.5 KV, X" =1.6 ohm
   b. Generator No.2 : 15 MVA, 6.6 KV, X" =1.2 ohm
   c. Generator No.3 : 25 MVA, 6.6 KV, X" =0.56 ohm
   d. Transformer T1 (3 phase) : 15MVA,33/11 KV, X=15.2 ohm per phase on high tension side.
   e. Transformer T2 (3 phase) : 15MVA,33/6.2 KV, X=16 ohm per phase on high tension side.
   f. Transmission line: 20.5 ohm/phase
   g. Load A : 15MW,11 KV,0.9 p.f lagging.
   h. Load B : 40 MW, 6.6 KV,0.85 p.f lagging.
6. With the help of single line diagram, explain the basic components of a power system.(8)
7. Compare the impedance and reactance diagram with suitable examples.(8)
8. Draw the structure of typical power system. Locate various section of it and explain them.(8)
9. Narrate the step by step procedure to be followed to find per unit reactance of power system.(8)

UNIT – II

PART A-2 MARK

1. Classify the types of buses.
2. Justify the need for slack bus.
3. State the need for Jacobian matrix.
4. Define voltage controlled bus.
5. When the generator bus is treated as load bus?
6. Name the iterative methods mainly used for solution of load load flow problems.

PART B – 4 MARK

1. List the advantages and disadvantages of Newton-Raphson method.
2. List the advantages and disadvantages of Gauss- Seidel method.
3. List the advantages and disadvantages of fast decoupled method.
4. Compare the Gauss-Seidel and Newton-Raphson methods of load flow study.

5. Write the load flow equation of Gauss- Seidel method.
6. Write the algorithm for fast decoupled method upto step 4.
7. Write the load flow equation of Newton-Raphson method.

PART C -12 MARK

1. Derive load flow algorithm using Gauss-Seidel method with flow chart.(12)
2. Summarize the algorithm of fast decoupled method with neat flow chart. (12)
3. Derive load flow algorithm using Newton-Raphson method with flow chart. (12)
4. The system data for a load flow solution are given in tables. Determine the voltages at the end of first iteration by Gauss-Seidal method. Take α=1.6. (12)
   Table:1

Buscode	**Admittance**
1-2	2- j8
1-3	1- j4
2-3	0.666- j2.664
2-4	1- j4
3-4	2-j8

Table:2

Buscode	**P**	**Q**	**V**	**Remarks**
1	-	-	$1.06\angle 0^\circ$	Slack bus
2	0.5	0.2	-	PQ
3	0.4	0.3	-	PQ
4	0.3	0.1	-	PQ

UNIT – III

PART A-2 MARK

1. List the various types of shunt and series faults.
2. Express the term unsymmetrical fault.

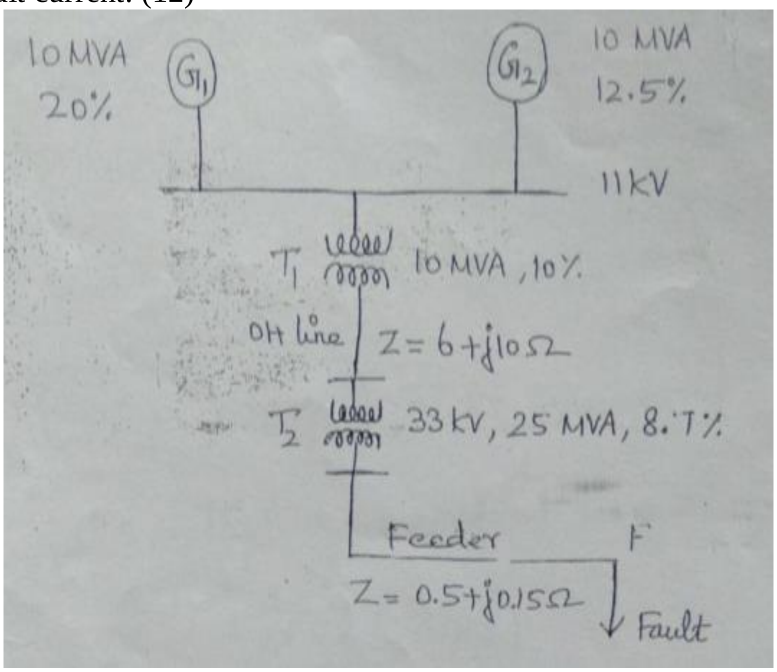
3. Express the term symmetrical fault
4. Identify Why faults occur in a power system?
5. Define subtransient reactance.
6. Define transient reactance.
7. For a fault at a given location, rank the various faults in the order of severity.

PART B – 4 MARK

1. Discuss the importance of short circuit study.
2. State thevenin theorem
3. Name the main factors to be considered to select a circuit breaker.

PART C -12 MARK

1. A generator is connected through a transformer to a synchronous motor. The subtransient reactance of generator and motor are 0.15 and 0.35 respectively. The leakage reactance of the transformer is 0.1 p.u. All the reactances are calculated on a common base. A three phase fault occurs at the terminals of the motor when the terminal voltage of the generator is 0.9 p.u. The output current of generator is 1 p.u. and 0.8 pf leading. Find the subtranseint current in p.u. in the fault, generator and motor. Use the terminal voltage of generator as reference vector. (12)
2. For the radial network shown in figure a 3 phase fault occurs at point F.Determine the fault current. (12)



3. Narrate step by step procedure to find symmetrical fault current by using thevenins theorem with example. (12)

UNIT – IV

PART A-2 MARK

1. Write the symmetrical components of three phase system.
2. Portray the sequence network of L- L fault.
3. Write down the equations to convert unbalanced phase voltage to symmetrical components.
4. Write down the equations to convert symmetrical components into unbalanced phase currents.
5. Define positive sequence component.
6. Define negative sequence component.

PART B – 4 MARK

1. Prove $1+a+a^2 = 0$.
2. Write short notes on sequence impedance.
3. Draw the positive sequence diagram of generator
4. Explain the positive, negative and zero sequence component of 3-phase system
5. Write and explain the formulas for computing the fault current in a power system network subjected to LG,LL and LLG fault.
6. Draw the sequence networks of L- L fault.
7. Portray the sequence network of L- G fault.
8. Sketch the sequence network of L- L-G fault.
9. Draw the zero sequence network of 3 phase delta-delta transformer.

PART C -12 MARK

1. Determine the symmetrical components of the unbalanced three phase currents $I_a = 10\angle 0^o$, $I_b = 12\angle 230^o$ Aand $I_c = 10\angle 130^o$A. (12)
2. Develop an expression to find the fault current when a single line to ground fault occurs on an unloaded generator.Draw its sequence diagram. (12)
3. Deduce the expression for symmetrical components from unbalanced voltages vectors. (12)
4. Deduce the expression for unbalanced voltages vectors from symmetrical components. (12)
5. Derive the relationship to determine the fault current for a line to line fault on an unloaded generator. Draw an equivalent network showing the interconnection of sequence of networks to simulate line to line fault. (12)
6. Derive the relationship to determine the fault current for a double line to ground fault on an unloaded generator. Draw an equivalent network showing the interconnection of sequence of networks to double line to ground fault. (12)

7. The symmetrical components of phase-a voltage in a 3-phase unbalanced system are V_{a0}=10 ∠180 V, V_{a1}=50 ∠0 V, and V_{a2}=20 ∠90 V. Determine the phase voltages V_{a}, V_{b}, V_{c}. (12)

UNIT – V

PART A-2 MARK

1. Define Stability.
2. Define steady state stability.
3. Define transient stability
4. Classify the power system stability.
5. State equal area criterion.
6. List out the methods to find the solution of swing equation.
7. Define critical clearing angle.
8. Define critical clearing time.

PART B – 4 MARK

1. Distinguish between steady state, transient and dynamic stability.
2. List the methods of improving the transient stability limit of a power system.
3. Define swing curve. What is the use of swing curve?
4. Give the expression for critical clearing time
5. What are the assumptions made in solving swing equation?

PART C -12 MARK

1. Derive the swing equation used for stability studies in power systems. (12)
2. Describe the equal area criterion for transient stability analysis of a system. (12)
3. State critical clearing angle and time and derive the formula. (12)
4. Elucidate about the Voltage stability.(8)
5. With the help of a neat flowchart, explain the modified Euler method of solving the swing equations. (12)
6. Explain the solution of swing equation by Runge Kutta Method. (12)

Prepared by

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