

**A 1222**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Sixth Semester

Electrical and Electronics Engineering

EE 339 — POWER SYSTEM ANALYSIS

Time : Three hours

Maximum : 100 marks

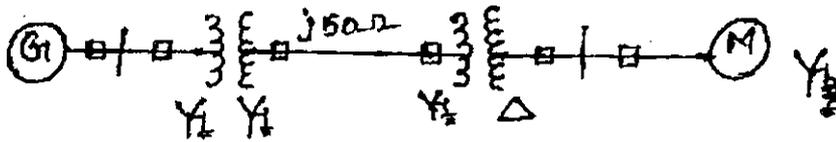
Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the equation for converting the p.u. impedance expressed in one base to another base.
2. Define : steady state stability.
3. What is bus impedance matrix?
4. Define : primitive matrix.
5. List the various types of shunt faults.
6. What is the need for short circuit analysis?
7. What is the information that is obtained from load flow study?
8. Write the need for slack bus.
9. Define swing curve. What is the use of swing curve?
10. List any two methods of improving the transient stability limit of power system.

PART B — (5 × 16 = 80 marks)

11. (a) Draw the reactance diagram using base of 100 MVA, 220 KV in 50 Ω line.

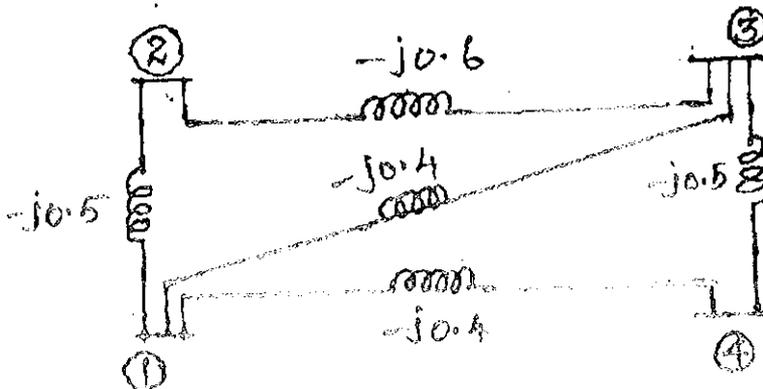


- Generator : 40 MVA, 25 KV,  $X'' = 20\%$   
 Synchronous motor : 50 MVA, 11 KV,  $X'' = 30\%$   
 Star-Star transformer : 40 MVA, 33/220 KV,  $X = 15\%$   
 Star-delta transformer: 30 MVA, 11/220 KV,  $X = 15\%$ .

Or

- (b) A 120 MVA, 19.5 KV generator has a synchronous reactance of 0.15 p.u. and it is connected to a transmission line through a transformer rated 150 MVA, 230/18 KV (star/delta) with  $x = 0.1$  p.u.
- calculate the p.u. reactance by taking generator rating as base values. (5)
  - calculate the p.u. reactance by taking transformer as base values. (5)
  - calculate the p.u. reactance for a base value of 100 MVA and 220 KV on H.T. side of transformer. (6)

12. (a) Find bus admittance matrix for the given network. Determine the reduced admittance matrix by eliminating node 4. The values are marked in p.u.



Or

(b) Find  
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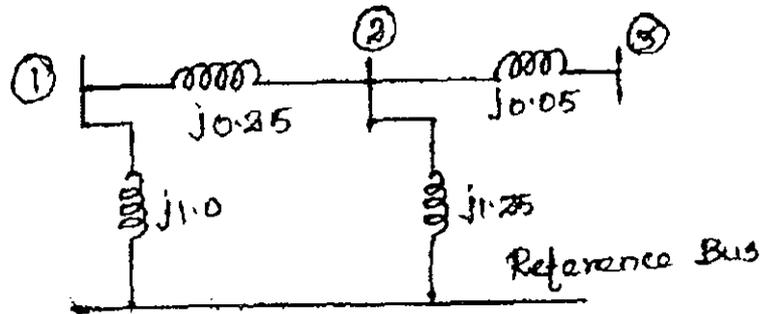
13. (a) De  
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14. (a)

(b)

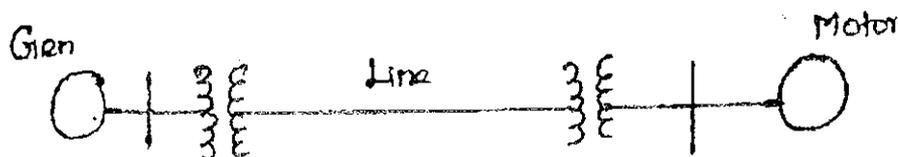
- (b) Find the bus impedance matrix for the system whose reactance diagram is shown in fig. All the impedances are in p.u.



13. (a) Derive the expression for fault current in line to line fault on an unloaded generator in terms of symmetrical components.

Or

- (b) A synchronous generator and a synchronous motor each rated 25 MVA, 11 KV having 15% sub-transient reactance are connected through transformers and a line as shown in fig. The transformers are rated 25 MVA, 11/66 KV and 66/11 KV with leakage reactance of 10% each. The line has a reactance of 10% on a base of 25 MVA, 66 KV. The motor is drawing 15 MW at 0.5 power factor leading and a terminal voltage of 10.6 KV. When a symmetrical 3 phase fault occurs at the motor terminals. Find the sub-transient current in the generator, motor and fault.

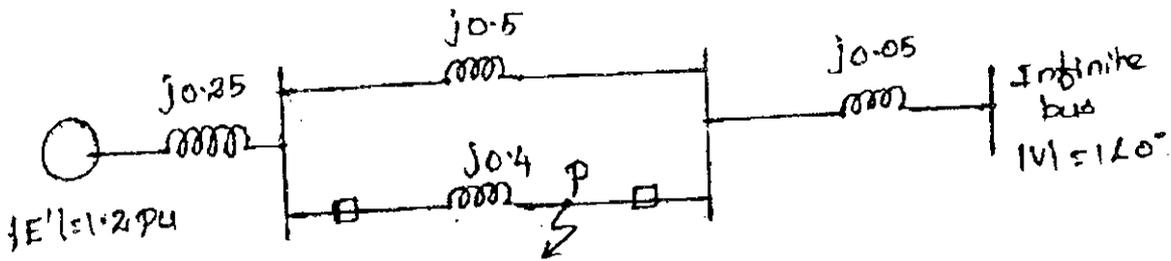


14. (a) (i) Derive the power flow equation in polar form. (8)  
 (ii) Write the advantages and disadvantages of Gauss-Seidal method and Newton-Raphson method. (8)

Or

- (b) Explain the step by step computational procedure for the Gauss-Seidal method of load flow studies.

15. (a)



Find the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance values of various components are indicated on the diagram. The generator is delivering 1.0 p.u. power at the instant preceding the fault. The fault occurs at point  $P$  as shown above in the figure.

Or

(b) Explain in detail the Equal Area Criterion.

Time : Three

1. What
2. Define
3. How
4. Comp
5. Name
6. Give
7. Wha
8. Wha
9. Give
10. Wha

11. (a)

(b)