

SUBJECT CODE NO: E-339
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(EEP/EE/EEE) Examination Nov/Dec 2017
Power Systems Analysis
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Q.No.1 from section A and Q.No.6 from section B are compulsory.
 - ii) Attempt any two questions from the remaining questions of each section
 - iii) Assume suitable data wherever necessary.

SECTION - A

Q.1 Solve any five questions

10

- a) What is impedance & reactance diagram?
- b) What is bus?
- c) What is bus Admittance matrix?
- d) Define the terms
 - i) node
 - ii) link
 - iii) tree
 - iv) Co- tree
- e) If reactance in ohm is 20Ω find per unit value for a base of 20 MVA & 10 KV.
- f) What do you mean by PQ bus?
- g) What is need of base values?

Q.2 a) Draw the per unit reactance diagram for the power system show in fig(1). Neglect resistance & use 08 of a base of 100MVA, 220KV in a 50Ω line. The rating of generator, motor & transformer are as follows:

G:- 40MVA, 25KV, $X'' = 20\%$

M:- 50 MVA, 11KV, $X'' = 30\%$

T₁:- 40MVA, 33Y/ 220 Y KV, X=15%

T₂:- 30 MVA, 11Δ/ 220 YKV, X=15%

Load:- 11KV, 50 MW +j68 MVAR.

Determine new per unit values of reactance of transmission line, & new values of per unit Reactance of transformer T₁ generator G, transformer T₂ & Motor M.

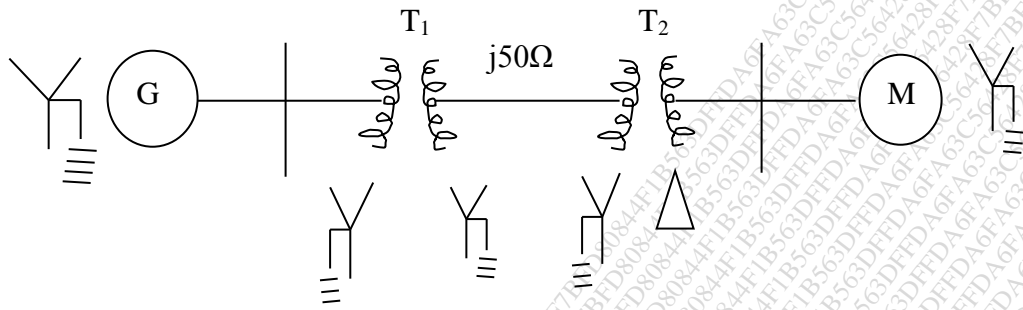
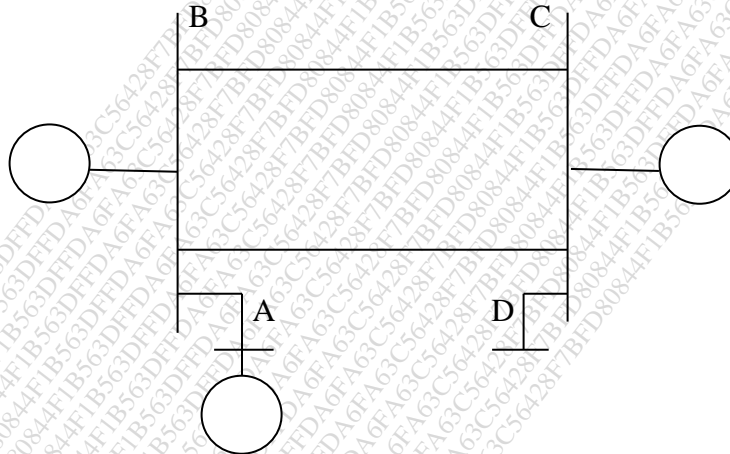


Fig (1) single line diagram

b) Prove that per unit in impedance of a Transformer is same weather computed from primary or secondary side. 07

Q.3 (a) For a power system as shown in fig (2) Obtain A, \bar{A} 08



Fig(2)

(b) Determine primitive network equation. 07

Q.4 a) Explain step by step procedure for NR method of load flow studies. 07

b) Find the bus impedance matrix for system whose reactance diagram is shown in fig(3). All impedances are in p.u 08

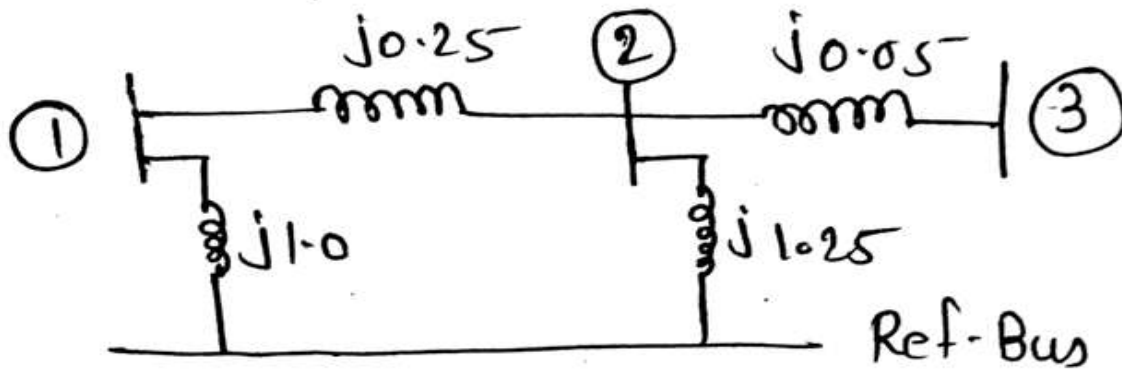


Fig.3

- Q.5 a) Derive an expression for symmetrical components of $V_S = A^{-1}V_P$. 08
- b) Derive the expression for transients on transmission line. 07

SECTION -B

- Q.6 Solve any five questions of following. 10

- (i) What are sequence impedance & sequence network?
- (ii) How the faults are classified?
- (iii) Define subtransient reactance.
- (iv) What is meant by doubling effect?
- (v) What is the sequence operator?
- (vi) Write down the equations to convert symmetrical components into unbalanced Phase current.
- (vii) What is need for load flow study?

- Q.7 a) Explain sequence impedance of transmission line. 08
- b) In a 3- & 4- wire system, the currents in R, Y & B lines under abnormal conditions of loading are as under. 07
- $I_R = 100 \angle 30^\circ$ A; $I_Y = 50 \angle 300^\circ$ A, $I_B = 30 \angle 180^\circ$ A. Calculate Positive, negative & zero sequence currents in R line & return current in neutral wire.

Q.8 a) Explain Z_{bus} building for Type 2 & Type 3 modifications. 07

b) A 30 MVA, 11KV, 3- ϕ synchronous generator has a direct sub transient reactance of 0.25 p.u. 08
 The negative & zero sequence reactance are 0.35 p.u & 0.1 p.u. respectively. The neutral of generator is solidly grounded. Determine subtransient current in generator & line to line voltages for subtransient condition. When a single line to ground fault occurs at generator terminals with generator operating unloaded at rated Voltage.

Q.9 a) Derive the expression to determine fault current for L- L fault & draw sequence network. 07

b) Draw positive, negative & zero sequence impedance diagram for fig. (4) 08

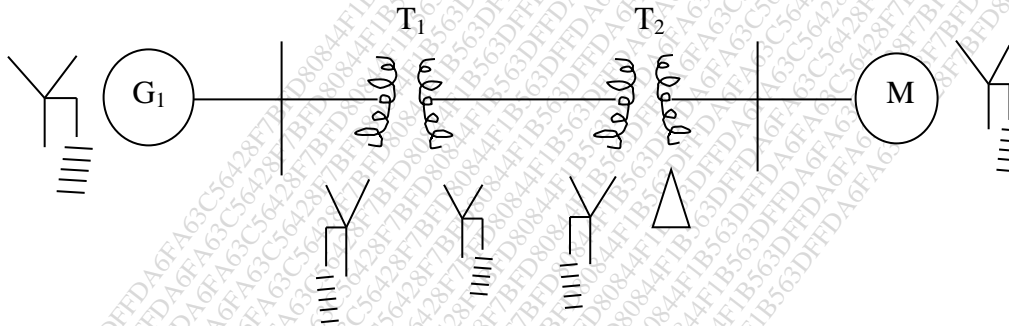


Fig (4).

Q.10a) Explain open conductor fault. 08

b) Explain on load sequence impedance of synchronous machine. 07