C.U.SHAH UNIVERSITY
Summer Examination-2019

Subject Name : Power System Analysis

Subject Code : 4TE06PSA1   **Branch: B.Tech (Electrical)**

Semester : 6   **Date : 25/04/2019**   **Time : 10:30 To 01:30**   **Marks : 70**

Instructions:
   (1) Use of Programmable calculator & any other electronic instrument is prohibited.
   (2) Instructions written on main answer book are strictly to be obeyed.
   (3) Draw neat diagrams and figures (if necessary) at right places.
   (4) Assume suitable data if needed.

Q-1   Attempt the following questions:

a) The per unit value of transformer impedance is _____ on primary and secondary side.   (1)
   (1)different   (2) same
   (3) depends upon turns ratio   (4) depends upon voltage ratio
b) Usually the value of _____ reactance is maximum for a synchronous generator.   (1)
   (1) Transient   (2) Sub transient
   (3) Steady state   (4) Unstable state
c) The limit of transient stability is _____ the steady state limit.   (1)
    (1) Greater than   (2) less than   (3)   equal to   (4) same as
d) In _____ method the convergence is not affected by the choice of slack bus.   (1)
   (1) N-R   (2) G-S
   (3) Both   (4) None
e) Single line diagram is representation of_____.   (1)
   (1) Single Phase system   (2) 3 phase unbalanced system
   (3) 3 phase balanced system   (4)   simple components
f) The per unit value of transformer impedance is _____ on primary and secondary side.   (1)
   (1) different   (2) depends upon turns ratio
   (3) same   (4)   depends upon voltage ratio
g) The p. u. synchronous impedance of of a machine is 2.0 p. u., its SCR is :   (1)
   (1) 0.5   (2) 1.414   (3) 2.0   (4) o.707
h) For a load flow solution, the quantities normally specified at Voltage controlled buses   (1)
   are
    (1) P and Q   (2) P and /V/   (3) Q and /V/   (4) P and delta
i) 3-phase to ground fault occurs in balanced power system. The value of zero sequence   (1)
   current is ---------------.
   (1)   10 to 20 times   (2)   3 times positive sequence current
   (2)   Zero   (4)   3 times phase current
j) To find out fault current, normally _____ matrix is used.   (1)
   (1) Bus Admittance   (2)   Loop Admittance
   (3) Bus Impedance   (4)   Loop Admittance

k) In GS load flow method, _____ is used to reduce number of iteration.　　(1)
   (1) Initial load condition　　　　　　(2) Acceleration factor
   (3) Slack bus　　　　　　　　　　　(4) 1 and 3.

l) Velocity of propagation wave in overhead line is _____ .　　(1)
   (1) Greater than velocity of light　　(2) equals to velocity of light
   (3) Equals to velocity of sound　　　(4) Less than velocity of light

m) 14 bus system have 1 slack bus. 3 PV buses and 10 PQ buses. The size of Jacobian　　(1)
   matrix in modified polar N-R load flow is _____ .
   (1) 13 x 13　　　(2) 26 x 26　　　(3) 11 x 11　　　(4) 23 x 23

n) Series reactors are used to　　(1)
   (1) improve the transmission efficiency
   (2) improve the power factor of the power system
   (3) improve the voltage regulation
   (4) bring down the fault level within the capacity of the switchgear

Attempt any four questions from Q-2 to Q-8

Q-2　　**Attempt all questions**
(a) Discuss the positive sequence network and negative sequence network of a synchronous　　**(7)**
generator.

(b) Draw the zero sequence components for the following configuration of 3 phase　　**(7)**
transformers. (i) Star grounded - star ungrounded (ii) Star grounded - Star grounded
(iii) Star grounded – Delta (iv) Delta – Delta

Q-3　　**Attempt all questions**
(a) Give classification of buses used in load flow analysis and explain each in detail.　　**(7)**

(b) Define per unit system. State its advantages. Derive the formulae of per unit impedance　　**(7)**
for the single phase case.
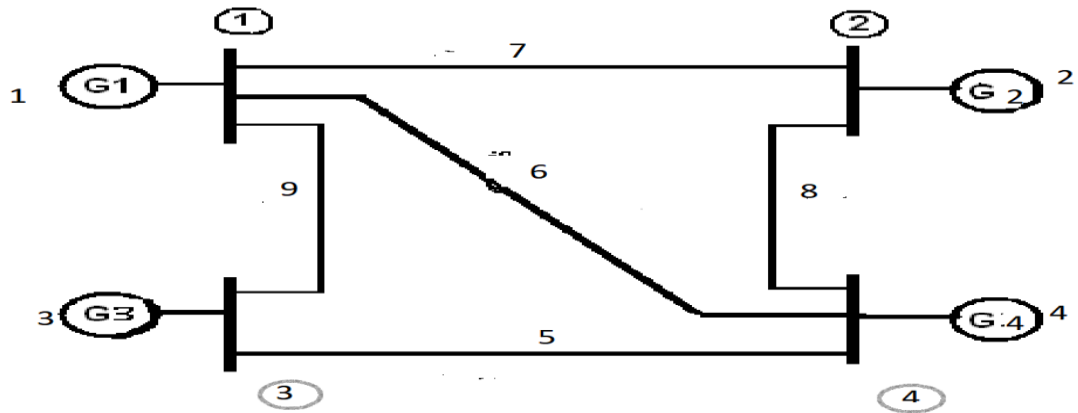
Q-4　　**Attempt all questions**
(a) Give comparison between Gauss Seidal and Newton Raphson load flow study.　　**(7)**

(b) Give basic assumptions taken in Fast decoupled load flow and explain its algorithm by　　**(7)**
using flow chart.

Q-5　　**(14)**

For the 4 bus power system shown in the figure below, derive the suitable bus incidence
matrix and evaluate the Ybus matrix if the diagonal matrix Y contains the following
elements : Dia [y10 y20 y30 y40 y34 y14 y12 y24 y13] .
 The notations have their usual meanings. All Generator's neutral are grounded through
impedance. with node 0.

Q-6 Attempt all questions

(a) Derive the value of Current Ia1 when a three phase transmission line is subjected to single line to ground fault. **(7)**

(b) A 25 KVA, 13.2 KV alternator with solidly grounded neutral has a sub transient reactance of 0.25 p.u. The negative and zero sequence reactance are 0.35 and 0.1 p. u. respectively. A single line to ground fault A single line to ground fault occurred at the terminal of the unloaded alternator. Determine the fault current. Assume line to neutral voltage before the fault be $1 + j0$ p. u. **(7)**

Q-7 Attempt all questions

(a) Draw and explain equal area criterion for stability of power system. **(7)**

(b) What are the factors, which affect steady state and transient stability of power system. Explain each in details. **(7)**

Q-8 Attempt all questions

(a) Explain Bewlay's lattice diagram and its importance to study travelling waves effect on transmission systems. **(7)**

(b) Explain point by point method for solving swing equations. Compare this method with equal area criterion method. **(7)**