

# C.U.SHAH UNIVERSITY

## Summer Examination-2017

**Subject Name: Power System Analysis**

**Subject Code: 4TE06PSA1**

**Branch: B.Tech (EEE,EE)**

**Semester: 6**

**Date: 19/04/2017**

**Time: 2:30 To 5:30**

**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.
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- Q-1 Attempt the following questions: (14)**
- a) One line diagram is representation of \_\_\_\_\_. (1)
- (1) Single Phase system
  - (2) 3 phase unbalanced system
  - (3) phase balanced system
  - (4) simple components
- b) In the case of transformer  $I_1/I_B$  is \_\_\_\_\_  $I_2/I_B$ . (1)
- (1) Greater than
  - (2) equal to
  - (3) less than
  - (4) divided by
- c) 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
- d)  $S = VI^*$  Where \* represents \_\_\_\_\_. (1)
- (1) remark
  - (2) exponent
  - (3) conjugate
  - (4) 3 phase
- e) The circuit breaker current rating is decided using \_\_\_\_\_. (1)
- (1) load flow study
  - (2) fault analysis study
  - (3) stability analysis study
  - (4) security study
- f) Usually the value of \_\_\_\_\_ reactance is maximum for a synchronous generator. (1)
- (1) Transient
  - (2) Sub transient
  - (3) Steady state
  - (4) Unstable state



- g) The distortion of the supply signal in symmetrical short circuit current is due to \_\_\_\_\_. (1)  
 (1) Fault impedance  
 (2) Prefault voltage  
 (3) Rotor D.C. component  
 (4) Unsymmetrical generator reactance
- h) The \_\_\_\_\_ theorem is solution for unbalanced set of phasors in mathematical form. (1)  
 (1) Constant Flux  
 (2) Constant Power  
 (3) Fortesque  
 (4) Berlesque
- i) Three phase power is \_\_\_\_\_ of symmetrical component powers. (1)  
 (1) Product  
 (2) sum  
 (3) image  
 (4) division
- j) Transformers are \_\_\_\_\_ to phase shift in case of symmetrical components. (1)  
 (1) Variant  
 (2) Invariant  
 (3) deviant  
 (4) constant
- k) The limit of transient stability is \_\_\_\_\_ the steady state limit. (1)  
 (1) Greater than  
 (2) less than  
 (3) equal to  
 (4) none
- l) The solution of point by point method is adopted to solve the swing equation for (1)  
 (1) Power Angle  
 (2) Critical clearing angle  
 (3) both  
 (4) none
- m) In \_\_\_\_\_ method the convergence is not affected by the choice of slack bus. (1)  
 (1) N-R  
 (2) G-S  
 (3) Both  
 (4) None
- n) If the torque angle increases without limit the system is \_\_\_\_\_. (1)  
 (1) Stable  
 (2) Marginally stable  
 (3) Critically stable  
 (4) Unstable

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

- Q-2 Attempt all questions (14)**
- a) For the function containing n variables derive the Taylor series form in vector representation for Newton Raphson Method. (7)
- b) State the comparison of various load flow methods. (4)
- c) Briefly explain the classification of bus for load flow study. (3)

- Q-3 Attempt all questions (14)**
- a) Define per unit system. Derive the formulae of per unit impedance for the single phase (7)



case.

- b) Derive the formulae of peak to peak value of short circuit current when a synchronous generator terminal is subjected to 3 phase symmetrical short circuit fault. (7)

**Q-4 Attempt all questions (14)**

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

**Q-5 Attempt all questions (14)**

- a) For the graph structure shown in the figure 1 derive the suitable bus incidence matrix and evaluate the Ybus matrix if the diagonal matrix Y contains the following elements : (14)  
 Dia [  $Y_{10}$   $Y_{20}$   $Y_{30}$   $Y_{40}$   $Y_{34}$   $Y_{23}$   $Y_{12}$   $Y_{24}$   $Y_{13}$  ] .. The notations have their usual meanings.

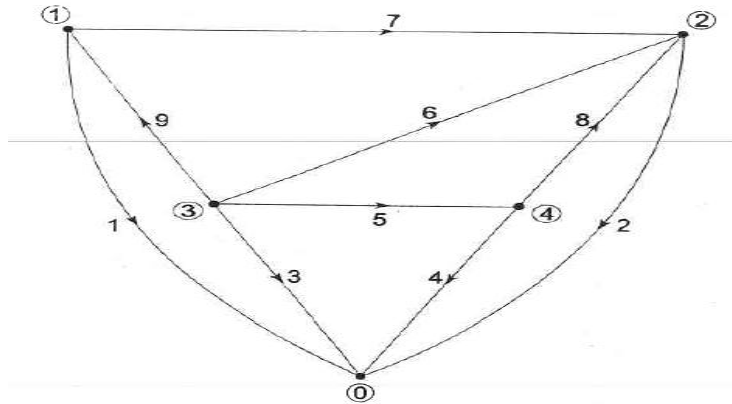


Figure 1 , Question 5 (a)

**Q-6 Attempt all questions (14)**

- a) Derive the value of Current  $I_{a1}$  when a three phase transmission line is subjected to single line to ground fault. (7)  
 b) With usual notations prove that  $V_P = AV_s$  (7)

**Q-7 Attempt all questions (14)**

- a) Derive the  $r+1$  iteration of Voltage of  $i$ th bus using a Gauss Siedel Method when system contains  $n$  buses in the power system and all the buses are of type PQ bus. (7)  
 b) Discuss the positive sequence network and negative sequence network of a synchronous generator. (7)

**Q-8 Attempt all questions (14)**

- a) Draw and explain equal area criterion system. (7)  
 b) In the system shown in Figure 2, a three-phase static capacitor of reactance 1 pu per phase is connected through a switch at motor bus bar. (i) Calculate the limit of steady state power with and without reactor switch closed. (ii) Recalculate the power limit with capacitive reactor replaced by an inductive reactor of the same value. Let p.u. power for generator is 1.2 p.u. and motor is 1.0 p.u. (7)



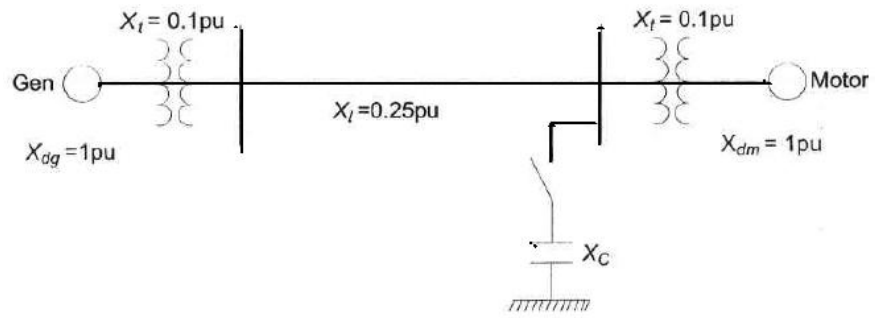


Figure 2, Question 8 (b)

