

**APJ Abdul Kalam Technological University**  
**First Semester M. Tech Degree Examination, December 2016**  
**Cluster: Kollam**  
**Branch: Electrical and Electronics Engineering**  
**Specialisation: Power Systems**  
**Subject: 02EE6221: Computer Aided Power System Analysis**

Time: 3 Hrs

Max. Marks: 60

**Instructions:** *Answer All Questions from Part A.*  
*Answer Two Full questions, One from each Module, from Part B*

**PART A**

1. Form the Ybus for the given system using similarity transformation method

Line No.	Bus Code (p – q)	Line Impedance	Mutual impedance
1	1 – 2	$0.08 + j0.20$	
2	1 - 4	$0.05 + j0.10$	$j0.01$ with element 4
3	2 - 3	$0.04 + j0.12$	
4	3 - 4	$0.04 + j0.14$	$j0.01$ with element 2

(9 marks)

2. Derive the off diagonal elements of the Jacobian matrix in Newton Raphson polar form of load flow.

(9 marks)

3. For a four bus network including two generators the positive, negative and zero sequence bus impedance matrices are as follows

$$Z_{bus}^1 = Z_{bus}^2 = \begin{bmatrix} 0.08 & 0.066 & 0.038 & 0.056 \\ 0.066 & 0.132 & 0.054 & 0.065 \\ 0.038 & 0.054 & 0.118 & 0.084 \\ 0.056 & 0.065 & 0.084 & 0.243 \end{bmatrix}$$

$$Z_{bus}^0 = \begin{bmatrix} 0.038 & 0.023 & 0.003 \\ 0.023 & 0.196 & 0.026 \\ 0.003 & 0.026 & 0.056 \end{bmatrix}$$

The zero sequence circuit is open at bus 4.

- a) Find the fault currents for a single line to ground fault at bus 2, for the four bus network given above.  
 b) Find the phase voltages at bus 2 and symmetrical components of the voltage at bus 3.

( 4 +5) marks

4. Illustrate the method of estimating the state of a linear system. Determine how much error will appear in estimation, when there is a 10% data is bad.

( 6+ 3) marks

## **PART B**

### **Module V**

5. What do you mean by contingency analysis? How is it done using a DC model?  
( 5+ 4) marks
6. What are the factors that would require the Contingency ranking for any power system?  
Illustrate one case using an example.  
(5+ 4) marks

### **Module VI**

7. a) Why do we determine the optimal generation ? How does loss in a system affect optimal generation?  
(8) marks
- b) When do we opt for a three phase load flow? Why?  
(7) marks
8. a) What are the specific features of matrices which help in finding the inverse?  
b) Derive the formula for system incremental cost in terms of cost coefficients.  
c) How does sparsity affect the speed of computation of load flow?  
(2+ 4 + 3) marks