Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 11228

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

First Semester

Power Systems Engineering

PS 4101 – COMPUTER AIDED POWER SYSTEM ANALYSIS

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How to model the sparsity of a precision matrix?
2. Mention the advantages and disadvantages of Gaussiant Elimination method.
3. Define Voltage controlled bus and Load bus.
4. What are the main advantages of decoupled load flow method as compared to NR method?
5. What is the optimal power flow problem?
6. What are the security constraints in optimal power flow?
7. What are symmetrical components?
8. Mention the types of unsymmetrical faults in a power system.
9. List out the factors influencing the transient stability.
10. How does ground faults came stability issue?

PART B — (5 × 13 = 65 marks)

11. (a) Solve the given system by Gaussian elimination

$2x+3y=6$
$x-y=1/2$

Or

(b) Explain the algorithm for L-U factorization with partial pivoting an example.

12. (a) With the step by step algorithm explain the Newton Raphson method with polar co-ordinates.

Or

(b) Explain the Fast Decoupled method for the power flow analysis with the flow chart.

13. (a) Define sensitivity factor and also Derive the sensitivity factor for a power system.

Or

(b) Explain the formulation of the Linear Programming problem for optimal power flow.

14. (a) Explain the step by step procedure to form Z_{bus} for symmetrical fault analysis with an example.

Or

(b) Derive the bus voltage, fault current, and line voltages for a single line to ground fault occurs between phase 'a' and neutral.

15. (a) Explain the fourth order Runge – Kutta methods for transient stability analysis with the step by step procedure.

Or

(b) Explain the simulation model of SMIB and multi machine system with classical synchronous machine model.

PART C — (1 × 15 = 15 marks)

16. (a) The per unit impedance matrix for the power system shown in fig 1 is given by

$$Zbus = \begin{matrix} j0.450 & j0.0075 & j0.0300 \\ j0.0075 & j0.24295 & j0.0300 \\ j0.0300 & j0.0300 & j0.2100 \end{matrix}$$

A bolted three phase fault occurs at Bus 2. Using the bus impedance matrix, calculate the fault current, bus voltage and line current during fault. All impedances in fig 1 are expresses in per unit on a common MVA base.

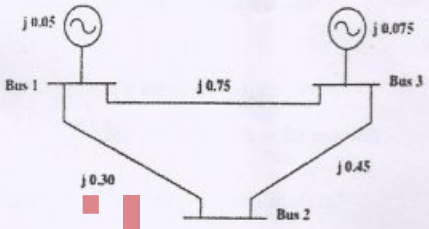

Fig 1

Or

(b) Explain the Optimal power flow formulations and their impacts on the performance of solution methods.