



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
 [AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
 Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 80031

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. / FEB. 2026

First Semester

Power Systems Engineering

P23PS102 - COMPUTER AIDED POWER SYSTEM ANALYSIS

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	List the factors considered when choosing a numerical method for solving algebraic equations.	2	K2	CO1
2.	State the LU factors of a matrix where L is lower triangular with non-unity diagonal elements and U is upper triangular with unity diagonal elements.	2	K1	CO1
3.	Recall the limitations of Newton Raphson method.	2	K1	CO2
4.	In a system with multiple generators, how do you determine which buses should be treated as P-V buses and which as slack bus?	2	K2	CO2
5.	List the applications of optimal power flow in power system analysis.	2	K1	CO3
6.	In the transmission line lossless case, λ is related to increase in power demand (MW). Is this still true for transmission line with losses? Justify.	2	K2	CO3
7.	Why prefault current is neglected in symmetrical fault analysis but considered in unsymmetrical fault analysis?	2	K2	CO4
8.	Sketch the negative sequence network diagrams for i. Delta–Delta connected transformer ii. Star–Delta connected transformer	2	K1	CO4

9. State the significance of maintaining stability in a power system operation. 2 K2 CO5
10. List the assumptions made in solving swing equation. 2 K1 CO5

PART – B

(5 x 13 = 65 Marks)

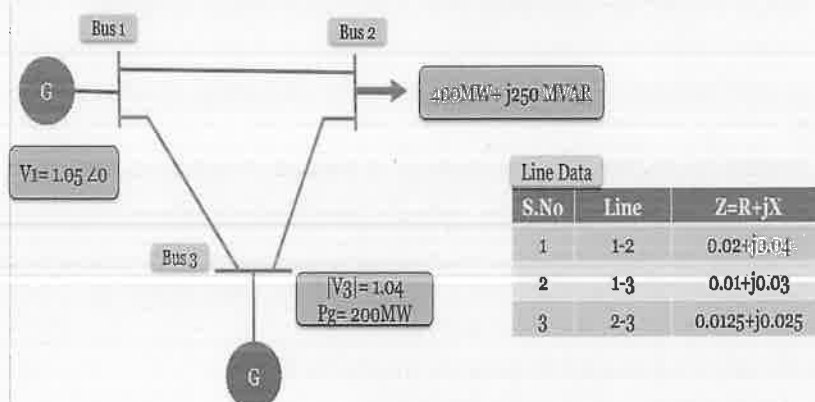
- | Q.No. | Questions | Marks | KL | CO |
|--------|--|-------|----|-----|
| 11. a) | Solve a triangular set of equations using the Gauss elimination method and demonstrate the step-by-step procedure. | 13 | K2 | CO1 |
| (OR) | | | | |
| b) | Explain any two of the effective schemes for optimal ordering of triangular factorization. | 13 | K2 | CO1 |
| 12. a) | Obtain the load flow solution at the end of the first iteration using the Newton–Raphson method for the given power system data. Assume Bus 2 can supply unlimited reactive power. | 13 | K2 | CO2 |

$$Y_{bus} = \begin{bmatrix} -j12 & j8 & j4 \\ j8 & -j12 & j4 \\ j4 & j4 & -j8 \end{bmatrix}$$

Bus No.	Type	Generation		Load		Voltage	
		P	Q	P	Q	Magnitude	Phase Angle
1	Slack	-	-	-	-	1.0	0°
2	P-V	5.0	-	0	-	1.05	-
3	P-Q	0	0	3.0	0.5	-	-

(OR)

- b) Solve load flow of the power system using FDLF method 13 K2 CO2



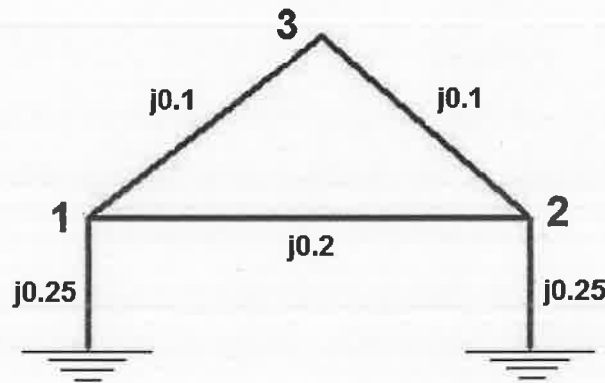
13. a) Discuss the role of objective functions in optimal power flow formulation and evaluate the effectiveness of any one of solution techniques of optimal power flow problem. 13 K2 CO3

(OR)

- b) Explain how control variables and dependent variables are handled in an OPF formulation. Give examples of each and explain how the algorithm uses them to reach an optimal solution. 13 K2 CO3
14. a) Deduce the expression for fault current during a single line-to-ground fault in a power system faulted through fault impedance Z_f . 13 K2 CO4

(OR)

- b) Construct the bus impedance matrix using the building algorithm for the given network diagram. Assume all impedances are in per-unit. 13 K2 CO4



15. a) Outline the algorithm for solving the swing equations in a multimachine system using modified Euler's method and illustrate how this method can be applied in transient stability studies. 13 K2 CO5

(OR)

- b) Discuss the modern techniques adopted to enhance transient stability in power systems. 13 K2 CO5

PART – C

(1 x 15 = 15Marks)

- | Q.No. | Questions | Marks | KL | CO |
|--------|---|-------|----|-----|
| 16. a) | Formulate the optimal power flow problem for a power system network considering both equality and inequality constraints. | 15 | K2 | CO4 |
| (OR) | | | | |
| b) | Develop a structured analytical approach to determine the subtransient current and line-to-line voltages for a 20 MVA, 13.8kV salient-pole generator (without damper windings and with a solidly grounded neutral) subjected to a line-to-line fault at its terminals. Use direct-axis subtransient reactance as 0.25 pu, negative sequence reactance as 0.35 pu, and zero sequence as 0.1 pu and assume rated terminal voltage with negligible resistance. | 15 | K2 | CO4 |