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10EE71

**Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Computer Techniques in Power System Analysis**

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. Explain the terms with example:
 (i) Tree (ii) Co-tree (iii) Basic cutsets (iv) Basic loop. (08 Marks)
- b. For the graph shown in Fig. Q1 (b), select tree T(1,2,3,4) and write :
 (i) Element-node incidence matrix.
 (ii) Basic cutset incidence matrix.
 (iii) Basic loop incidence matrix.

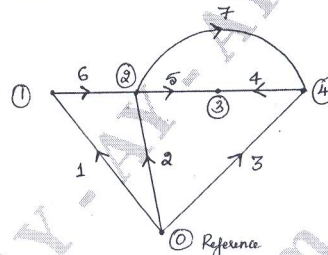


Fig. Q1 (b)

- 2 a. Form the bus admittance matrix by the method of inspection for the system shown in Fig. Q2 (a). Take $a_1 = 0.92$ and $a_2 = 0.95$. (12 Marks)

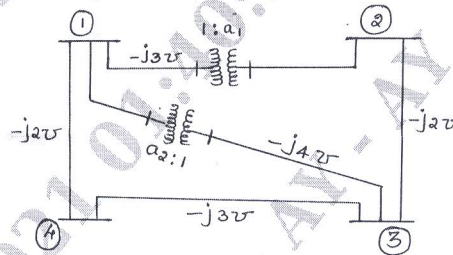


Fig. Q2 (a)

- b. The series impedances of the lines are shown in Fig. Q2 (b). Taking the elements in the order 0-1, 1-2, 1-3 and 2-3, develop Z_{bus} by building algorithm. (10 Marks)

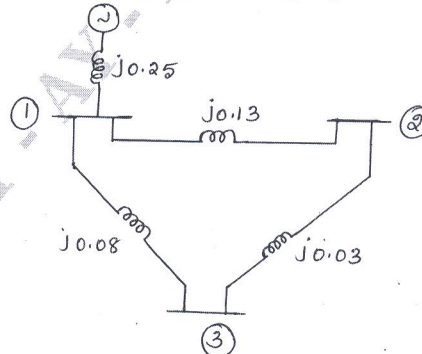


Fig. Q2 (b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

- 3 a. Draw the flow chart for Gauss Seidel method of load flow analysis for the power system with PQ buses. (08 Marks)
- b. Obtain Gauss Siedel load flow studies at the end of 1st iteration for the power system shown in Fig. Q3 (b). Assume a flat voltage start for voltages V_2 and V_3 .

Line Data			
SB	EB	R(P.U)	X(P.U)
1	2	0.02	0.04
1	3	0.01	0.03
2	3	0.0125	0.025

Bus Data			
Bus No.	P_i	Q_i	V_i
1	-	-	$1.05 \angle 0^\circ$
2	2.566	1.102	-
3	1.386	0.452	-

(12 Marks)

- 4 a. The data of a 3 bus system is given below. Using Newton-Raphson method. Find the Jacobian matrix at the end of 1st iteration. All values are in P.U. Take constraint for Q_2 as $0 \leq Q_2 \leq 2.0$. (12 Marks)

Y_{bus}		
-j15	j10	j5
j10	-j15	j5
j5	j5	-j10

Bus Data			
Bus No.	P_i	Q_i	V_i
1	-	-	$1+j0$
2	5.32	-	1.1
3	3.64	0.531	$1+j0$

- b. Explain the Fast decoupled load flow analysis. (08 Marks)

PART - B

- 5 a. Derive the criterion for Economic generation scheduling neglecting losses. (06 Marks)
- b. Three plants of total capacity of 1500 MW are scheduled operation to supply a total load of 975 MW. Evaluate the optimal load scheduling if the plants have the following cost characteristics and the generation limit. What is the total cost of generation?

$$C_1 = 500 + 5.3P_1 + 0.004P_1^2 \text{ \$/hr, } 200 \leq P_1 \leq 450$$

$$C_2 = 400 + 5.5P_2 + 0.006P_2^2 \text{ \$/hr, } 150 \leq P_2 \leq 350$$

$$C_3 = 200 + 5.8P_3 + 0.009P_3^2 \text{ \$/hr, } 100 \leq P_3 \leq 225.$$

(08 Marks)

- c. Explain the iterative technique for load dispatch neglecting losses. (06 Marks)

- 6 a. Two bus system is shown in Fig. Q6 (a). If 100 MW is transmitted from Plant 1 to the load a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by load when the system λ is 22 \$/Mwh. The incremental fuel cost of two plants are given below:

$$\frac{dC_1}{dP_{g1}} = 13 + 0.1 P_{g1} \text{ \$/Mwh}$$

$$\frac{dC_2}{dP_{g2}} = 12 + 0.12 P_{g2} \text{ \$/Mwh}$$

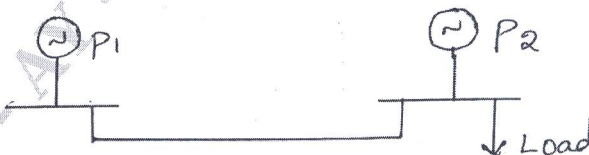


Fig. Q6 (a)

(10 Marks)

- b. Compute the loss coefficient for the network shown in Fig. Q6 (b)

$$I_a = (1 - j0.15) \text{P.U.},$$

$$Z_a = (0.02 + j0.15) \text{P.U.}$$

$$I_b = (0.5 - j0.1) \text{P.U.},$$

$$Z_b = (0.03 + j0.15) \text{P.U.}$$

$$I_c = (0.2 - j0.05) \text{P.U.},$$

$$Z_c = (0.02 + j0.25) \text{P.U.}$$

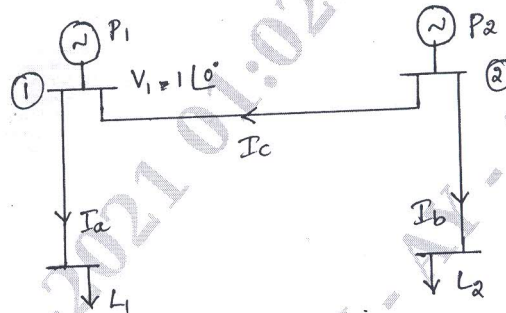


Fig. Q6 (b)

- 7 a. Illustrate clearly the method of solving swing equation using Runge-Kutta approach for transient analysis of power system. (10 Marks)
- b. With the help of algorithm, explain the method of finding the transient stability of a given power system using modified Euler's method. (10 Marks)
- 8 a. For the Swing equation, $0.0331 \frac{d^2\delta}{dt^2} = 0.8 - 1.333 \sin \delta$. Calculate δ and W after 0.05 seconds by taking a step by 0.05 sec. Given $\delta_0 = 0.756$, $W_0 = 2.067$. Use Runge-Kutta method. (10 Marks)
- b. Explain Milne Predictor corrector method. (10 Marks)
