USN

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 cutest incidence matrix.
(iii) Basic loop incidence matrix.

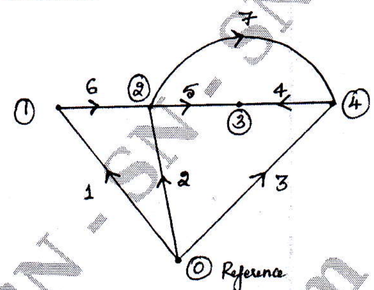

Fig. Q1 (b)

(12 Marks)

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 $a_2 = 0.95$. **(10 Marks)**

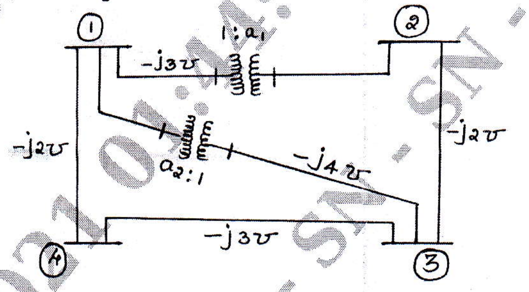

Fig. Q2 (a)

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.

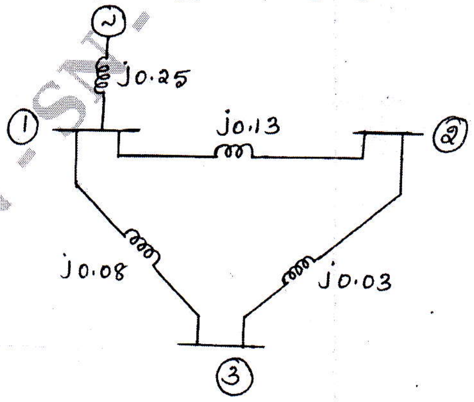

Fig. Q2 (b)

(10 Marks)

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 $0 \le Q_2 \le 2.0$. **(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?

$C_1 = 500 + 5.3P_1 + 0.004P_1^2$ \$/hr, $200 \le P_1 \le 450$

$C_2 = 400 + 5.5P_2 + 0.006P_2^2$ \$/hr, $150 \le P_2 \le 350$

$C_3 = 200 + 5.8P_3 + 0.009P_3^2$ \$/hr, $100 \le P_3 \le 225$. **(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:

$$\frac{dC_1}{dPg_1} = 13 + 0.1\,Pg_1 \text{ \$/Mwh}$$

$$\frac{dC_2}{dPg_2} = 12 + 0.12\,Pg_2 \text{ \$/Mwh}$$

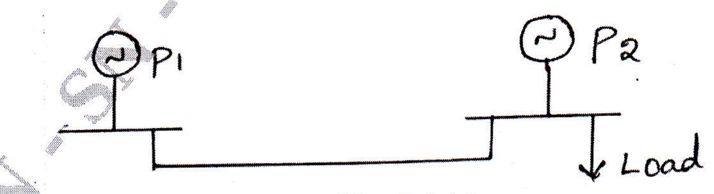

Fig. Q6 (a) **(10 Marks)**

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

$I_a = (1 - j0.15)$P.U., $Z_a = (0.02 + j0.15)$P.U.

$I_b = (0.5 - j0.1)$P.U., $Z_b = (0.03 + j0.15)$P.U.

$I_c = (0.2 - j0.05)$P.U., $Z_c = (0.02 + j0.25)$P.U.

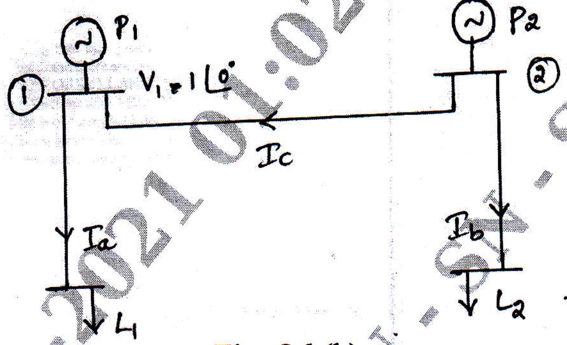

Fig. Q6 (b)

(10 Marks)

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)**

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