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10EE71

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

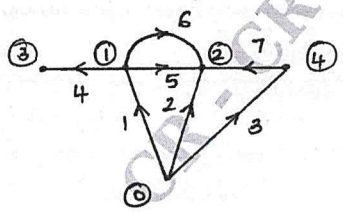
Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART - A

1 a. Define i) Graph ii) Path iii) Tree iv) Loop. **(04 Marks)**

b. The oriented connected graph of a system is shown in fig. Q1(b), obtain
i) Basic cutest incidence matrix B ii) Basic loop incidence matrix C.
Select 5, 6 and 7 as links. Prove that $C_b = -B_t^t$. **(10 Marks)**

Fig.Q1(b)



c. What is a Primitive Network? The data relating to passive elements is given in Table Q1(c). Obtain i) Primitive impedance matrix ii) Primitive admittance matrix. **(06 Marks)**

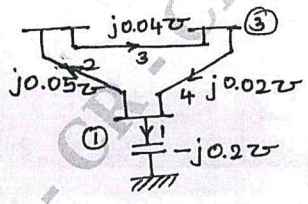
Table Q1(c)

Element	Self Impedance (Pu) $Z_{pq,\ pq}$	Mutual Impedance (Pu) $Z_{pq,\ rs}$
1	0.6	-
2	0.8	0.1 (with element 1)
3	0.2	-

2 a. Obtain an expression for bus admittance matrix using Singular transformation method. **(06 Marks)**

b. Form Y_{BUS} using singular transformation for the power system shown in fig. Q2(b). **(06 Marks)**

Fig.Q2(b)



c. Derive an expression for off diagonal elements Z_{qi} of bus impedance matrix using building algorithm when branch is added to the partial network. **(08 Marks)**

3 a. Explain how buses are classified to carryout load flow analysis in Power System. Discuss the significance of slack bus. **(07 Marks)**

b. Write a short note on Acceleration of Convergence. **(03 Marks)**

c. For a 3 bus power system elements of Y_{BUS} are given as $Y_{11} = 4.5 - j18$; $Y_{12} = -2.5 + j1.0$ $Y_{13} = -2 + j8$; $Y_{22} = 4.5 - j20$; $Y_{23} = -2 + j10$; $Y_{33} = 4 - j18$. Real bus powers are given by 1.6 and -0.7 and reactive bus powers are 1.6 and -0.7 at buses 2 and 3 respectively. Bys 1 is slack bus with $E_1 = (1.04 + j0)$. Assuming initial voltages at buses 2 & 3 to be $(1 + j0)$, find the value of voltage at bus 3 at the end of first iteration using Gauss – Siedal method with an acceleration factor of 1.6. **(10 Marks)**

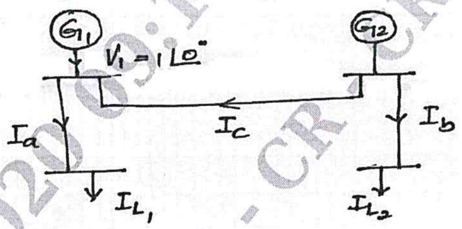
4 a. Write the step by step algorithmic procedure for load flow analysis using Newton - Raphson's method in Polar co-ordinates. **(08 Marks)**
b. Compare NR and GS methods for load flow analysis procedure. **(06 Marks)**
c. What are the assumptions made in fast decoupled load flow method? Write a flow chart of the method. **(06 Marks)**

PART - B

5 a. Derive an expression for optimal loading including transmission losses for an 'n' plant system. **(06 Marks)**
b. The fuel costs of two units are given by $F_1 = 1.5 + 20P_{G_1} + 0.1P_{G_1}^2$ Rs/hr.
$F_2 = 1.9 + 30PG_2 + 0.1P_{G_2}^2$ Rs/hr.
P_{G_1} & P_{G_2} are in MW. Find the optimal schedule neglecting losses when the demand is 200MW also calculate λ. **(06 Marks)**
c. The incremental cost of 2 plants are , $IC_1 = 0.1P_1 + 22$ Rs/M whr
$IC_2 = 0.12P_2 + 16$ Rs/M whr
If both units are operating at all time, P_{min} = 20MW and P_{max} = 100MW, determine economical operating schedule of the plants for loads 40MW, 80MW, 160MW and 180MW, neglecting transmission losses. **(08 Marks)**

6 a. Derive an expression for loss co-efficients and transmission loss in terms of generation in an interconnected system. **(10 Marks)**
b. For the network shown in fig. Q6(b) , obtain the loss co-efficients. Take
$I_a = 1.0 + j0.15$ pu $Z_a = 0.02 + j0.15$ pu
$I_b = 0.5 - j0.10$ pu $Z_b = 0.03 + j0.15$ pu
$I_c = 0.2 - j0.05$ pu $Z_c = 0.02 + j0.25$ pu **(10 Marks)**

Fig.Q6(b)



7 a. Explain with necessary equations and graphs, the solution of swing equation by point by point method. **(10 Marks)**
b. Explain clearly representation of loads in a power system during transient period. **(10 Marks)**

8 a. Illustrate the steps involved in estimating internal voltage angles and machine speed using Range – Kutta method during transient period. **(10 Marks)**
b. Discuss on Modified Euler's method for transient stability studies. **(10 Marks)**

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