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10EE71

Seventh Semester B.E. Degree Examination, Aug./Sept. 2020
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. For the oriented graph shown in Fig.Q1(a). Obtain the following incidence matrices. Select elements 5, 6, 7 as links and node as reference : i) A ii) B iii) K iv) C.

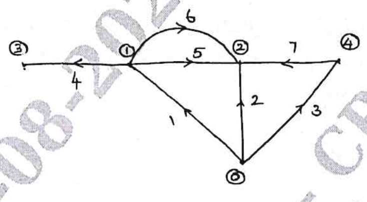

Fig.Q1(a) **(10 Marks)**

b. Define and explain the following terms with an example.
i) Oriented graph ii) Tree iii) Bus incidence matrix iv) Basic cutsets v) Basic loops. **(10 Marks)**

2 a. For the power system in Fig.Q2(a). the line data impedances in p.u. are shown. Obtain Z_{BUS} matrix using building algorithm. Add the elements in the sequence 0 – 1, 1 – 2, 0 – 2, 2 – 3.

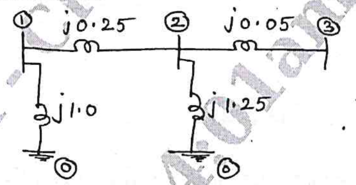

Fig.Q2(a) **(10 Marks)**

b. Derive the generalized algorithm for finding the elements of Bus impedance matrix Z_{BUS} when a branch is added to the partial network. **(10 Marks)**

3 a. For the power shown in Fig.Q3(a), the value of real and reactive power are given in Table Q3(a)(I). All buses other than slack bus are PQ buses. Assume flat start, find the voltages and bus angles at 3 buses at the end of first iteration using Gauss – Seidal method. The line admittances in p.u. are given in Table Q3(a)(II). **(12 Marks)**

Table Q3(a)(I)

BUS	P_i (p.u)	Q_i (p.u)	V_i(p.u)
1	–	–	$1.04\angle 0°$
2	0.5	–0.2	–
3	–1.0	0.5	–
4	0.3	–0.1	–

Table Q3(a)(II)

Line	G(p.u)	B(p.u)
1 – 2	2.0	–6.0
1 – 3	1.0	–3.0
2 – 3	0.666	–2.0
2 – 4	1.0	–3.0
3 – 4	2 .0	–6.0

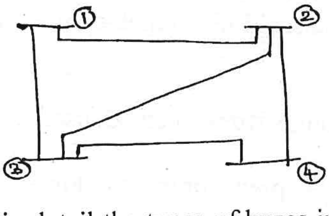

Fig.Q3(a)

b. What is load flow problem? Explain in detail the types of buses in a power system. Discuss the significance of slack bus in load flow studies. **(08 Marks)**

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.

4 a. Explain the algorithm procedure for load flow analysis using Newton – Raphson method in polar co-ordinates. **(10 Marks)**

b. What are the assumptions made in fast decoupled load flow method? Explain the algorithm procedure for fast decoupled load flow problem. **(10 Marks)**

PART – B

5 a. Derive the expression for optimal economic dispatch in a thermal power system with the consideration of transmission losses. **(10 Marks)**

b. A 2 bus system is shown in Fig.Q5(b). If 100 MW is transmitted from plant 1 to the load, a transmission loss of 10MW is incurred. Find required generation for each plant and the power received by load when the system λ is Rs.25/Mwh. The incremental fuel costs of the two plants are given below :

$$\frac{dC_1}{dP_{G1}} = 0.02P_{G1} + 16 \text{ Rs./Mwh}$$

$$\frac{dC_1}{dP_{G2}} = 0.04P_{G2} + 20 \text{ Rs./Mwh}$$

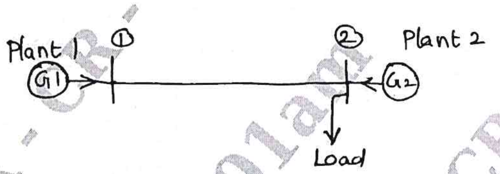

Fig.5(b) **(10 Marks)**

6 a. Determine the loss coefficients for the network show in Fig.Q6(a), using the given data :

$I_a = 1.0 - j\,0.15$ pu $Z_a = 0.02 - j\,0.15$ pu
$I_b = 0.5 - j\,0.1$ pu $Z_b = 0.03 - j\,0.15$ pu
$I_c = 0.2 - j\,0.05$ pu $Z_c = 0.02 - j\,0.25$ pu

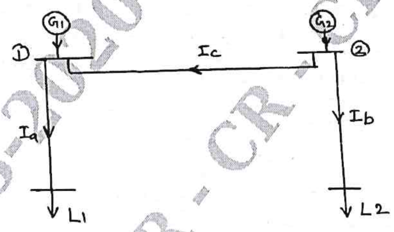

Fig.Q6(a) **(10 Marks)**

b. Explain the problem formulation and solution procedure of optimal scheduling for hydro – thermal plants. **(10 Marks)**

7 a. Explain the solution of swing equation by point by point method. **(10 Marks)**

b. Explain modified Euler's method used in solution of swing equation under transient stability studies. **(10 Marks)**

8 a. Explain Runge–Kutta method used in solution of swing equation for transient stability analysis. **(10 Marks)**

b. Explain Milne predictor method for the solution of swing equation. **(10 Marks)**

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