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06EE71

# Seventh Semester B.E. Degree Examination, Dec.09/Jan.10
# Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

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

## PART – A

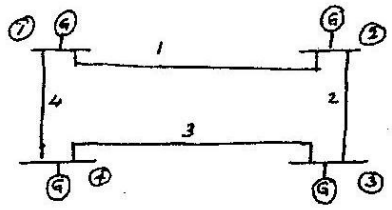
1 a. Define following terms with examples : i) Graph ; ii) Branch – path incidence matrix. **(04 Marks)**

b. The bus incidence matrix is given below. Draw the oriented graph. Obtain augmented loop incidence matrix. **(08 Marks)**

$$\begin{vmatrix} 1 & 0 & 0 & 0 & -1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 & -1 & -1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & -1 & 1 & 0 \end{vmatrix}$$

c. For the power system shown in Fig.1(c), select ground as reference and a tree for which the link elements are 1-2, 1-4 and 2-3. Write basic cutset and basic loop incidence matrix. Verify the relation $C_b = -B_l^t$ **(08 Marks)**

Fig.1(c).

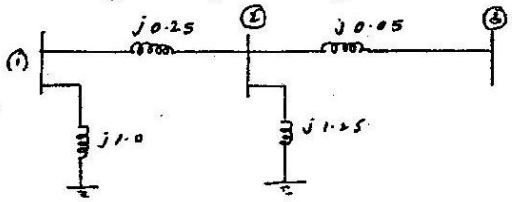



2 a. Explain briefly the primitive network used in the formation of bus admittance matrix by singular formation. **(04 Marks)**

b. Derive the generalized algorithm equation for finding the new elements of bus impedance matrix, when added element to partial network is link. **(08 Marks)**

c. Prepare the bus impedance matrix for the system shown in Fig.2(c), using building algorithm. All the impedances are given in p.u Take ground as reference bus. **(08 Marks)**

Fig.2(c).




3 a. Explain following with respect to load flow analysis:
i) Types of buses
ii) Importance of controlling bus
iii) Constraints for load flow solution. **(08 Marks)**

b. The voltage magnitude at bus – 2 is to be maintained at 1.03 p.u., with bus – 1 as slack bus as in Fig.3(b), Compute voltage at the end of first iteration using Gauss – Seidel technique. Also, find power at slack bus.
Given : $0 < Q_2 < 35$ MVAr,
Base MVA = 100
Acceleration factor = 1.4,
Bus data details is given in Table 2. **(12 Marks)**

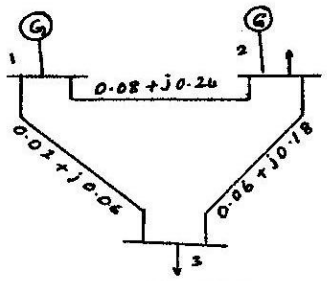



Fig.3(b).

Table 2. Bus data.

| Bus | Voltage | Gen | | Load | |
|---|---|---|---|---|---|
| | | $P_G$ | $Q_G$ | $P_D$ | $Q_D$ |
| 1 | 1.05 | - | - | - | - |
| 2 | 1.03 | 20 | - | 50 | 20 |
| 3 | 1.0 | - | - | 60 | 25 |

4 a. Draw the flow chart of Newton – Raphson method for load flow analysis. **(06 Marks)**

b. Explain fast decoupled load flow technique. **(08 Marks)**

c. Compare Gauss – Seidel and Newton – Raphson methods of load flow analysis. **(06 Marks)**

## PART – B

5 a. Explain the method of equal incremental cost for the economic operation of generators with transmission loss considered. **(08 Marks)**

b. The fuel costs for a plant consisting of 3 units are as follows:

$F_1 = 0.1\ P_1^2 + 40\ P_1 + 100$ Rs/hr

$F_2 = 0.125\ P_2^2 + 30\ P_2 + 80$ Rs/hr

$F_3 = 0.15\ P_3^2 + 20\ P_3 + 150$ Rs/hr.

Assume that all 3 units are operating at all times and the total lad is 400 MW. The minimum and maximum loads on each unit are 20 and 150 MW respectively. How will 400 MW load be shared among the 3 units for optimal operation? **(06 Marks)**

c. In a system with 2 plants, the incremental fuel costs are given by

$IC_1 = 0.01\ P_{G_1} + 20$ Rs/MW h

$IC_2 = 0.015\ P_{G_2} + 22.5$ Rs/MW h

The system is running under optimal scheduling with $P_{G_1} = P_{G_2} = 100$ MW. If incremental transmission loss of generator 2 is 0.2, find the plant penality factors and incremental transmission loss of generator 1. **(06 Marks)**

6 a. Explain problem formation and solution procedure of optimal scheduling for hydro thermal plants. **(10 Marks)**

b. For a system,one line diagram is shown in Fig.6(b). Assume $I_1 = 1$p.u, $I_2 = 0.8$ p.u. If the voltage at bus 3 is $V_3 = 1$ p.u, find loss coefficients and power loss. Take $Z_a = 0.04 + j\ 0.16$, $Z_b = 0.03 + j\ 0.12$ and $Z_3 = 0.02 + j\ 0.08$ p.u. **(10 Marks)**

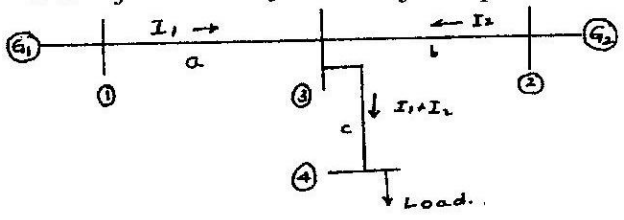



Fig.6(b).

7 a. With the help of a flow chart, explain the method of finding the transient stability of a given power system using modified Euler's method. **(10 Marks)**

b. Explain the solution of swing equation by point – by – point method. **(10 Marks)**

8 a. Explain the Runge – Kutta method. **(10 Marks)**

b. Discuss representation of load for transient stability studies. **(10 Marks)**

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