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NEW SCHEME

Seventh Semester B.E. Degree Examination, May 2007
Electrical and Electronics Engineering
Computer Techniques in Power Systems

Time: 3 hrs.]   [Max. Marks:100

Note : *1. Answer any FIVE full questions.*
2. Assume missing data, if any, suitably.

1   a. Define a primitive network. Give the representation of a typical component both in
       impedance and admittance forms. Obtain performance equations in both the cases.
       (05 Marks)

    b. Explain the formation of Y_{BUS} and hence Z_{BUS} by singular transformation analysis.
       (07 Marks)

    c. For the network shown in fig.1(c); obtain the Bus admittance matrix by singular
       transformation analysis. Line data is given in the table below: **(08 Marks)**

Line number	Connecting nodes	Admittance in P.U.
1	1-2	1.0
2	2-3	2.0
3	3-1	1.0

Ref. node (1)   Fig.1(c)
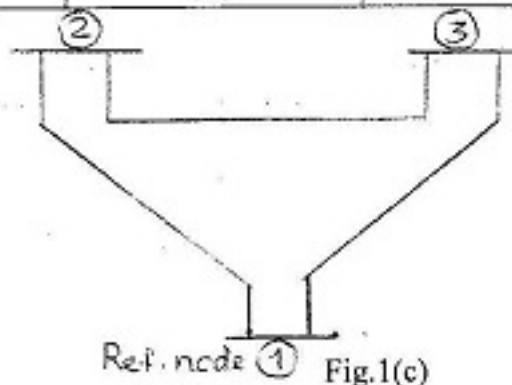
2   a. Explain the step-by-step algorithm for the formation of Bus impedance matrix when
       a branch is added to the partial network.   **(12 Marks)**

    b. Form Z_{BUS} for the power system shown in fig.2(b), by adding the elements in the
       sequence 1-2, 1-3, 1-4 and 4-5. Select node-(1) as reference node. The line reactance
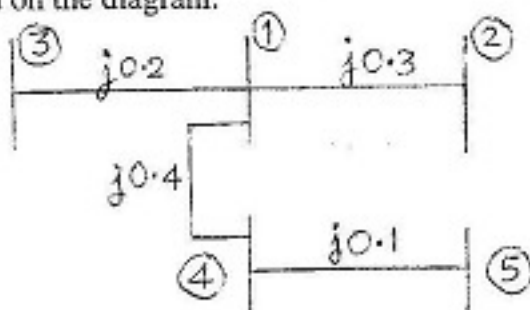   in P.U. are as indicated on the diagram.   **(08 Marks)**

Fig.2(b)

3   a. Develop a mathematical model of a speed governing system of steam turbine used in load frequency control problems. Show the block diagrams for speed governing system, turbine model and generator load model. (12 Marks)

   b. Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governors are 4% and 5% respectively from no load to full load. Assuming that the governors are operating at 50 Hz at no load, how would a load of 600 MW be shared between them? What will be the system frequency at this load? Assume free governor operation. (08 Marks)

4   a. Explain: i) Significance of slack bus and ii) Importance of Bus admittance matrix (Y_{BUS}) during load flow analysis. (08 Marks)

   b. The following is the system data for a load flow study:

Bus code	1 - 2	1 - 3	2 - 3	2 - 4	3 - 4
Admittance in P.U.	$2 - j8$	$1 - j4$	$0.67 - j2.66$	$1 - j4$	$2 - j8$

The schedule of active and reactive powers in P.U. are as follows:

Bus code	P	Q	V	Remarks
1	-	-	1.06	Slack Bus
2	0.5	0.2	1.0	PQ Bus
3	0.4	0.3	1.0	PQ Bus
4	0.3	0.1	1.0	PQ Bus

Determine the voltages at the end of first iteration of Gauss-Siedel method. (12 Marks)

5   a. Explain the structure of Jacobian used in Newton Raphson Load Flow (NRLF) solution for systems having PQ and PV buses and hence establish that 'the presence of PV buses simplifies the Jacobian matrix of NRLF solution'. (10 Marks)

   b. Explain the representation of transformers with fixed tap setting and develop a model for representing TCUL transformers during load flow analysis. (10 Marks)

6   a. Explain equal incremental cost criterion with reference to economic operation of power system. (10 Marks)

   b. Incremental fuel cost in Rs./MWHr for a plant consisting of 2 units are given by,

$$\frac{dF_1}{dP_1} = 0.0008P_1 + 8.0, \quad \frac{dF_2}{dP_2} = 0.0096P_2 + 6.4$$

Assume that both units are operating at all times. Total load varies from 250 to 1250 MW. Maximum and minimum loads on each unit are to be 625 MW and 100 MW respectively. Find the incremental fuel cost and the allocation of load between units for the minimum cost of various total loads. (10 Marks)

7   a. Explain the modified Euler's method of solution techniques to solve differential equations. (10 Marks)

   b. Explain the representation of synchronous machine and load for transient stability studies. (10 Marks)

8   Write short notes on any four of the following:
   a. Two area load frequency control
   b. Classification of system buses for load flow analysis
   c. Automatic economic load dispatch
   d. Importance of swing equation for stability analysis
   e. Methods to improve transient stability. (20 Marks)

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