CBCS SCHEME

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18EE71

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Power System Analysis – II

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain with an example :
   i) Oriented graph
   ii) Basic cut sets
   iii) Basic loops. **(06 Marks)**

b. For the network shown in the Fig.Q1(b), formulate the oriented graph, tree, bus incidence matrix(A), branch–path incidence matrix(K), Basic cut set incidence matrix (B), basic loop incidence matrix (C). Choose elements (1, 2, 3, 4) as three branches.

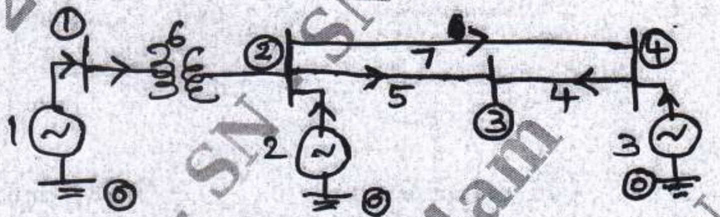

Fig.Q1(b) **(08 Marks)**

c. Explain with an example, primitive networks in :
   i) Impedance form ii) Admittance form. **(06 Marks)**

OR

2 a. Obtain the primitive impedance matrix and primitive admittance matrix using the data shown in the Fig.Q2(a).
   $[z] \Rightarrow$ impedances (self) of elements (e)
   Z_m = mutual impedance (in pu) between e = 1 and e = 2 $Z_m = j0.1$pu.

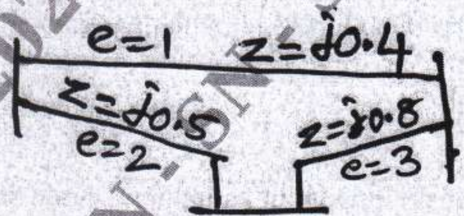

Fig.Q2(a) **(06 Marks)**

b. Derive an expression for bus admittance matrix (Y_{BUS}) using singular transformation method. **(08 Marks)**

c. For the sample network shown in Fig.Q2(c), obtain BUS admittance matrix (Y_{BUS}) by inspection method.

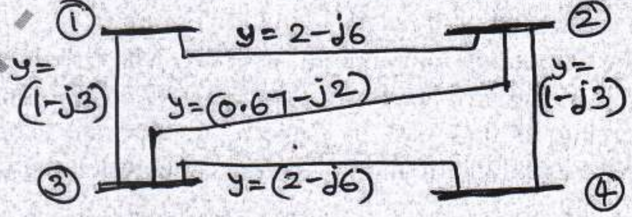

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. Explain the importance of load flow studies in power systems analysis. **(06 Marks)**

b. Derive the Static Load Flow Equations (SLFE) (in polar form). **(08 Marks)**

c. Explain with suitable algorithmatic steps involved in, Gauss-Seidal iterative method for load flow solution (GSLF method). **(06 Marks)**

OR

4 a. What are the constraints to be considered for a load flow solution? **(05 Marks)**

b. Classify the Buses in power system for conduction of load flow solution. **(05 Marks)**

c. For the sample power system shown in Fig.Q4(c), all buses except slack bus are PQ buses. Calculate the voltages at end of 1[st] iteration using Gauss – Seidal load flow (GSLF) method.

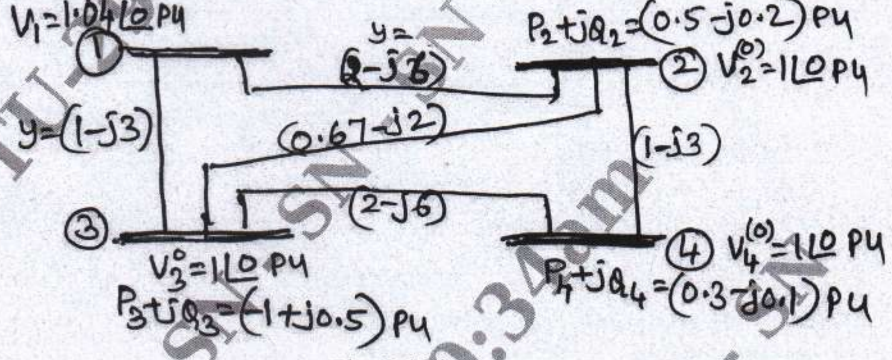

Fig.Q4(c) **(10 Marks)**

Module-3

5 a. Explain with a flow chart Newton – Raphson Load Flow (NRLF) method to solve load flow problem (in polar form). **(10 Marks)**

b. A sample 3-Bus system has slack Bus, PQ bus, PV Bus (one each), write the structural form power system Jacobian matrix [J] with necessary equations to calculate its elements. **(10 Marks)**

OR

6 a. Explain in brief the important assumption made in arriving at Fast Decoupled Load Flow Method (FDLF) from NRLF method. **(10 Marks)**

b. Explain with a flow chart FDLF method (in polar form). **(10 Marks)**

Module-4

7 a. Write a brief note on the performance curves of a thermal power station for economic load dispatch studies. **(06 Marks)**

b. Derive the expression for economic dispatch with transmission losses neglected. **(06 Marks)**

c. A power plant consisting of two units $IC_1 = 40 + 0.2P_1$ and $IC_2 = 30 + 0.25P_2$. Find the total yearly saving in fuel cost in Rupees, for optimal scheduling of a load of 130MW as compared to equal distribution of same load between them. **(08 Marks)**

OR

8 a. Derive an expression for condition for economic load dispatch including transmission loss (B-coefficient) **(08 Marks)**

b. What is Unit Commitment? What are the constraints to be considered in Unit Commitment (UC)? Explain in brief. **(04 Marks)**

c. Explain the algorithm steps in dynamic programming approach to solve UC problem. **(08 Marks)**

Module-5

9 a. Explain with necessary equations the Z_{BUS} formulation under the following modification – Type 1, Type – 2, Type – 3, Type – 4 (without mutual couplings). **(10 Marks)**

b. Determine Z_{BUS} using step-by-step algorithm taking node ◎ as reference Fig.Q9(b). (Add elements in ascending order of numbering).

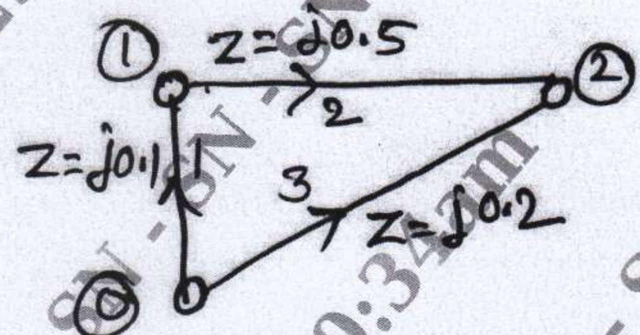

Fig.Q9(b) **(10 Marks)**

OR

10 a. Derive the swing equation for conducting power system stability studies. **(10 Marks)**

b. Write an explanatory note on methods employed for numerical solution of swing equation :

i) Point – by – point method

ii) R K methods. **(10 Marks)**

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