CBCS SCHEME

USN

21EE62

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Power System Analysis – 2

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 of the following :
i) Oriented graph ii) Basic cutsets iii) Basic loops. **(06 Marks)**

b. With usual notations prove that $Y_{BUS} = A^T[Y]A$ using singular transformation method. **(06 Marks)**

c. For the power system shown in Fig.Q1(c) select ground as reference and a tree for which link elements are 1–2, 1–4, 2–3, 3–4. Obtain basic cutset and basic loop incidence matrices. Verify the relation $C_b = B_\ell^T$.

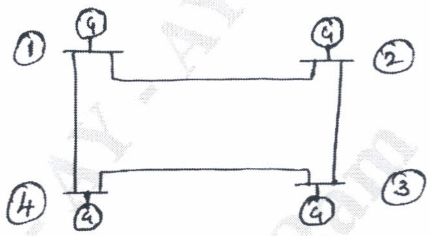

Fig.Q1(c) **(08 Marks)**

OR

2 a. What is primitive network? Give the representation of a typical component and arrive at their performance equation in impedance and admittance form. **(07 Marks)**

b. For a power system shown in Fig.Q2(b) below, obtain Y_{BUS} using singular transformation method by considering Bus(4) as reference bus.

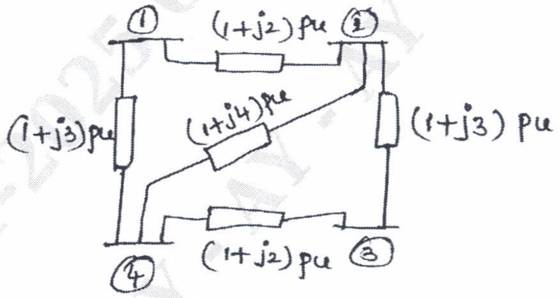

Fig.Q2(b) **(08 Marks)**

c. For the sample network shown in Fig.Q2(c). Obtain bus admittance matrix by using inspection method $[Y_{BUS}]$.

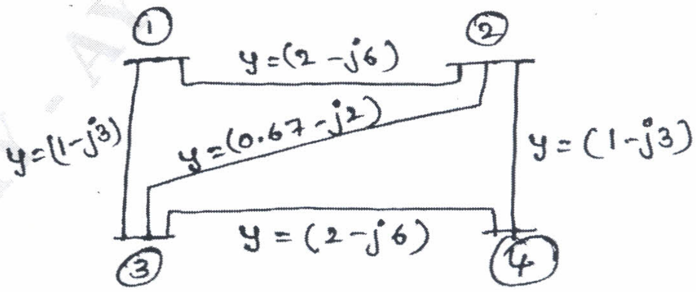

Fig.Q2(c) **(05 Marks)**

Module-2

3 a. Derive the expressions for power flow-equations used in load flow analysis. **(08 Marks)**

b. What are different types of buses, considered during load fowl analysis? Explain briefly. **(06 Marks)**

c. Why load flow analysis in power system in necessary? Explain. **(06 Marks)**

OR

4 a. Explain the load flow solution procedure of Gauss-Siedel method for a power system having PQ and PV buses with 'Q' limits. **(10 Marks)**

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

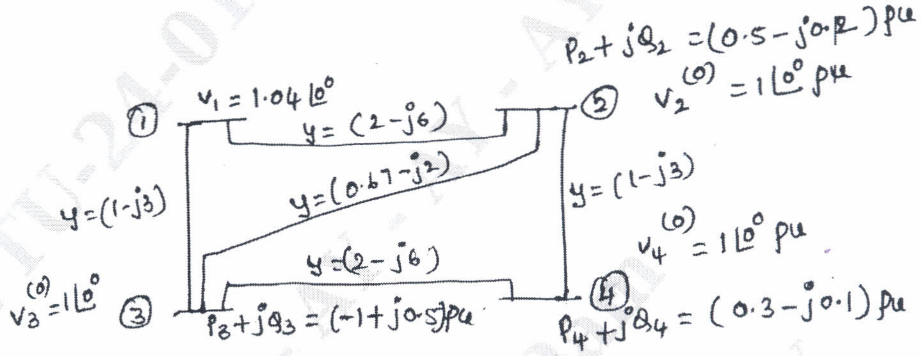

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. Compare NR and method for load flow analysis. **(06 Marks)**

b. Derive the expressions of diagonal elements of Jacobian matrices in NR method of load flow analysis. **(08 Marks)**

c. Starting from all the assumptions deduce the Fast Decoupled Load Flow (FDLF] method. **(06 Marks)**

OR

6 a. Explain with flow chart and equation how the load flow analysis is carried out using Newton – Raphson Load Flow [NRLF] method. **(10 Marks)**

b. For a 3-bus system, the elements of Y_{BUS} are as follows :

$$Y_{11} = y_{22} = Y_{33} = 24.23\angle -75.95 \text{ pu}\ ;\ Y_{12} = Y_{13} = Y_{21} = Y_{23} = Y_{31} = Y_{32} = 12.13\angle 104.04 \text{ Pu.}$$

The bus voltages are $V_1 = (1.04 + j0)$pu (Slack), $V_2 = (1 + j0)$pu (PQ Bus), $V_3 = (1.04 + j0)$pu (PV bus). Determine the elements of sub matrix J_1 and J_4 of Jacobian matrix in NR load flow method. **(10 Marks)**

Module-4

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

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

c. A power plant consisting of two units.

$C_1 = 0.05\, p_1^2 + 20P_1 + 800$ Rs/hr

$C_2 = 0.06P_2^2 + 20P_2 + 900$ Rs/hr

Find the total yearly saving in fuel cost in rupees. For optimal scheduling of a load of 150Mw as compared to equal distribution of same load between them. **(08 Marks)**

OR

8 a. What are the transmission line loss co-efficients? Derive an expression for transmission loss as a function of plant generation for a two plant system. **(10 Marks)**

b. Explain how dynamic programming is applied to obtain unit commitment. **(10 Marks)**

Module-5

9 a. Obtain the generalized algorithm expression for bus impedance matrix elements when a link is added to the partial network. Also discuss the special cases. **(10 Marks)**

b. Explain clearly the point-by-point method of solving swing equation. Mention the assumptions made. **(10 Marks)**

OR

10 a. Obtain Z_{BUS} by building algorithm for the system shown in Fig.Q10(a). all value are in pu. (impedance).

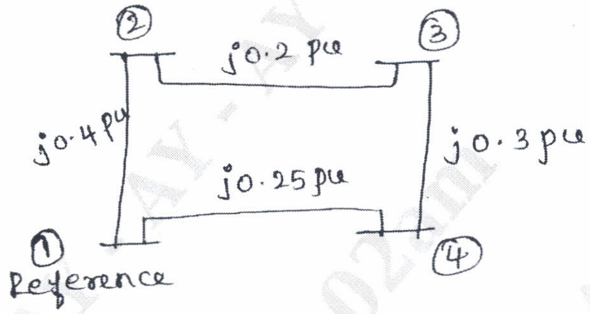

Fig.Q10(a) **(10 Marks)**

b. Discuss the methodology of using Runge-Kutta technique for transient stability studies of a power system. **(10 Marks)**

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