USN ☐☐☐☐☐☐☐☐☐☐

10EE71

Seventh Semester B.E. Degree Examination, June/July 2018
Computer Techniques in Power System Analysis

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting
atleast TWO questions from each part.
2. Missing data, if any, may suitably be assumed.

PART – A

1 a. With the help of a typical one line diagram, define the basic terms associated with graph theory. **(10 Marks)**

   b. For the tree shown in Fig.Q1(b), form the basic cut set matrix B and basic loop incidence matrix C and hence determine C^tB. **(10 Marks)**
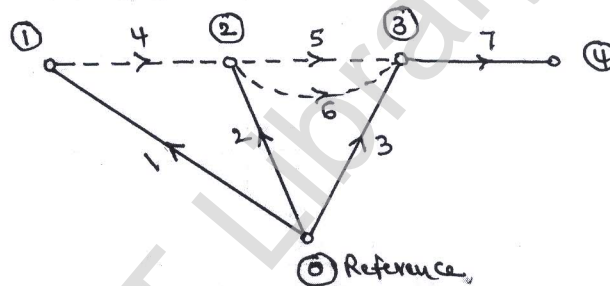

Fig.Q1(b)

2 a. With the usual notations, derive the equation :
$$Y_{BUS} = A^t [y] A.$$
(06 Marks)

   b. The primitive admittances of the lines are shown in the Fig.Q2(b). Taking ground as reference, form Y_{BUS} by Direct inspection method.
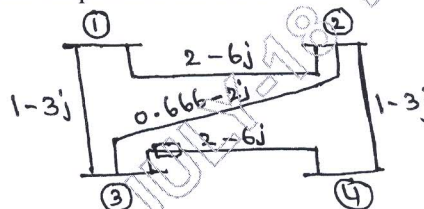

Fig.Q2(b)

   Bus ③ has a transformer in the line 3 – 4 with off - nominal turns ratio 1.04. **(06 Marks)**

   c. The p.u. impedances of the lines are shown in the Fig.Q2(c). Determine Z_{Bus} by Building Algorithm technique. Take the elements in the order : $0 - 1$, $1 - 2$, $0 - 2$.
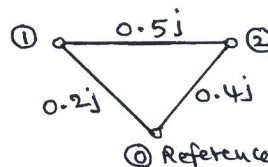

Fig.Q2(c)

(08 Marks)

3 a. Give the algorithm for GS method of load flow analysis for power system having both PQ and PV buses. **(10 Marks)**

b. The input data for a 3 bus system is as follows:

$$Y_{Bus} = \begin{array}{c} ① \\ ② \\ ③ \end{array} \begin{bmatrix} -20.834j & 4.167j & 16.667j \\ 4.167j & -9.723j & 5.556j \\ 16.667j & 5.556j & -22.223j \end{bmatrix}$$

Given :

Acceleration factor, $\alpha = 1.4$

Bus	Voltage, p.u.	Net Power, p.u.	
		P	Q
1 (Slack)	1.05 + j0	-	-
2 (PQ bus)	-	− 0.3	− 0.2
3 (PQ bus)	-	− 0.6	− 0.25

Using GS iterative method, find bus voltages and slack bus power at the end of first iteration. **(10 Marks)**

4 a. Draw the flow chart for Newton-Raphson method of Load Flow analysis for power system with PQ buses. **(10 Marks)**

b. For a 3 bus system the following data is given :

$$Y_{Bus} = \begin{array}{c} ① \\ ② \\ ③ \end{array} \begin{bmatrix} 15\underline{|-90°} & 10\underline{|90°} & 5\underline{|90°} \\ 10\underline{|90°} & 15\underline{|-90°} & 5\underline{|90°} \\ 5\underline{|90°} & 5\underline{|90°} & 10\underline{|-90°} \end{bmatrix}$$

Bus No.	Type	Voltage, p.u.	Net Power	
			P p.u.	Q p.u.
1	Slack	1 + j0	-	-
2	PV bus	1.1 + j0	5.3217	-
3	PQ bus	1 + j0	− 3.6392	− 0.534

Determine the elements of the sub-matrices J_1 & J_4 of the Jacobian matrix J of NR load flow

equation : $\begin{bmatrix} \Delta P \\ \Delta Q \end{bmatrix} = [J] \begin{bmatrix} \Delta\delta \\ \Delta|V| \end{bmatrix}$ **(10 Marks)**

PART – B

5 a. With the help of neat figures, explain the performance curves of generating unit. **(12 Marks)**

b. Given $\dfrac{dC_1}{dP_1} = 0.2P_1 + 40$ Rs/MWhr ; $\dfrac{dC_2}{dP_2} = 0.25P_2 + 30$ Rs/MWhr .

(i) How is the total load of 150 MW distributed for economic operation? Find λ.

(ii) If the load is shared equally find the net increase in operating cost. **(08 Marks)**

6 a. For the one line diagram shown in Fig.Q6(a) : $I_1 = 1.0 \lfloor 0°$ p.u. ; $I_2 = 0.8 \lfloor 0°$ p.u.

If the voltage at Bus 3 is $V_3 = 1.0 \lfloor 0°$ p.u. Find the loss coefficients. Line impedances are : $0.04 + 0.16$ j p.u. ; $0.03 + 0.12$j p.u. and $0.02 + 0.08$j p.u. for sections a, b and c respectively. Also find the total transmission loss using the loss coefficients. **(12 Marks)**
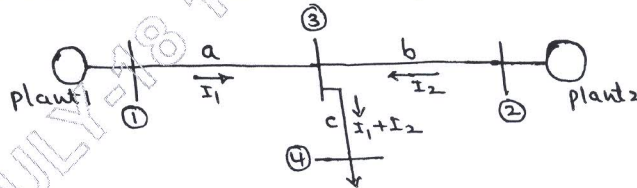

Fig.Q6(a)

b. Write the algorithm for economic load scheduling using iterative method. **(08 Marks)**

7 a. Drive swing equation in terms of machine constant m as well as machine constant H. **(08 Marks)**

b. With the help of diagrams showing the approximations used in the incremental calculations of P_a, ω and δ, give the procedure for first iteration of point by point method. **(12 Marks)**

8 a. Draw the flow-chart for modified Euler's method of solving swing equation. **(12 Marks)**

b. Explain representation of power system for transient stability studies. Give the assumptions made for the same. **(08 Marks)**

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