B.E. (Electrical Engineering (Electronics & Power) Eighth Semester (C.B.S.)

Computer Applications in Power System Paper - I Elective – III

P. Pages : 3 **TKN/KS/16/7665**

Time : Three Hours * 0 4 2 7 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Due credit will be given to neatness and adequate dimensions.
7. Assume suitable data wherever necessary.
8. Illustrate your answers wherever necessary with the help of neat sketches.
9. Use of non programmable calculator is permitted.

1. a) For a oriented graph shown in Fig. 1 (a) obtain : **12**

i) Bus impedance matrix [A]

ii) Branch path incidence matrix [K]

iii) Augmented cut set incidence matrix $[\hat{B}]$.

iv) Augmented loop incidence matrix $[\hat{C}]$.

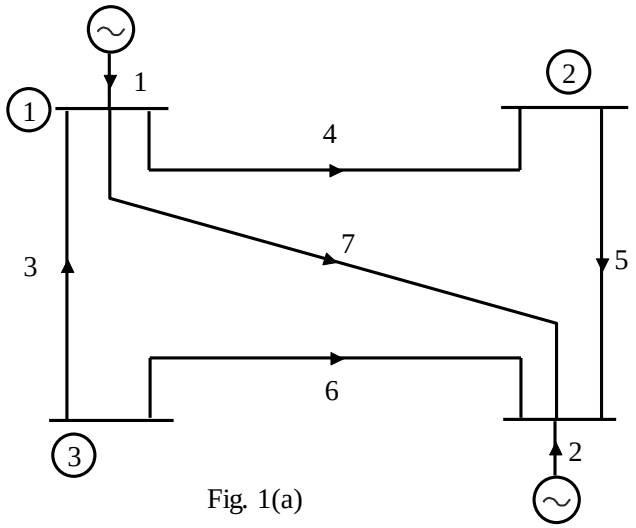

Fig. 1(a)

b) Explain in brief the following terms :

i) Network graph. ii) Tree of a graph.

iii) Primitive network. iv) Basic cut set.

OR

2. a) Derive the equation of loop impedance matrix $[Z_{loop}]$ using singular transformation. **6**

b) For the network graph shown in Fig 2 (b) obtain Y_{BR}, Z_{loop} & Y_{Bus} by singular transformation. **14**

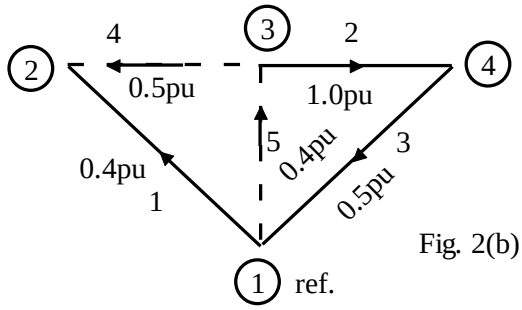

Fig. 2(b)

3. a) Derive the equation useful for formation of Z_{Bus} when added element is a link, start from performance equation of a partial network. **10**

b) The bus impedance matrix Z_{Bus} for the sample power system is given below. **10**
Modify the bus impedance matrix.
i) If include the addition of an element from bus '2' to bus '3' with an impedance of 0.4pu.
ii) If include the addition of an element from bus '4' to bus '2' with an impedance of 0.5pu in given matrix.

Z_{Bus} =

	2	3	4
2	0.271	0.126	0.329
3	0.126	0.443	0.188
4	0.329	0.188	0.380

OR

4. a) Explain the formation of Y_{Bus} by direct inspection method with suitable example. **6**

b) Obtain Z_{Bus} using building algorithm method for power system shown in Fig. 4 (b). **14**

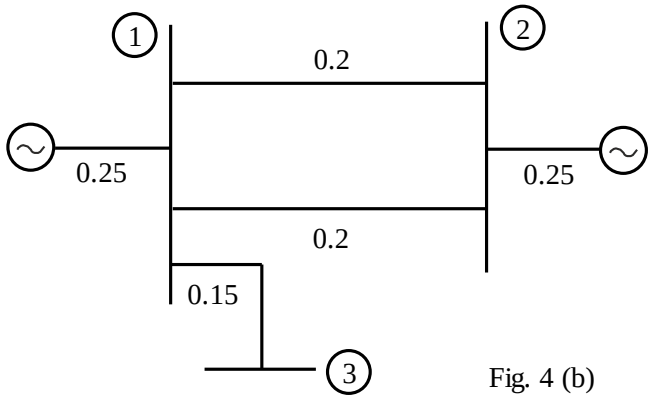

Fig. 4 (b)

5. a) Derive an expression for performance equation of 3-phase stationary element in admittance form when excitation is balanced. **10**

b) How $3-\phi$ network component is represented in impedance and admittance form? Write down the performance equation of the 3-phase element in both these form. **10**

OR

6. Consider a 3-phase to ground fault on bus no. 2 of the power system shown in Fig. (6) carry out short circuit analysis to find. **20**

i) Total fault current
ii) Voltage of each bus during fault
iii) Current through the phase 'C' of the transformer element.

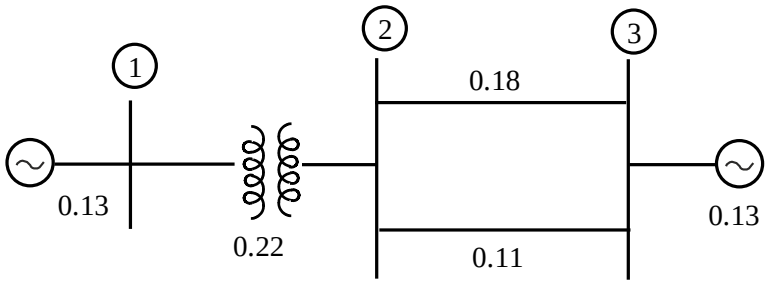

Fig. (6)

7. a) Compare the performance of Gauss-Seidal & Newton Raphson methods for load flow solution. **5**

b) Derive the equation used to calculate real & reactive bus powers for load flow solution by using the Newton Raphson Method with Y_{Bus}. **8**

c) Draw the flowchart of Gauss Seidal iterative method. **7**

OR

8. A 20MVA 50C/s generator circuit delivers 18MW over a double circuit line to an infinite bus. The generator bus Kinetic energy is 2.52MJ/MVA at rated speed. The generator transient reactance is $X_d^l = 0.35pu$. Each transmission circuit reactance is 0.2pu on 20MVA base. Initially the generator bus voltage was 1.1pu & infinite bus voltage 1.0pu. A 3-phase short circuit occurs at the mid point of one of the transmission lines at t = 0 and it is cleared in 0.05 sec. Find the swing of the rotor upto 0.15. Taking time step of 0.05 sec. Use modified Euler's Method. **20**

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