USN | | | | | | | | | | |

10EE71

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define a primitive network. Give the representation of primitive network in impedance and admittance form. Obtain the performance equations in both the cases. **(06 Marks)**

b. For the power system shown in Fig. Q1(b). Draw the oriented graph and obtain the following incidence matrices.

i) Element – node incidence matrix $\hat{A}$
ii) Bus incidence matrix A
iii) Branch - path incidence matrix K
iv) Basic cutest incidence matrix B
v) Augmented cutest incidence matrix $\hat{B}$
vi)Basic loop incidence matrix C
vii)Augmented loop incidence matrix $\hat{C}$.

Choose bus ① as reference. Take link as elements 4 and 5. **(14 Marks)**

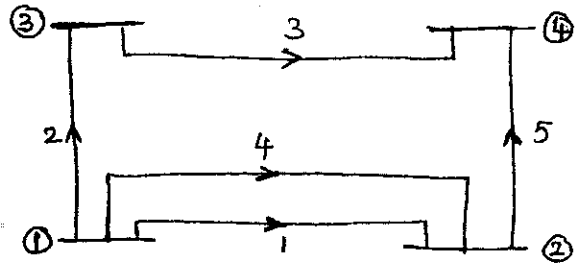

Fig. Q1(b)

2 a. Derive an expression for formation of Bus admittance matrix Y_{BUS} by singular transformation. **(05 Marks)**

b. Derive the generalized algorithm for finding the elements of Bus impedance matrix Z_{BUS} when a link is added to the partial network. **(08 Marks)**

c. For the power system shown in Fig. Q2(c) with Bus 1 as reference and line data impedances in p.u as shown. Compute Z_{BUS} using building algorithm. Add the elements in the sequence 1 – 2, 2 – 3 and 1 – 3. **(07 Marks)**

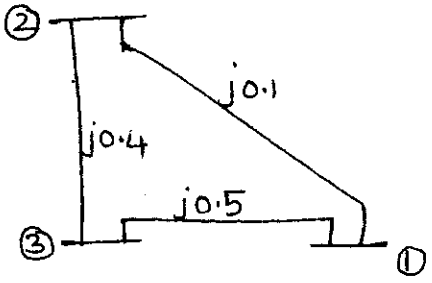

Fig.Q2(c)

3 a. What is load flow problem? Explain in detail the types of buses in a power system. Discuss the significance of slack bus in load flow studies. **(10 Marks)**

b. Fig. Q3(b) shows a three bus power system using G – S method, determine the bus voltages at the end of first iteration. The values shown are line impedances in p.u Bus data are given in Table Q3(b). **(10 Marks)**

Bus	Generation		Load		Voltage	Bus type
	$P_{G(pu)}$	$Q_{G(pu)}$	$P_{D(pu)}$	$Q_{D(pu)}$		
1	–	–	–	–	$1.05\angle 0°$	Slack bus
2	3	–	–	–	1.0	PV bus
3	–	–	4	2	–	PQ bus

Table Q3(b)

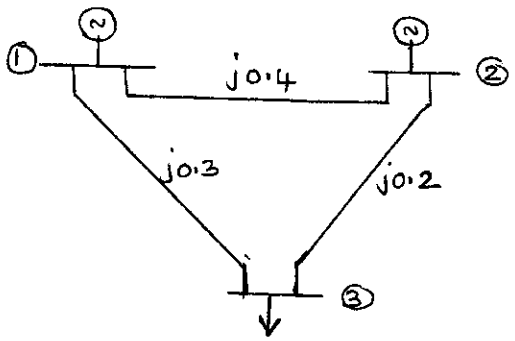

Fig.Q3(b)

4 a. Explain the algorithmic procedure for load flow analysis using Newton – Raphson's method in polar co-ordinates. And compare N – R and G – S method for load flow analysis. **(10 Marks)**

b. What are the assumptions made in fast decoupled load flow method? Explain the algorithm through a flow chart. **(10 Marks)**

PART – B

5 a. What is penalty factor? Derive an expression for optimal economic dispatch including transmission losses. **(10 Marks)**

b. A two bus system is shown in Fig. Q5(b). If 100 MW is transmitted from plant 1 to the load, a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by load when the system λ is Rs. 25/ Mwhr. The incremental fuel costs of the two plants are given below :

$$\frac{dc_1}{dP_{G_1}} = 0.02\ P_{G_1} + 16\,Rs/Mwh$$

$$\frac{dc_2}{dP_{G_2}} = 0.04\ P_{G_2} + 20\,Rs/Mwh.$$ **(10 Marks)**

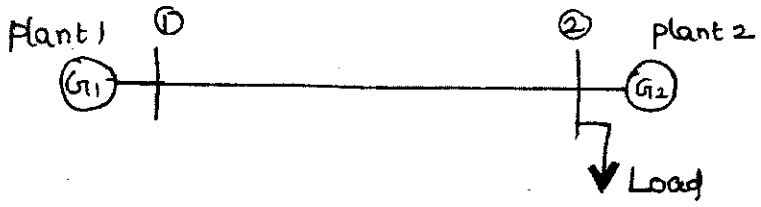

Fig.Q5(b)

6 a. Explain the problem formulation and solution procedure of optimal scheduling for hydro – thermal plants. **(10 Marks)**

b. Compute the loss coefficients for the network shown in Fig. Q6(b), using the given data :

$I_a = 1.0 - j\,0.15$ pu $\quad Z_a = 0.02 - j\,0.15$ pu

$I_b = 0.5 - j\,0.1$ pu $\quad Z_b = 0.03 - j\,0.15$ pu

$I_c = 0.2 - j\,0.05$ pu $\quad Z_c = 0.02 - j\,0.25$ pu. **(10 Marks)**

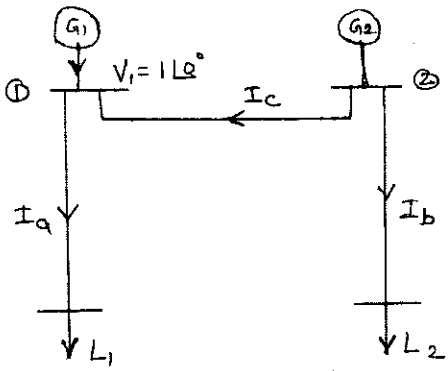

Fig.Q6(b)

7 a. Explain with necessary equations the solution of swing equation by point by point method. **(10 Marks)**

b. Explain the modified Euler's method used in solution of swing equation under transient stability studies. **(10 Marks)**

8 a. Explain Runge – Kutta method used in solution of swing equation for transient stability analysis. **(10 Marks)**

b. Explain Milne predictor corrector method for solution of swing equation. **(10 Marks)**

* * * * *