Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

Subject code: 710707N

Subject Name: Modern Power System Protection

Date: 03 /02 /2011 **Time: 02.30 pm – 05.00 pm**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain the advantages of digital relays for protection. **07**

(b) With the help of block diagram, explain the various components of hardware of a digital relay. **07**

Q.2 **(a)** Draw the generalized flow-chart for relay coordination. **07**

(b) Explain the method of full-cycle Fourier algorithm for phasor estimation. What are its' advantages? **07**

OR

(b) Explain the least square estimation technique for phasor estimation. Show its application for equations of 3-samples per data window. **07**

Q.3 **(a)** For the **figure 1** shown below, prepare the linknet structure and decide the numbers assigned to the relays by algorithm. **07**

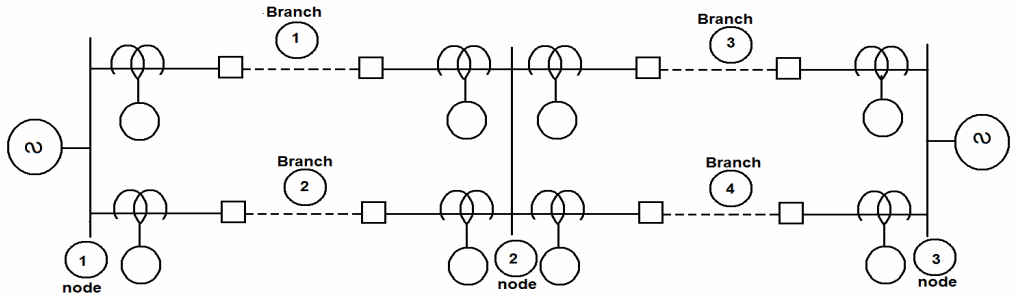

Figure 1 - Linknet Structure

(b) Using the linknet structure developed above; decide the back-up relays considering relays R_1 as primary relay. Use standard algorithm. **07**

OR

Q.3 **(a)** **07**

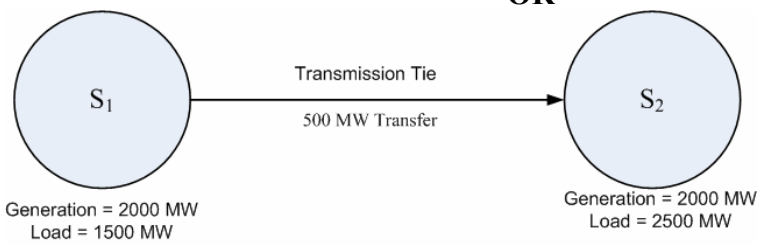

Figure 2: Interconnected system S

In the **figure 2** shown above:

(i) Find the initial rate of frequency decline for S_2, when the tie is suddenly lost. Consider 50 Hz as base frequency, inertia constant of S_2 as 4 and power factor of the machines as 0.85.

(ii) Consider that there is 2 % load reduction for 1 % frequency drop. At what frequency will the load reduction will be equal to the generation deficit caused due to tie loss.

(iii) What will happen to the auxiliaries at that frequency?

(b) Explain the criteria for deciding the number of load-shedding steps for a load shedding scheme. **07**

Q.4 **(a)** Explain the working of Induction Cylinder type frequency relay. Draw its characteristic for a typical operational delay of 6 cycles. **07**

(b) Explain the criteria for deciding the location of the frequency relays for implementing load shedding scheme. **07**

OR

Q.4 **(a)** Explain the precautions for automatic reclosing of circuit breakers. **07**

(b) Explain the factors governing the application of reclosing. **07**

Q.5 **(a)** Explain the main aspects of automatic synchronizing. **07**

(b) Explain the concept of adaptive relaying. **07**

OR

Q.5 **(a)** Explain the problems caused in relaying due to the effect of transient phenomena when a fault occurs in a series compensated transmission line. **07**

(b) Explain the principle of travelling wave based relay for directional comparison unit of carrier protection of EHV/UHV lines. **07**

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