CONTROL OF PARALLEL TRANSMISSION LINES

AIM

To study the use of in-phase & quadrature injection voltages to control load sharing between two parallel short transmission lines

EQUIPMENT

240 V, 3-phase, 10 A bench supply

Parallel short lines model (Each line is represented by a single-core 6mm ^{2}, 7 strand flexible cables suitable for 250 V supply- the resistance of the cable is 2.57 ohms, and the inductance is 485 mH)

Foster transformer -Terminals A1-A5, a1-a7
30/75 V Voltmeter
Wattmeter 5/10A, 75/150/300 V
Ammeter 5/10/20 A
Voltmeter 150/300 V
Bank of three single-phase, single-throw knife switches 13 kW Resistance bank Single-phase 10 A inductor without core (for use in series with the resistor bank)

THEORY

Explain the effect of quadrature & in-phase injection using the short line circle diagram.

PROCEDURE

1. Connect the circuit as shown in FIG.1. Explain what the circuit represents. Short-circuit the injection leads. Switch on and adjust the load (if necessary) to approximately 5 A and 500W.
2. With the circuit set for quadrature injection take readings of the power & current flowing in each line and the load. The injected values of 15V, 7.5 V, 0V, -7.5 V and -15 V may be used.
3. Re-connect the injection circuit for in-phase injection. Take the readings described in 2 above. Tabulate all the readings.

RESULTS

1. Prepare a table of the following experimental quantities for in-phase and quadrature injection

- Power, voltage and current at the load
- Power and current in each line
- Injected voltage

2. Prepare a table of values derived from the experimental results with the following quantities for in-phase and quadrature injection

- VARS in line 1,line2 and the load
- Injection voltage

Note that VARS = SQRT (VA2 -W^2)

3. Plot graphs of VARS and Watts against injected voltage in line 2 for both in-phase and quadrature injection

CONCLUSIONS

Explain the results of the different types of injection shown by your graphs e.g. describe how you would control the VARS in line 1 and the watts in line 2.

Is power flow always from the sending end to the receiving end?

What effect has the ratio of R to X (for the line0 on the slope of the lines in your graphs?

If the receiving end voltage were held constant, what would happen to the sending-end voltage?

FIG. 1 is given below

FIG.1