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Name.....................................

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SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2006

EE 2K 704—POWER SYSTEMS—II

(New Scheme)

Time : Three Hours | Maximum : 100 Marks

Answer **all** *questions.*

I. (a) Explain the procedure for formulation of bus admittance matrix using singular transformation.

(b) Discuss the advantages of using the per unit quantities in power system calculations.

(c) Explain how the transmission line loss is included in the economic dispatch problem.

(d) With the help of a block diagram, discuss the tie line model of a power system.

(e) What is the significance of specifying the three phase and single line to ground fault levels in a power system ?

(f) Establish that sequence networks do not have mutual coupling between them.

(g) What are the causes of voltage instability in a power system ?

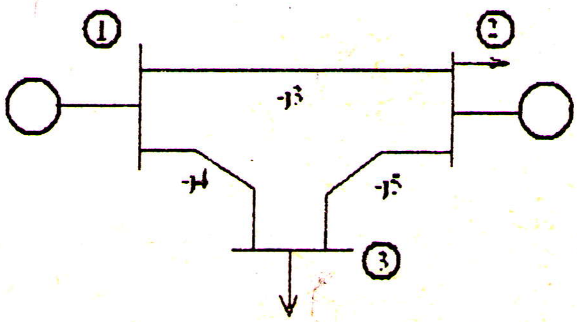
(h) Give a brief account of flexible AC transmission systems.

(8 × 5 = 40 marks)

II. (a) Show that the fast decoupled load flow solution technique is an extension of the Newton Raphson method in polar coordinates. State the assumptions clearly.

Or

(b) A three bus power system is shown below. The per unit admittances on a base of 100 MVA are indicated on the diagram. The bus data is given in the table. Determine (i) The bus admittance matrix ; (ii) Voltage at bus 2 and bus 3 after the second iteration using Gauss Siedel method. Use an acceleration factor of 1.6.



Turn over

Bus	Bus type	Generation (MW)		Load (MW)		Bus voltage (pu)	
		P	Q	P	Q	V	δ
1	Slack			0	0	1.02	0
2	P Q	25	15	50	25		
3	P Q	0	0	60	30		

III. (a) The fuel inputs to the two generating plants are given below :

$$F_1 = 0.015\,P_1^2 + 16P_1 + 50$$
$$F_2 = 0.025\,P_2^2 + 16P_2 + 30$$

The loss coefficients of the system are $B_{11} = 0.005$, $B_{12} = -0.0012$ and $B_{22} = 0.002$. The load to be supplied is 200 MW. Determine the economic operating schedule and the corresponding cost of generation if (i) the line losses are coordinated and (ii) losses are included but not coordinated.

Or

(b) The incremental fuel costs in Rs. / MWhr for the two units in a generating station are

$$\frac{dF_1}{dP_1} = 0.1P_1 + 20 \text{ and}$$
$$\frac{dF_2}{dP_2} = 0.12P_2 + 16$$

The limits of generation are 20 MW and 125 MW. Determine the incremental fuel cost and the load allocation when the load on the station is (i) 100 MW and (ii) 150 MW. Assume that both units are committed.

IV. (a) Describe the tie bar method of interconnecting the bus bar sections in a generating station.

A generating station contains four bus bar sections with four generators of 30 MVA, 12 % reactance connected to the individual bus sections. The bus bar reactance values are 10 % each. Calculate the maximum short circuit MVA fed into a fault on any bus bar . If the number of bus bar sections are increased to infinity, what will be the maximum short circuit MVA ?

Or

(b) A three phase 5 MVA, 6.6 kV alternator with X = 0.8 pu is connected to a 33 kV transmission line of impedance 0.12 + j0.48 ohms. The transformer is rated at 3 MVA, 6.6 / 33 kV with X = 0.05 pu. Determine the fault current supplied by the generator when it is operating under no load with 6.9 kV for a three phase delta connected fault at 15 km from the generator with a fault impedance of 12 + *j*48 ohm.

V. (a) (i) Explain the concept of an infinite bus.

(ii) Derive from the fundamentals, the expression for the critical clearing angle.

(iii) Discuss the effect of neutral grounding on the stability of power systems.

Or

(b) Derive the expression for the pull out curve under steady state operation of a generator connected to an infinite bus. Hence explain the term maximum excitation limit (MEL).

(4 × 15 = 60 Marks)