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B.Tech. (EL) VI Semester

POWER SYSTEM OPERATION AND CONTROL

(EE-302 C)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

(i) It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.

(ii) Answer any four questions from Part-B in detail.

(iii) Different sub-parts of a question are to be attempted adjacent to each other.

(iv) Assume missing data appropriately if any.

PART–A

1. (a) What do you mean by loadability of Transmission line? (1.5)

(b) What do you understand by flat voltage start? (1.5)

(c) What is the role of acceleration factor in load flow study? (1.5)

(d) What do you mean by critical angle? (1.5)

(e) What do you mean by frequency stability? (1.5)

(f) What are the objectives of AVR in an interconnected system? (1.5)

(g) Name the different entities in deregulated electricity market. (1.5)

(h) Define Penalty factor in EDC. (1.5)

(i) What are the major loops used in large Alternators. (1.5)

(j) Write an application of capacitor banks and explain with phasor. (1.5)

PART–B

2. The line and bus data for a three bus system is given in the following tables. The voltage magnitude at the bus-2 is to be maintained at 1.04 pu. The maximum and minimum reactive power limit for bus-2 is to maintained at 0.3 and 1.0 pu respectively. Take bus-1 as slack bus and determine the voltages at various buses by Gauss-Siedal method at the end of first iteration.

Table-1

BUS CODE	Impedance (pu)
1-2	0.05+j0.16
1-3	0.03+j0.17
2-3	0.03+j0.13

Table-2

BUS No.	Voltage (pu)	Generation (pu)		Load (pu)	
		MW	MWAr	MW	MWAr
1	1.06+j0	–	–	0	0
2	1.04	0.8	–	0	0
3	–	0	0	.54	.21

(15)

3. (a) Explain various methods of improving transient stability limit. (10)

(b) Explain the methods of improving Steady State Stability limit. (05)

4. A Generating station contains total number of three generating units. The fuel cost expressions are

$C_1 = 0.4P_1^2 + 10P_1 + 25$ Rs/hr

$C_2 = 0.35P_2^2 + 5P_2 + 20$ Rs/hr

$C_3 = 0.475P_3^2 + 15P_3 + 35$ Rs/hr

The generation limits of the units are

$30 \text{ MW} \leq P_1 \leq 500 \text{ MW}$

$30 \text{ MW} \leq P_2 \leq 500 \text{ MW}$

$30 \text{ MW} \leq P_3 \leq 250 \text{ MW}$

The total load that these supply varies between 90 MW and 300 MW. Assuming that the three units are operating all the time, compute the economic operating schedule as the load changes. (15)

5. (a) Write a note on dynamic interaction between Q-V and P-f loops. (5)

(b) A 50 Hz, 4 pole turbo-generator rated at 20 MVA and 13.2 kV has an inertia constant of 9 kW. Sec/kVA. (i) Find the K.E. stored by the rotor at synchronous speed. (ii) If the input power is 20 MW and out power is 15 MW. Find the acceleration in degree/sec^2 and in rpm/sec. (iii) Assuming the acceleration computed is constant for a period of 10 cycles. What is the change in that period. Also find the speed in rpm at the end of 10 cycles. (10)

6. Obtain the modelling of an isolated Generating system and its steady state analysis. (15)

7. (a) Explain various factors demanding of deregulation. (8)

(b) Explain in detail the effect of synchronous machine excitation. (7)
