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Total number of printed pages – 3

B. Tech
PCEL 4401

Seventh Semester (Special) Examination – 2013
POWER SYSTEM OPERATION AND CONTROL

BRANCH : ELECTRICAL

QUESTION CODE : D385

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory and any **five** from the rest.*

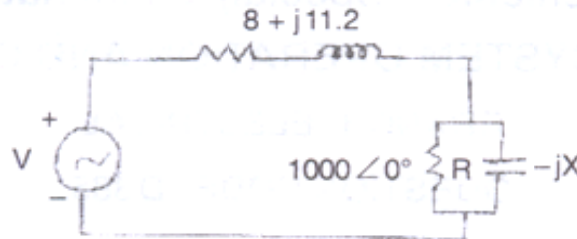
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
- (a) What is complex power ? Explain drawing power triangle.
- (b) What is the value of reactive power if the generator bus is treated as load bus ?
- (c) Explain the term 'Jacobian'.
- (d) What are the different buses exist in a powersystem ?
- (e) Write down two methods for improvement of transient stability.
- (f) The incremental of two units in a plant are
- $$IC1 = 0.3P_1 + 60 \text{ Rs / MW hr}$$
- $$IC2 = 0.4P_2 + 48 \text{ Rs / MW hr}$$
- Find the optimum sharing of load if the total load is 150 MW.
- (g) Explain the need of fly ball speed governer.
- (h) Why transient stability limit is less than the steady state stability limit ?
- (i) What is the function of ACE in an isolated control area ?
- (j) Define critical clearing angle.



P.T.O.

2. (a) The load shown in Fig (1) below consist of a R in parallel with a capacitor of reactance X. The load is fed from a single phase supply through a line impedance of $8 + j11.2 \Omega$. The rms voltage at the load terminal is $1000 \angle 0^\circ$ V rms and the load is taking 25 kVA at 0.8 p.f (lead)
Find the value of R and X. Also determine the supply voltage. 5



Fig(1)

- (b) What is reactive power ? How it is generated and absorbed in power system ? Also explain the need for power factor correction. 5
3. (a) The line impedances for a power system network is given in the following table. Draw the one line diagram showing connection between various buses. Also determine the Y bus matrix. 5

Line (bus to bus)	R, (p.u)	X (p.u)
1-2	0.05	0.15
1-3	0.10	0.3
2-3	0.15	0.45
2-4	0.10	0.30
3-4	0.15	0.15

- (b) Explain why a Y bus matrix more advantageous over Z bus matrix in power system network for load flow analysis. 5
4. (a) Briefly explain the objective of economic scheduling of power plant. Also derive Exact Co-ordination equation with reference to economic load dispatch. 5
- (b) A System consist of two generating unit with Fuel cost of
 $F_1 = 0.05P_1^2 + 20P_1 + 2$ Rs/MW hr
 $F_2 = 0.075P_2^2 + 22.5P_2 + 1.8$ Rs/MW hr
 The system operates on economical dispatch with 100MW of power generation by each plant. The ITL of plant 2 is 0.2. Find the penalty factor of plant 1. 5

5. (a) Draw the complete schematic diagram of speed governing system of a thermal power plant. Also obtain the transfer function. 5
- (b) What is meant by control area ? Draw the block diagram of a two area system. 5
6. (a) Illustrate the block diagram model of two area LFC system and obtain its static response ? 5
- (b) The speed regulation of two 950 MW alternators A and B running in parallel is 100 to 104% and 100 to 105% for full load to no load respectively . Find how these machines will share a total load of 1500 MW. 5
7. (a) Explain equal area criterion for stability analysis in power system. 5
- (b) A 50 Hz generator of reactance 0.8 p.u is connected to an infinite bus through a line of 0.4 p.u reactance. $E = 1.05$ p.u, $V = 1$ p.u. The inertia constant is 4 MJ/MVA. The generator is loaded to 70% of the maximum power limit. Find the frequency of natural oscillation. 5
8. Write short notes on any **two** : 5×2
- (a) Single line diagram of a power system
- (b) Dynamic inter action between PF and QV loop
- (c) Unit Commitment problem.