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425102

December, 2019

M.Tech. (Power System) - 1st SEMESTER

Power System Dynamics-I(MPS–102-A)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part- A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Assume any missing Data.*

PART - A

1. (a) Which type of rotor is generally used for high speed alternators or turbo alternators? Why? (1.5) CO1

(b) If the field of the synchronous motor is overexcited then what will be its power factor? (1.5) CO1

(c) How the efficiency of a synchronous generator depend on the torque angle? (1.5) CO1

(d) What are the assumptions made in modeling of synchronous machine? (1.5) CO1

(e) In what ways the characteristics of induction machine differ from synchronous machine? (1.5) CO3

(f) How the static load models are different form dynamic load models? (1.5) CO3

(g) Discuss the basic functions and types of excitation systems. (1.5) CO4

(h) What is damper winding? What is the use of damper winding? (1.5) CO1

(i) State the functions and input signals given to PSS. (1.5) CO2

(j) What are the assumptions taken in representation of saturation in stability studies? (1.5) CO2

PART - B

2. (a) Drive a mathematical model to describe the dynamic behavior of three phase salient pole synchronous machine, having two damper coils on the quadrature axis and one damper coil on the direct axis. (10) CO1

(b) Draw the functional block diagram of synchronous generator excitation control system. (5) CO4

3. (a) What are dynamic load models? Explain a thermostatically controlled load model. (7.5) CO3

(b) Discuss the open circuit and short circuit characteristics of synchronous machine and find out the saturated value of inductances. (7.5) CO1

4. (a) A 555 MVA, 24 KV, 0.9 pf, 60 Hz,3 phase 2 pole synchronous generator has

$L_{aa} = 3.2758 + 0.0458 \cos(2\theta)$ mH

$L_{ab} = -1.6379 - 0.0458 \cos(2\theta + \pi/3)$ mH

(i) Find L_d and L_q.

(ii) If stator leakage inductance L1 is 0.4129 mH, Determine Lad and Laq in Henrys. (6) CO1

(b) Obtain the equations of induction machine in dq reference frame of reference. (9) CO3

5. (a) A 555 MVA, 24 KV, 0.9 pf, 60 Hz, 3 phase 2 pole, 3600 rpm turbine generator Ra = 0.003, with the given operating conditions per unit P = 0.9, Q = 0.436, Et = 1.0, It = 1.0 φ = 25.84, Find the air gap torque Te in N-m. (6) CO2

(b) Discuss the equations to analyze the performance of synchronous machine under balanced steady state conditions. (9) CO2

6 (a) Explain the simplified model of synchronous machine in operational parameter with amortesseur neglected. (8) CO2

(b) What do you mean by governor for a turbine? Explain a mechanical hydraulic governor for a hydro turbine. (7) CO3

7. (a) What are the elements which form the excitation systems? Explain a self excited dc exciter. (7) CO4

(b) Explain a DCIA exciter mode with block diagram. (8) CO4