Roll No. | | | | | | | | | | | | |

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M.Tech.(EE) (2018 Batch) (Sem.–1)

POWER SYSTEM DYNAMICS-I

Subject Code : MTEE-102-18

M.Code : 75216

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.
3. Assume any missing data appropriately

1. a) Explain dis-advantages of per unit system of parameter measurement. (6)

   b) Prove by Power lnvariance upon transformation from three axis to two axis? (6)

2. a) Derive an expression for transformer and speed voltages developed in the armature of a two pole DC machine. (6)

   b) Describe physical concept of Park's Transformation. (6)

3. a) Write state-space model of synchronous motor using d-q axis theory. (6)

   b) Explain connection matrix [C] used in Park's transformation. (6)

4. a) Classify the power system disturbances occurring as small signal and large signal. (6)

   b) What is the purpose of power system stabilizer, and also explain its functioning with the help of blocks? (6)

5. Draw and explain block diagram of SMIB considering effects of synchronous machine field circuit dynamics. (12)

6. a) Draw and explain induction motor equivalent circuit from steady state stability point of view. (6)

   b) Explain the synchronous generator excitation control methods employed. (6)

7. Figure below shows the single line diagrams of thermal generating station consisting of four 555MVA, 24kV, 60Hz units. (12)

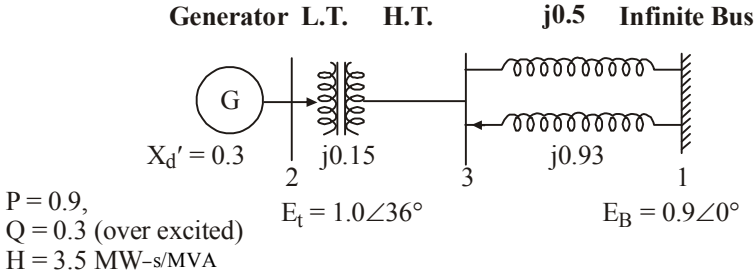

Fig.1 Single line diagram of SMIB

The post fault condition in per unit on the 2220MVA, 24kV base is as given below :

Parameter	Value	Parameter	Value	Parameter	Value
X_d	1.81	$T_{do}^{'}$	8.0	P	0.9
X_q	1.76	H	3.5 MW-s/MVA	Q	0.3 (overexcited)
$X_d^{'}$	0.3	K_D	0,10,-10	E_t	$1.0\angle 36°$
X_t	0.16	R_a	0.003	E_B	$0.995\angle 0°$

If the generators are to be modeled as a single equivalent generator represented by the classical model. Write the linearized state equation of the system. Determine the eigenvalues, left and right eigen vectors, and participation matrix for K_D=10 damping coefficient (in pu torque/pu speed).

8. The following parameters are in per unit on machine rating of a 555MVA, 24kV, 0.9 p.f. 60Hz, 3600 prm turbine-generator :

L_{ad}	1.66	L_{aq}	1.61	L_l	0.15	R_a	0.003
L_{fd}	0.165	R_{fd}	0.0006	L_{1d}	0.1713	R_{1d}	0.0284
L_{1q}	0.7252	R_{1q}	0.00619	L_{2q}	0.125	R_{2q}	0.02368

L_{fkd} is assumed to be equal to L_{ad}

When the generator is delivering rated MVA at 0.9 pf(lag) and rated terminal voltage, compute the following :

a) The Internal angle δ_i in electrical degrees. (6)

b) Per unit values of e_d, e_q, i_d, i_q, i_{1d}, i_{1q}, i_{2q}, i_{fd}, e_{fd} (6)

Assume that the effect of magnetic saturation at the given operating condition is to reduce L_{ad} and L_{aq} to 80% of the values given above.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.