QPC: RJ20MTECH033 AR 19 Reg. No

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (First Semester – Regular) Examinations, June – 2021

MPCPE1020- MODELING AND ANALYSIS OF ELECTRICAL MACHINES

(Power Electronics)

Time: 2 hrs Maximum: 50 Marks

The figures in the right hand margin indicate marks.

PART – A **(2 x 10 = 20 Marks)**

Q1. Answer **ALL** questions

a. For an electromechanical energy conversion give the energy balance equation
b. Represent graphically energy and co energy and MMF Vs Flux for varying air gap.
c. Define Field energy and Co energy.
d. The stator current of a three-phase rotating electric machine with symmetrical stator winding are

$I_{as} = \sqrt{2} I_a \cos \omega_e t, \qquad I_{bs} = \sqrt{2} I_b \cos\left(\omega_e t - \frac{2\pi}{3}\right),$

$I_{cs} = \sqrt{2} I_c \cos\left(\omega_e t + \frac{2\pi}{3}\right)$ where the currents I_a,I_b and I_c are unbalanced. Comment on the total air gap MMF due to stator currents

e. Give the expression for MMF of field winding of synchronous motors
f. Give an expression for fundamental space MMF
g. Give the expression for converting dq0 to abc quantities.
h. Explain why two-phase quantities appear as constant quantities in synchronously rotating reference frame.
i. What is phase winding of SRM?
j. What is the difference between conventional DC motor and PMBLDC motor?

PART – B **(6 x 5 = 30 Marks)**

Answer ***ANY FIVE*** questions **Marks**

2. Derive the general expression for torque in terms of energy and co-energy of a doubly excited rotating electromagnetic system **6**
3. Show that the field energy in a linear magnetic system can be given as $W_f = ½ Li^2 = ½ \Psi I = 1/2L \Psi^2$ **6**
4. Draw and discuss circuit model of 3-phase synchronous motor. **6**
5. Derive the voltage equations for synchronous motor in terms of flux linkages. **6**
6. Discuss the various operational impedances for a synchronous machine with four rotor windings **6**
7. Explain generalized modelling of single-phase induction motor. **6**
8. Explain the steady state performance analysis of switched reluctance motor. **6**

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