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**Question Paper Code: 41252**

M.E. DEGREE EXAMINATION, DECEMBER 2014.

First Semester

Power Electronics and Drives

14PPE101 - ANALYSIS OF ELECTRICAL MACHINES

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (5 x 1 = 5 Marks)

- In a linear magnetic circuit, the relation between energy  $W_{fld}$  and  $W'_{fld}$  is  
(a)  $W_{fld} > W'_{fld}$       (b)  $W_{fld} < W'_{fld}$       (c)  $W_{fld} = W'_{fld}$       (d) None
- A linear 3 phase coupled system are magnetically symmetrical if  
(a) diagonal elements are equal and all off diagonal elements of inductance matrix are also equal  
(b) diagonal elements are equal and all off diagonal elements of inductance matrix are not equal.  
(c) diagonal elements are not equal and all off diagonal elements of inductance matrix are equal  
(d) diagonal elements are not equal and all off diagonal elements of inductance matrix are also not equal.
- The mutual inductance between field winding and an armature coil may be expressed as  
(a)  $+L\cos\theta_r$       (b)  $-L\cos\theta_r$       (c)  $-X\cos\theta_r$       (d)  $+X\cos\theta_r$
- The expression for the slip at maximum torque is  
(a)  $S_m = r_r'G$       (b)  $S_m = -r_r'G$       (c)  $S_m = r_rG$       (d)  $S_m = -r_rG$
- Park's equations are obtained by setting the speed of the arbitrary reference frame  
(a) equal to stator speed      (b) greater than rotor speed  
(c) less than rotor speed      (d) equal to rotor speed

PART - B (5 x 3 = 15 Marks)

- Write the significance of co – energy.

7. Write in brief about the commonly used reference frames.
8. Draw the time – domain block diagram of a permanent magnet dc machine.
9. Write the voltage and torque equation of induction machine.
10. Define rotor angle and angle between rotors.

PART - C (5 x 16 = 80 Marks)

11. (a) Derive the expression for torque and force developed in a multiple excited magnetic systems. (16)

Or

- (b) Explain the procedure of determining, air gap mmf and inductance per phase using physical machine data. (16)

12. (a) (i) Enumerate about the change of variables in capacitive elements. (8)

- (ii) Briefly explain the transformation between reference frames. (8)

Or

- (b) Discuss in detail about variables observed from several frames of reference. (16)

13. (a) Derive the voltage and torque equations of dc machines. (16)

Or

- (b) Explain the solution of dynamic characteristics of dc shunt machine by Laplace transformation. (16)

14. (a) (i) Obtain the voltage equation of an induction machine in arbitrary reference frame variables. (8)

- (ii) Draw and discuss the free acceleration characteristics of an induction machine. (8)

Or

- (b) Describe the dynamic performance of induction machine during a three phase fault at machine terminals with necessary characteristics. (16)

15. (a) Write explanatory notes on the following:

- (i) Park equations (8)

- (ii) Importance of steady state analysis of synchronous machines. (8)

Or

- (b) Explain the significance of computer simulation in the analysis of synchronous machines in detail. (16)