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Question Paper Code : 13932

M.E. DEGREE EXAMINATION, JANUARY 2015.

First Semester

Power Electronics and Drives

PX 7101 — ANALYSIS OF ELECTRICAL MACHINES

(Common to M.E. Power Systems Engineering)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define magnetically coupled circuits.

2. State the term co-energy.

3. Draw the equivalent circuit of a separate field and armature excited DC shunt machine.

4. Explain the steady state operating characteristics of a shunt connected DC machine.

5. Write the notations of variables used in the different reference frame.

6. What is the necessity of transformation of variables from one reference frame to other?

7. Name the commonly used frame of reference for the description of behaviour of an induction motor.

8. Write the electromagnetic torque equation in terms of flux linkages of an induction motor.

9. Mention the number of circuits present in a typical stator and rotor windings of a synchronous machine.

10. What do you understand from the term dynamic performance of a synchronous machine?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the electromechanical energy conversion employing electric field as an means of transferring energy.

Or

(b) Illustrate the winding arrangement of an elementary four pole, three phase, star connected salient pole synchronous machine with schematic diagram.

12. (a) Draw the schematic diagram of an elementary 2-pole DC machine and derive the expression for mutual inductance between the field winding and the armature.

Or

(b) Explain the dynamic performance of permanent magnet DC machine during starting and sudden changes in load torque.

13. (a) Let $f_{as} = \cos t$; $f_{bs} = \frac{1}{2}t$ and $f_{cs} = -\sin t$ are signals in 'abc' frame; determine the expression for f_{ds}, f_{qs} and f_{0s} in 'dq_0' frame.

Or

(b) Explain the transformation of stationary circuit variables to the arbitrary reference frame for three phase inductive circuit.

14. (a) Derive the torque equation of a three phase induction motor in machine variables.

Or

(b) Illustrate the dynamic performance of an induction motor during sudden changes in the load torque and fault.

15. (a) Derive the stator voltage equations of a synchronous machine in arbitrary reference-frame variables.

Or

(b) Explain the Park's equations of transformation of stator variables to rotor reference frame.

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