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Question Paper: U1402

M.E. DEGREE EXAMINATION, NOV/DEC 2024

First Semester

Power Electronics and Drives

21PPE102 – MODELING AND ANALYSIS OF ELECTRICAL MACHINES

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1. (a) Write short notes on Reference-frame theory, commonly used reference frames & Transformation between reference frames. CO1-U (20)
Or
(b) Explain Generalized theory of rotating electrical machine and Kron's primitive machine CO1-U (20)
2. (a) (i) Derive the mathematical model of a cumulatively compounded DC motor in matrix form. (10 Marks) CO2-App (20)
(ii) Derive the mathematical model of a DC shunt motor in state variable form. (10 Marks)
Or
(b) Obtain the state space model of a 3- ϕ induction motor with CO2-App (20)
(i) Stator reference frame (10 Marks)
(ii) Rotor reference frame. (10 Marks)
3. (a) Explain the construction and operating principle of surface & interior permanent magnet machines CO1-U (20)
Or
(b) Draw the equivalent circuits of a 2-phase unsymmetrical induction machine using voltage equations in stationary reference-frame variables. CO1-U (20)

4. (a) Obtain the dynamic model of a 3- ϕ induction motor in synchronizing rotating reference frame in state variable form and represent them in matrix form. CO2-App (20)

Or

(b) For a 2 -pole, 3-phase, Y-connected, salient – pole synchronous machine, derive the voltage equations in machine variables and in arbitrary reference frame variables. CO2-App (20)

5. (a) Apply Park's transformation on a three phase synchronous machine and obtain its voltage and torque equations. CO2-App (20)

Or

(b) Derive the expression for armature mutual inductances of a salient pole synchronous machine from a consideration of its basic parameters. CO2-App (20)