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Question Paper Code: 47303

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Seventh Semester

Electrical and Electronics Engineering

14UEE703- SPECIAL ELECTRICAL MACHINES

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Vernier motor is an _____ type synchronous motor
 - unexcited reluctance
 - excited reluctance
 - unexcited permeance
 - excited permeance
- The material's resistance to becoming magnetized is called
 - Resistance
 - Resistivity
 - Reluctance
 - Permeance
- Operation of stepper motor at high speed is referred to as
 - Fast forward
 - Slewing
 - Inching
 - Jogging
- The rotational speed of a given stepper motor is determined solely by the
 - Shaft load
 - Polarity of stator current
 - Step pulse frequency
 - Magnitude of stator current.
- A switched reluctance motor differs from a VR stepper motor in the sense that it _____
 - has rotor poles of ferromagnetic material
 - rotates continuously
 - is designed for open-loop operation only
 - has lower efficiency

6. For which one of the following applications a Reluctance Motor is preferred?
- (a) Electric shavers (b) Refrigerators
(c) Signaling and timing devices (d) Lifts and hoists
7. Which one of the following permanent magnet material has low coercive force?
- (a) Cobalt – samarium (b) Alnico
(c) Barium and strontium ferrites (d) Neodymium – iron - boron
8. The qualities aspired to obtain a good permanent magnet is/are _____
- (a) high residual flux (b) lowcoercivity
(c) high coercivity (d) high residual flux and high coercivity
9. In order to get maximum torque in Permanent Magnet Synchronous Motor, the angle between the stator flux and rotor flux is kept closer to.
- (a) 90° (b) 45° (c) 30° (d) 60°
10. In PMSM the airgap flux distribution is _____
- (a) Sinusoidal (b) Quasi sinusoidal
(c) Triangular (d) both a and b

PART - B (5 x 2 = 10 Marks)

11. Draw the phasor diagram of Synchronous Reluctance Motor.
12. Define holding torque and detent torque in Stepper motor.
13. Point out the disadvantages of Switched Reluctance Motor.
14. How the demagnetization occurs in PMBLDC motor.
15. What are the assumptions made in derivation of torque equation for Permanent Magnet Synchronous Motor?

PART - C (5 x 16 = 80 Marks)

16. (a) Discuss about the various types of Synchronous reluctance motor based on rotor construction with neat sketch (16)

Or

- (b) Derive the voltage and torque equation of synchronous reluctance motor (16)

17. (a) Describe the construction and operation of Hybrid Stepper Motor with different modes. (16)

Or

(b) Explain the closed loop control concept of Stepper motor with neat diagram. (16)

18. (a) (i) Describe the various operating modes of Switched Reluctance motor (8)

(ii) Explain the speed-torque characteristics of Switched Reluctance Motor. (8)

Or

(b) Discuss the necessity of power electronic circuit in Switched Reluctance Motor and explain different types of converter circuits in detail. (16)

19. (a) (i) Sketch the structure of controller for permanent magnet brushless DC motor and explain the functions of various blocks. (8)

(ii) Explain the speed- torque characteristics of Permanent Magnet Brushless DC motor in detail. (8)

Or

(b) A PMBLDC motor has torque constant 0.12 Nm/A referred to DC supply. Find the motor's no load speed when connected to 48V DC supply. Find the stall current and stall torque if armature resistance is $0.15\Omega/\text{phase}$ and drop in controller transistor is 2V . (16)

20. (a) Write short note on constructional features of Permanent Magnet Synchronous Motor. (16)

Or

(b) Describe the microprocessor based control of permanent magnet synchronous motor with neat diagram. (16)

