PSNA COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS
MODEL EXAMINATION
Sub: Special Electrical Machines (EE1001)

PART A

Answer all the questions   **(10*2 = 20)**

1. Write the torque equation of PM synchronous reluctance motor. Identify alignment torque and reluctance torque.
2. List the applications of synchronous reluctance motor.
3. List the advantages of multistack Variable Reluctance Motor.
4. Define the term step angle.
5. Write the disadvantages of switched reluctance motor.
6. Bring out the salient difference between the stepper motor and the switched reluctance motor.
7. Mention the types of materials used in PMDC motor.
8. Write the applications of PMDC motor.
9. How a PMSM is started?
10. How PM motors are named based on the wave shape of emf.

PART B
Answer all the questions   **(5*16 = 80)**

11. (a) (i). List the difference between axial and radial type synchronous reluctance motor with its neat figures.   (6)

(ii). Describe the construction and principle of operation of synchronous reluctance motor.   (10)

(OR)

(b) Explain the torque speed characteristics of synchronous reluctance motor and compare it with the induction motor.   (16)

12. (a) (i). What is the need for suppressor circuit in the driver of stepper motor? Give different methods with its merits and demerits.   (8)
    (ii). Design the unipolar drive for the following details.   (8)
        R_m=1.23 ohms, L_m= 7.94mA, I_{ph}= 3.5A, τ_{e1}= 1 ms, τ_{e2} = 0.5ms

(OR)

(b) Explain the principle of operation of VRSM with all the modes of excitation and write short notes on micro stepping.   (10+6)

13. (a) (i). With neat block diagram explain the importance of closed loop control in switched reluctance motor. (10)

(ii). Compare the switched reluctance motor with stepper motor. (6)

(OR)

(b) (i). Explain the torque speed characteristics of switched reluctance motor. (8)

(ii). A SRM with 6:4 poles has a stator pole arc of 30 degree and a rotor pole arc of 32degree. The aligned and un aligned inductance values are 10.7 mH and 1.5 mH. Calculate the instantaneous torque when the rotor is 30 degree before the aligned position and the phase current is 7 A. Neglect fringing. (8)

14. (a). Describe the construction of PM brushless DC motor with its advantages and disadvantages and compare it with conventional DC motor. (8+8)

(OR)

(b) (i). Derive the torque and emf equation of PMBLDC motor with its wave forms. (8)

(ii). A PMBLDC motor has a stall torque of 1 Nm with a stall current of 5A. Find its no load speed in rpm when fed from a 28V dc supply. During on over load the motor temperature becomes excessive and the magnet loss is 12% of their remanent flux density. If the armature resistance is 0.8 Ohms. Find the speed at which the motor will run when the load torque is 0.3 Nm. Assume a total brush voltage drop of 2 V and the supply voltage of 28 V dc. Ignore friction and other losses. (8)

15. (a). Discuss the vector control and microprocessor control of PM synchronous motor. (8)

(OR)

(b) (i). Derive the torque and emf equation for ideal sine wave motor. (8)

(ii). A brushless PM sine wave motor has an open circuit voltage of 173 V of its corner point speed of 3000 rpm. It is supplied from a PWM converter whose maximum voltage is 200 V. Neglecting resistance and all other losses estimate the maximum speed at which maximum current can be supplied to the motor. (8)

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