

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID :121656 Roll No.

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B.Tech.

(SEM. VI) THEORY EXAMINATION 2013-14

SPECIAL ELECTRICAL MACHINES

Time : 3 Hours

Total Marks : 100

Note :- Attempt all five questions. Each question carries equal marks.

1. Discuss any **four** parts of the following : (5×4=20)
- Compare the merits and demerits of single-cage and double-cage induction motors.
 - What are the important problems peculiar to Linear Induction Machine ?
 - Draw the Speed-Torque characteristics of switch reluctance motor.
 - The useful torque of a 3- ϕ , 50Hz, 8-pole induction motor is 190N-m. The rotor frequency is 1.5Hz. Calculate the rotor copper losses if mechanical losses are 700 Watts.
 - Discuss the torque-pulse rate characteristics of a stepping motor.
 - What is the difference between stepper motors and switched reluctance motors ?

2. Attempt any **two** of the following : **(10×2=20)**
- (a) Explain the constructional details and working principle of operation of synchronous reluctance motors with neat diagrams.
 - (b) Explain the operation of 3- ϕ bipolar BLDC motor with neat diagrams and switching table
 - (c) Explain open loop and closed loop control of stepper motor.
3. Attempt any **two** of the following : **(10×2=20)**
- (a) Explain the principle of operation and constructional features of hybrid motor in detail.
 - (b) Discuss the phenomenon of "Single Phasing" when applied to the three-phase induction motors, designed for continuous working. Explain the difference in behaviour when the single-phasing occurs in the primary and the secondary windings.
 - (c) What is the motor torque τ_m required to accelerate an initial load of $3 \times 10^{-4} \text{ kgm}^2$ from $f_1 = 1000 \text{ Hz}$ to $f_2 = 2000 \text{ Hz}$ during 100 m/sec ? The frictional torques τ_f is 0.05 N-m and step angle is 1.8° .
4. Attempt any **two** parts of the following : **(10×2=20)**
- (a) Explain the modes of operation of Power Controller for Permanent Magnet Brushless DC motor with a neat diagram.
 - (b) Discuss the construction, principle of operation and characteristics of universal motors.
 - (c) A permanent magnet DC commutator motor has no-load speed of 6000 rpm when connected to a 120 V supply. The armature resistance is 2.5Ω and rotational and gross lines may be neglected. Determine the speed when the supply voltage is 60 V and the torque is 0.5 Nm .

5. Attempt any **two** of the following : **(10×2=20)**
- (a) Derive the EMF and torque equation of permanent magnet synchronous motors.
 - (b) Discuss the slip-power recovery scheme of a 3- ϕ induction motor control. What are its merits & demerits.
 - (c) Write short notes on any **two** of the following :
 - (i) Capacitor Motor
 - (ii) Shaded Pole Motor
 - (iii) PCB Motors
 - (iv) Repulsion Motors.