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EEE012

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

PAPER ID :121656 Roll No. 1 1 0 3 2 2 1 0 2 5

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)**

   (a) Comapare the merits and demerits of single-cage and double-cage induction motors.

   (b) What are the important problems peculiar to Linear Induction Machine ?

   (c) Draw the Speed-Torque characteristics of switch reluctance motor.

   (d) 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.

   (e) Discuss the torque-pulse rate characteristics of a stepping motor.

   (f) What is the difference between stepper motors and switched reluctance motors ?

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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 3×10^{-4} kgm^2 from f_1 = 1000 Hz to f_2 = 2000 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 6000rpm when connected to a 120V supply. The armature resistance is 2.5Ω and rotational and gross lines may be neglected. Determine the speed when the supply voltage is 60V and the torque is 0.5 Nm.

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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.