10724

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

PAPER ID : 2049 Roll No.

B.Tech.

(SEM IV) EVEN SEMESTER THEORY EXAMINATION, 2009-2010

ELECTRICAL MACHINES

Time : 3 Hours   *Total Marks : 100*

Note : *Attempt **ALL** questions.*

1.   Attempt **any four** parts of the following :   **(4x5=20)**

   (a)   Explain polarity test of a transformer and mention its importance.

   (b)   Give the constructional differences between a core type and shell type transformer.

   (c)   In what way is all day efficiency different from conventional efficiency ? How is all day efficiency calculated ?

   (d)   State the applications of autotransformers. What are the reasons of higher efficiency of autotransformers as compared to conventional transformers ?

   (e)   What are distinguishing features of Δ - Y and Δ - Δ 3-phase connections ?

(f) Explain with the help of connection and phasor diagrams, how Scott connections are used to obtain two-phase supply from 3-phase supply mains ?

2. Attempt **any two** parts of the following : (2x10=20)

(a) Explain the constructional features and principle of working of a dc machine. Derive the emf equation of a dc generator.

(b) A 4-pole dc shunt motor working on 250 V takes a current of 2A when running at no load at 1000 rpm. How much back emf is generated ? What will be its back emf, speed and percentage speed drop if the motor takes 51A at a certain load ? Armature resistance and shunt field resistance are 0.2Ω and 250Ω respectively.

(c) Explain how torque is produced in dc motor ? Explain the speed-torque characteristics of a dc shunt motor and a dc series motor. Mention different applications of dc shunt and dc series motors.

3. Attempt **any two** parts of the following : (2x10=20)

(a) Discuss the theory of operation of a 3-phase induction motor. What is meant by slip of an induction motor ? Explain the importance of slip in operation and performance of induction motor.

(b) A 1000V, 24 pole, 50 Hz, 3-phase star connected induction motor has a slip ring rotor having a resistance of 0.02Ω and stand still reactance of 0.3Ω per phase. The motor develops full load torque at a speed of 245 rpm. Find :
(i) Full load torque
(ii) Speed at maximum torque and
(iii) Maximum torque.
Neglect stator impedance. The ratio of stator to rotor turns is 2.

(c) Explain why a starter is needed for starting an induction motor ? With the help of a circuit diagram explain how an auto-transformer is used in starting an induction motor ?

4. Attempt **any two** parts of the following : (2x10=20)

(a) By means of a neat diagram, describe the main parts of an alternator. Describe the difference in construction of rotors of alternators used in hydroelectric plants and steam plants.

(b) A 3-phase, 1500 kVA, star-connected, 50 Hz, 2300V alternator has a resistance between each pair of terminals as measured by direct current is 0.16Ω. Assume that the effective resistance is 1.5 times the ohmic resistance. A field current of 70A produces a short-circuit current equal to full-load current of 376 A in each line. The same field current produces an emf of 700V on open circuit. Determine the synchronous reactance of the machine and its full load regulation at 0.8 power factor lagging.

(c) Explain why a synchronous motor does not develop a starting torque ? Explain one method of starting a synchronous motor.

5. Attempt any two parts of the following : **(2x10=20)**

(a) Explain the operation of single phase induction motor with the help of double revolving field theory.

(b) Explain the principle of operation of stepper motor. What are their applications ?

(c) What is two phase servomotor ? What are its applications ? Draw its torque-speed characteristics for various control voltages.

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