EEE-501

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

PAPER ID : 2111   Roll No. ☐☐☐☐☐☐☐☐☐☐

B. Tech.

(SEMESTER. V) THEORY EXAMINATION, 2012-13

ELECTROMECHANICAL ENERGY CONVERSION – II

Time : 3 Hours]   [Total Marks : 100

Note :   Answer all the Sections.

SECTION – A

1. Answer all parts of this section. $2 \times 10 = 20$

    (a)   Explain why closed type slots are often used for small induction motors ?

    (b)   What is the condition for producing maximum torque in a 3-phase induction motor ?

    (c)   What is the speed of rotor mmf of a 3-phase induction motor w.r.t. its stator mmf ?

    (d)   Why a 3-phase synchronous motor will always run at synchronous speed ?

    (e)   What is meant by hunting of synchronous motor ?

    (f)   What is the purpose of damper winding ?

    (g)   Does a resistance start induction motor have a high or low starting torque ? Explain.

    (h)   How the direction of rotation of a capacitor-start induction motor is changed ? Discuss.

    (i)   What is a shaded-pole motor ?

    (j)   What happens when the auxiliary winding of a capacitor motor disconnected during running condition ?

SECTION – B

2. Answer any three parts of the following : $3 \times 10 = 30$

    (a)   Prove that resultant field in case of 3-phase induction machine is given by $\phi_{res} = \frac{3}{2} \phi_{max}$ where ϕ_{max} is the maximum flux in any one phase.

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(b) Draw the equivalent circuit of a 3-phase induction motor under blocked rotor condition.

(c) What is synchronous condenser ? Explain with the help of phaser diagram its operation and application.

(d) A 2.3 kV, 3-phase star-connected synchronous motor Z_s = (0.2 + j 2.2) ohms per phase. The motor is operating at 0.5 power factor leading with a line current of 200 A. Determine the generated emf/phase.

(e) Derive the equivalent circuit of a single phase induction motor with the help of double revolving field theory.

SECTION – C

Answer **all** questions in this section.   **5 × 10 = 50**

3. What is slip ? Draw the torque-slip characteristic of an induction motor. Derive the torque slip relation.

OR

By means of power-flow diagram, show the flow of power in a 3-phase induction motor from the electrical source to mechanical load at the motor shaft. Based on above, show that

$$P_g : P_{cu} : P_m = 1 : S : (1 - S)$$

where all terms used have their usual meanings.

4. Describe no-load and blocked rotor test for 3-phase induction motor.

OR

Briefly explain the phenomenon of Cogging and crawling.

5. Explain effect of varying excitation on armature current and power factor in a synchronous motor. Draw & discuss V curves.

OR

What is the nature of power factor in a power system ? Explain how a synchronous motor can be used for power factor improvement, with proper vector diagram.

6. Define the terms synchronous reactance and voltage regulation of alternator. Explain synchronous impedance method of determing voltage regulation of an alternator.

OR

An alternator is connected to an infinite bus and is running at no load. Explain briefly how to increase its real and reactive power outputs.

7. Describe briefly various starting methods for single phase induction motor.

OR

Name three types of stepper motors and comment on their constructional differences.

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