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TEE – 406

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

PAPER ID : 2050 Roll No. | | | | | | | | | | |

B.Tech.

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

ENERGY CONVERSION

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt ALL the questions.*

*(ii) All questions carry **equal** marks.*

1. Attempt **any two** parts : **(2x10=20)**

(a) Explain the constructional features and principle of working of rotating electrical machine.

(b) Deduce the expression for torque in round rotor machine.

(c) Determine the breadth and pitch factor for a 3-phase winding with 2 slots per Pole per phase. The coil span is 5 slot-pitches. If the flux density wave in the air-gap consists of the fundamental and 24 % third harmonic, calculate the percentage increase in the rms value of the phase voltage due to harmonic.

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

(a) Explain the concepts field control and armature control method for DC motors with their advantages and disadvantages.

(b) A 220 V shunt motor with an armature resistance of 0.5 Ω is excited to give constant main field. At full load the motor runs at 500 rpm and takes an armature current of 30 A. If a resistance of 1.0 Ω is placed in the armature circuit, find the speed at

(i) full load torque

(ii) double full load torque.

(c) Draw and explain the different characteristics of DC series, shunt and compound motors.

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

(a) Explain the construction and principle of operation of a synchronous motor with the relevant diagram.

(b) Draw the equivalent circuit diagram for the three phase induction motor. Also draw the torque-slip characteristics.

(c) A 200V, 3-phase star connected synchronous motor has an effective resistance and synchronous reactance of 0.2 Ω and 2.2 Ω respectively. The input is 800 kW at normal voltage the induced line emf is 2500 V. Calculate the line current and power factor.

4. Attempt **any four** parts : (4x5=20)

(a) The junction capacitance of a thyristor in the state of reverse blocking is 25 pF. What is the dv/dt capability of the thyristor if the device can be turned on following flow of charging current of 0.30 A ?

(b) What is role of free wheeling diode in a half wave rectifier feeding an inductive load ?

(c) How the firing pulses in a cycloconverter should be arranged to get a low frequency output voltage nearly sinusoidal ?

(d) Describe the operation of a DC series motor on a single phase semi converter. Develop the governing equations.

(e) The latching current for a thyristor being 50mA, the device is inserted between a load and a dc voltage source of 50 volts. Calculate the minimum width of the gate pulse required to turn on the thyristor when the load is :

(i) Purely inductive having an inductance of 120 mH and

(ii) Consisting of resistance and inductance of 12 ohm and 100mH respectively.

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

(a) What are different methods of speed control of induction motor ? Why thyristorised method is advantageous ?

(b) Describe the operation of a three-phase 120° mode voltage source inverter and draw its voltage waveforms.

(c) Explain the term duty cycle in chopper control circuit. Describe the operation of step-down chopper circuit.

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