

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

PAPER ID : 2050

Roll No.

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B. Tech.

(SEM. IV) THEORY EXAMINATION 2010-11

ENERGY CONVERSION

Time : 3 Hours

Total Marks : 100

Note : Attempt **all** the questions. All questions carry equal marks.

1. Attempt any **two** parts of the following : $(2 \times 10 = 20)$

- (a) A pole, 3-phase, 50 Hz, 2.3 kV synchronous machine has 42 slots. Each slot has two conductors in a double layer winding. The Coil pitch is 17 slots. Each phase winding has two parallel paths. Calculate the flux/pole required to generate a phase voltage of $2300/\sqrt{3}$ V.
- (b) Explain the rotating magnetic field concepts for rotating machines.
- (c) Derive emf equation for an alternator. Explain clearly the meaning of —
- (i) Distribution factor and
- (ii) Coil span factor.
- Give expression for them.

2. Attempt any **two** parts of the following : $(2 \times 10 = 20)$

- (a) A 220 V D.C. shunt motor draws a no-load armature current of 2.5 A when running 1400 rpm. Determine its speed when taking an armature current of 60 A, if armature

reaction weakens the flux by 3 percent. Take armature resistance = 0.2Ω .

- (b) Derive an expression for the torque of a DC motor. Also differentiate between the generator action and motor action of a DC machine.
- (c) Discuss the application of shunt, series and compound motors.

3. Attempt any **two** parts of the following : (2×10=20)

- (a) What are V-curves ? How are they determined experimentally ?
- (b) (i) Draw equivalent circuit of a 3-phase induction motor.
(ii) A 12 pole, 3 phase alternator is coupled to an engine running at 500 rpm. It supplies a 3-phase induction motor having a full -load speed of 1440 rpm. Find the percentage slip and number of poles of motor.
- (c) Discuss briefly the following :
 - (i) Crawling
 - (ii) Cogging.

4. Attempt any **four** parts of the following : (4×5=20)

- (a) State the difference between an SCR and TRIAC, also discuss common methods of turning off of a thyristor.
- (b) Write short notes on :
 - (i) IGBT
 - (ii) power MOSFET
 - (iii) GTO

- (c) Define the following keeping in mind rectification :
- (i) Form Factor of output voltage
 - (ii) Ripple factor of output voltage
 - (iii) Transformer utilization factor
 - (iv) Harmonic factor
 - (v) Displacement factor
 - (vi) Crest factor.
- (d) A three phase bridge rectifier is supplied from a star connected supply having 440 V line value at 50 Hz frequency. The average load current being 100A. Find the load resistance and load voltage.
- (e) Why half wave rectifiers are not much used in industries ?
What is its possible effective application in industry ?

5. Attempt any **two** parts of the following : **(2×10=20)**

- (a) How is it possible to construct a transistorised three phase bridge inverter using six transistors ? Describe the operation for both 180° mode of conduction. Why this inverter is called quasi-square wave inverter ?
- (b) Draw the schematic of a three phase current source inverter and describe its operation.
- (c) How inverters can be used as voltage controller of rotor circuit for a three phase wound rotor induction motor ?