Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

PME5H001

5th Semester Regular / Back Examination 2018-19

ENERGY CONVERSION TECHNIQUES

BRANCH : MECH

Time : 3 Hours

Max Marks : 100

Q.CODE : E109

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 **Short Answer Type Questions (Answer All-10)** **(2x10)**

a) What do you mean by energy is conserved in a electro-magnetic energy conversion devices?

b) How and why annealing process is done in transformer core ?

c) The magnetic flux density in the core of a 4.4-kVA, 4400/440-V, 50-Hz, step-down transformer is 0.8 T (rms). If the induced emf per turn is 10 V, determine the primary and secondary turns,

d) Write down the principle of operation of synchronous motor? What is the application of this motor?

e) What is the significance of term 'back emf'?

f) Why is an induction motor called an asynchronous motor? Write one of the advantages of squirrel cage induction motor.

g) Draw and identify the stable operating point of an induction motor from its torque-speed.

h) Why a single phase induction motor is not self starting?

i) When applied voltage per phase is reduced by one-half in an induction motor, to what factor the starting torque would be reduced?

j) What is the voltage regulation of an alternator supplying 0.75 leading p.f. load at rated terminal voltage of 3000 V and having no load induced emf of 2000V?

Part- II

Q2 **Focused-Short Answer Type Questions- (Answer Any EIGHT out of TWELVE)** **(08x06)**

a) Write down briefly the construction and principle of operation of single phase transformer. Find the induced emf equation as well.

b) Draw and explain the power angle curve of a three phase alternator showing the different power factor regions.

c) Draw the phasor diagram for an alternator operating at leading, lagging and unity power factor loading.

d) Explain the variation in torque when the load is increased upon (a) a shunt motor, (b) a series motor, and (c) a compound motor. What is the advantage of a cumulative compound motor over a series motor?

e) Enumerate the various losses in rotating type DC machine. Derive the condition for maximum efficiency of a DC machine.

f) Explain the various types of three phase transformer connections and its applications.

g) Derive the condition for maximum efficiency of single phase transformer.

h) Draw and discuss the load characteristics of DC series and cumulatively compound DC generator.

i) Explain the principle of operation of a DC motor and derive the torque developed in armature.

j) Explain various methods of speed control of DC shunt motor with neat diagram and show the torque-speed characteristics at constant power and constant torque mode.

k) Focusing on the reduction of magnetic losses, explain the construction of single phase transformer.

l) A DC series motor is started with load, explain.

Part-III

Long Answer Type Questions (Answer Any TWO out of FOUR)

Q3 **a)** Showing the various components used in DC machines explain their functions. **(8+8)**

b) A 25 kW, 250V, DC shunt generator has armature and field resistances of 0.06 ohm and 100 ohm respectively. Determine the total armature power developed when working (i) as a generator delivering 25 kW output and (ii) as a motor taking 25 kW input.

Q4 **a)** Describe the voltage build up of separately excited DC generator. What is boost generator? **(8+8)**

b) In a 50-KVA, star-connected, 440V, 3-phase, 50-Hz alternator has armature resistance of 0.25 ohm per phase and synchronous reactance is 3.2 ohm per phase. Determine at rated load and unity power factor (i) no-load e.m.f. E_0 (ii) line voltage (iii) percentage voltage regulation on full-load

Q5 **a)** The following data were obtained from testing a 48-KVA, 4800/240-V, step-down transformer : **(8+8)**

Test	Voltage in Volt	Current in Amp	Power in Watt
Open circuit test	240	2	120
Short circuit test	150	10	600

Draw the equivalent circuit and find the transformer parameters as viewed from (a) the high voltage side and (b) the low-voltage side.

b) Derive the expression for induced emf in a three phase alternator. Explain the pitch factor, the distribution factor and their effects.

Q6 **a)** What are the different types of DC generator? Explain the necessary conditions for build up the voltage of a self excited shunt generator. **(8+8)**

b) An 8 pole dc shunt generator with 778 wave-connected armature conductors and running at 500 r.p.m. supplies a load of 12.5 ohm resistance at terminal voltage of 50 V. The armature resistance is 0.24 ohm and the field resistance is 250 ohm. Find the armature current, the induced e.m.f. and the flux per pole.