Printed Pages: 2

EE-301

Roll No. | | | | | | | | | | |

B.Tech
(SEM III) ODD SEMESTER THEORY EXAMINATION, 2015-16
ELECTRO-MECHANICAL ENERGY CONVERSION – I

Time: 3 Hours *Maximum Marks: 100*

Note: *Attempt all questions.*

Q.1. *Attempt any **TWO** parts of the following.* 10**x2=20**

a) Derive the expression of the voltage induced in a generic machine in generator form.
b) Explain the concept of Energy and Co-Energy in an electro-mechanical energy conversion process.
c) Derive the expression for the Torque in an electric motor.

Q.2. *Attempt any FOUR parts of the following.* 5x4**=20**

a) Derive the expression of induced EMF in a DC generator. What is the effect of type of winding induced EMF? Which type of armature winding is preferred for high capacity generators and why?
b) Write in detail about armature reaction phenomenon? Explain its adverse effects.
c) Why are Interpoles and Compensating windings used in DC machines? Explain their placement, connections and their corrective roles in DC machines.
d) Explain how the commutation process works in a DC machine. What are faulty commutations and their disadvantages?
e) Draw the OCC and explain the development of back emf in a DC shunt generator.
f) Explain the External and Internal characteristics of a self excited DC generator.

Q.3. *Attempt any **TWO** parts of the following.* **10x2=20**

(a) Explain whether a DC motor is self starting or not. Draw the diagram of a three point starter and explain its working. Which lacuna of three point starter is overcome by four point starter and how?
(b) Attempt the following.
   i) A 4 pole, separately excited wave wound DC machine with negligible armature resistance is rated for 230 volt and 5 KW at a speed of 1200 RPM. If the same armature coils are reconnected to form a lap winding, what is the rated voltage (in volts) and power in KW at 1200 RPM of the reconnected machine if the field circuit is left unchanged?
   ii) Describe Hopkinson's test in detail.
(c) In various speed control methods used for a DC motors, explain the sequence of events that occur to cause a change in the speed.

Q.4. *Attempt any **TWO** parts of the following.* **10x2=20**

a) Answer the following.
   i) Explain how a zero voltage regulation condition is possible only for a leading power factor load in a single phase Transformer?
   ii) Discuss about a test that is performed on two identical transformers, where the losses only are supplied by the source while keeping them fully loaded. Name the test.

b) The maximum efficiency of a single phase, 100KVA, 1000/500 volts, 50 Hz transformer is 98% and it occurs at 80% full load, 0.9 power factor lagging. Find the efficiency at a) Full load, 0.8 power factor leading, b) 90% full load at unity power factor.

c) Why and how are the Open circuit and Short circuit tests performed in a single phase Transformer? Why are only one type of losses considered while the other is neglected in these tests?

Q.5. *Attempt any **TWO** parts of the following.* **10x2=20**

(a) Explain the star-star, delta-delta, star-delta (-30 degrees) and star-delta (+30 degrees) connections in a three phase transformer.

b) Two single phase transformers T1 and T2 each rated 500 KVA are operated in parallel. Percentage impedances of T1 & T2 are (1+j6) and (0.8 +j4.8) respectively. To share a load of 1000 KVA at 0.8 lagging power factor, find the contribution of T2 in KVA.

c) Explain the excitation phenomena in single and three phase transformers.