B.TECH
(SEM-III) THEORY EXAMINATION 2019-20
ELECTRO-MECHANICAL ENERGY CONVERSION-I

Time: 3 Hours   *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 10 = 20**

a.	Why does the energy storage in a magnetic material occur mainly in the air gap?
b.	What is the significance of co-energy?
c.	Define the term armature reaction in dc machines.
d.	What are the conditions to be fulfilled for a shunt generator to build up voltage?
e.	Enumerate the factors on which the speed of a DC motor depends.
f.	Why field control is considered superior than armature control method of DC shunt motor?
g.	Can the voltage regulation of a transformer go to negative? If so under what condition?
h.	Distinguish power transformers & distribution transformers?
i.	Write the condition for parallel operation of transformer.
j.	What are the limitations of open delta connection?

SECTION B

2.   **Attempt any *three* of the following:**   **10x3=30**

a.	Discuss the principle of "Electro mechanical energy conversion". Also explain its applications and limitation
b.	A 220 V DC shunt motor on no-load runs at 900 rpm takes 5A. The total armature and shunt field resistance are 0.2 and 220 ohms respectively. Calculate the speed when loaded and taking a current of 50A, if armature reaction weakens the field by 3%.
c.	What is the necessity of Starter in DC Motor? List the types of starter and Explain Three Point Starter with neat diagram
d.	Open circuit and short circuit tests are performed on a 10kVA, 220V/110V, 50 Hz transformer, and both tests are performed with the instrument on the high-voltage side, and the following data are obtained: Open-circuit test: input voltage= 220V, input current= 3.16A, input power =500W. Short-circuit test: input voltage=65V, input current =10A, input power 400W. Obtain the approximate equivalent circuit, referred to the a) High voltage side, b) Low voltage side.
e.	Draw the connection diagram of open-delta system and show that, $$\frac{S_{open\,\Delta}}{S_{closed\,\Delta}} = \frac{1}{\sqrt{3}}$$

SECTION C

3.   **Attempt any *one* part of the following:**   **10x1=10**

a.	Derive an expression for electromagnetic torque developed in singly excited linear magnetic system.
b.	Show that in a linear magnetic system the energy and co-energy are represented by the same expression.

4.   **Attempt any *one* part of the following:**   **10x1=10**

a.	Explain the principle of operation of DC generator. Also derive the expression for the emf generated in the armature winding of a DC generator.
b.	Discuss in detail the phenomenon of commutation in DC machines and also explain the methods adopted to improve commutation.

5.   **Attempt any *one* part of the following:**   **10x1=10**

a.	Two identical dc shunt machines when tested by Hopkinson's method gave following data: line voltage 230V, line current excluding both the field currents 30 A, motor armature current 230 V, field currents 5A and 4 A. if the armature resistance of each machine is 0.025ohm, calculate efficiency of both the machines.
b.	Explain with the help of neat diagram, Ward Leonard Method used for speed control of DC motor. What are the advantages and disadvantages of this method?

6.   **Attempt any *one* part of the following:**   **10x1=10**

a.	What is an auto transformer? Explain the advantages and disadvantages of auto transformer. Compare the conductor savings of auto transformer with a conventional two winding transformer.
b.	Briefly explain the sumpner's test and polarity test.

7.   **Attempt any *one* part of the following:**   **10x1=10**

a.	What do you understand by "load sharing" in three phase transformer? Also mention its basic role and limitations in three phase transformer.
b.	Explain the working principle and constructional detail of three winding transformer. Also mention the importance of third winding.