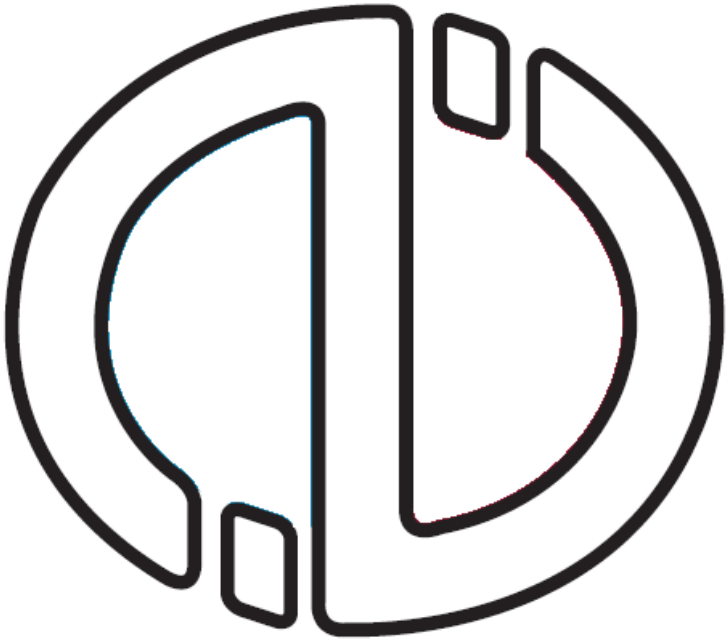

ANADOLU UNIVERSITY

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

EEM 311 Principles of Energy Conversion Laboratory

Fall 2016-2017

Experiment 6 : Universal Motor – DC Operation

Purpose :

To experiment on the operation of a universal motor under dc supply. To calculate the efficiency of the motor with various loading conditions.

Background and Theoretical Discussion :

Universal motors are designed as dc motors. However they can also run well on ac. No-load speed of universal motors is quite high, often in the range of 20000 rpm. Having high speed capability, universal motors of a given horsepower rating are significantly smaller than other kinds of ac motors operating at the same frequency. Their starting torque is relatively high. These characteristics make universal motors ideal for devices such as hand drills, hand grinders, food mixers, routers, vacuum cleaners, and like, which require compact motors operating at speeds greater than 3000/3600 rpm.

Equipment List :

1	**DL 1013M2**	Power Supply
1	**DL 1031**	Digital Power Measuring Unit
1	**DL 1019M**	Elecromagnetic Brake
1	**DL 2006C**	Torque Meter
1	**DL 1029**	Universal Motor
1	**DL 1025**	DC generator
1	**DL 2025D**	Tachometer
1	**DL 1017R**	Resistive load bank
1	**DL 1017L**	Inductive load bank
1	**Wavetek**	Hand Multimeter

Procedure :

After the set up of the motor under test and the brake, make all connections in accordance with the attached diagrams.

1. Set the main switch “ON” and, acting on the variac, adjust the power supply until the motor reaches up to 3000 rpm. Let the motor run a few minutes for the steady state temperature to be reached.
2. Keep the motor dc source constant at a level you adjusted before for 3000 rpm.
3. Set magnetic brake voltages from 25 V to 200Vç
4. Record required values to fill the following data table.

Magnetic Brake Voltage	V_{in}	I_{in}	P_{in}	P_{out}	Torque (Nm)	Speed (rpm)	Efficiency (%)
25							
50							
75							
100							
125							
150							
175							
200							

For your calculations use following formulas.

Input power $P_{in} = V_{in} \times I_{in}$

Output power $P_{out} = 2\pi \times \left(\frac{n}{60} \right) \times T$

Efficiency $\eta = \frac{P_{out}}{P_{in}}$