LOAD TEST ON THREE-PHASE INDUCTION MOTOR

JUNE 12

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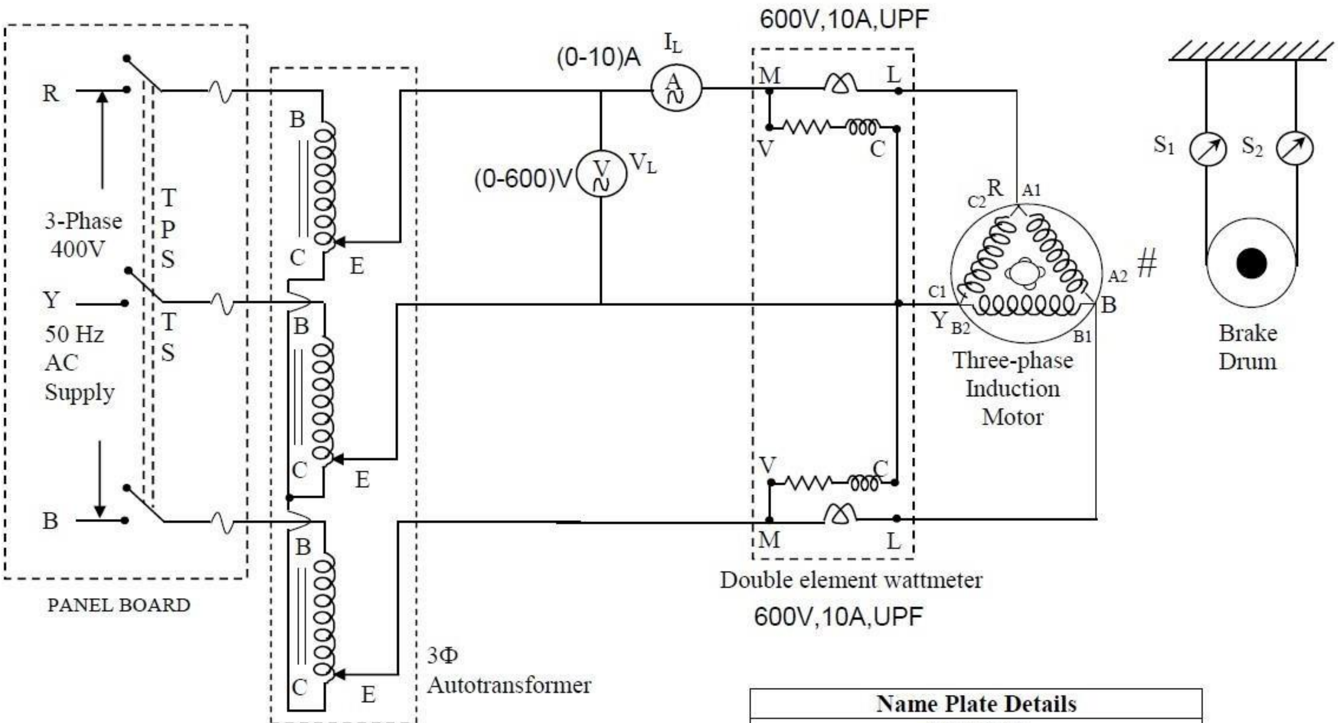
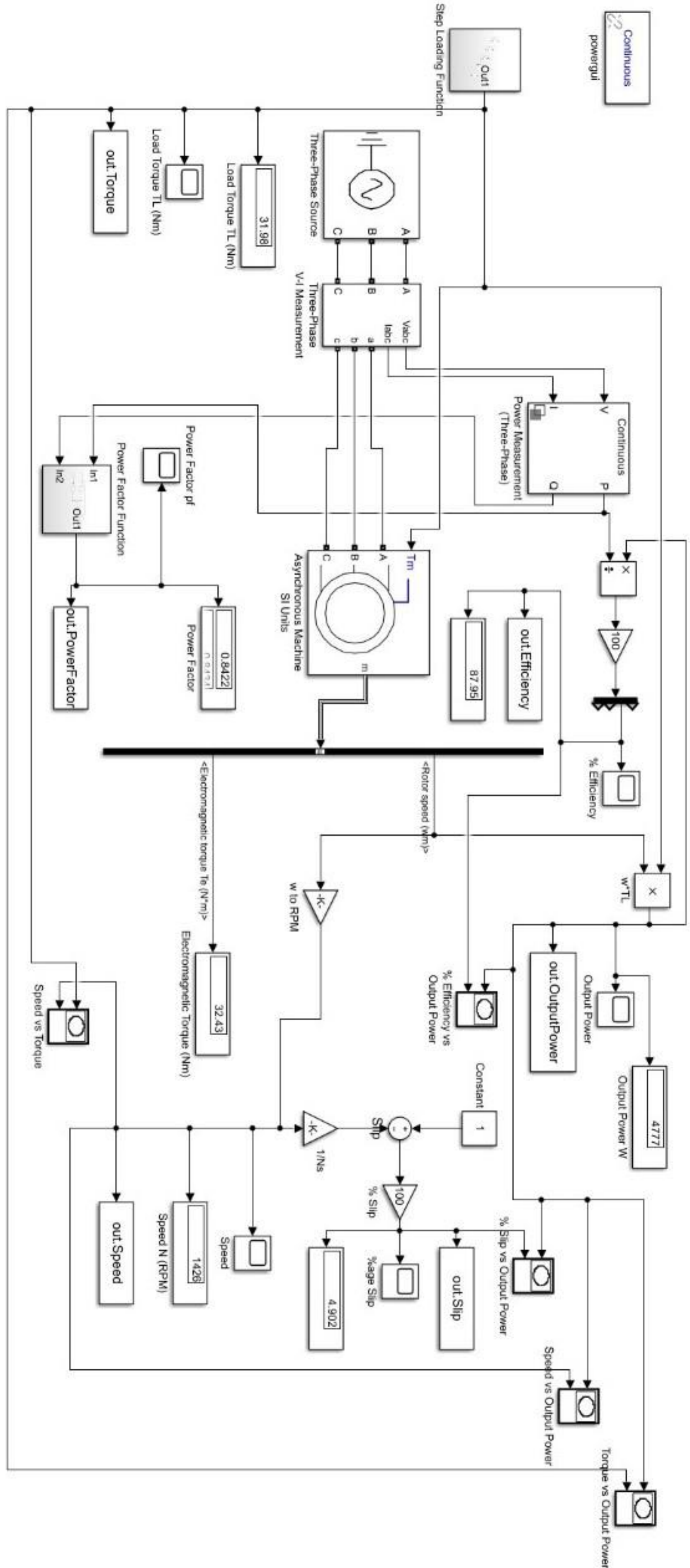
Circuit Diagram-

CIRCUIT DIAGRAM – LOAD TEST ON THREE-PHASE INDUCTION MOTOR

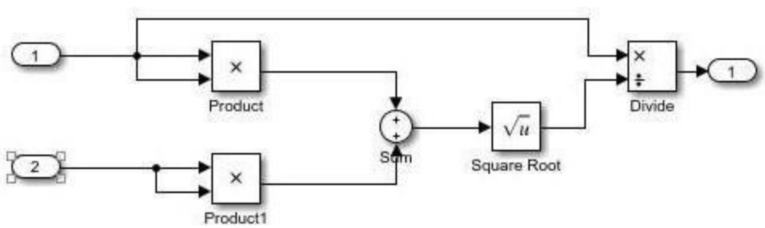


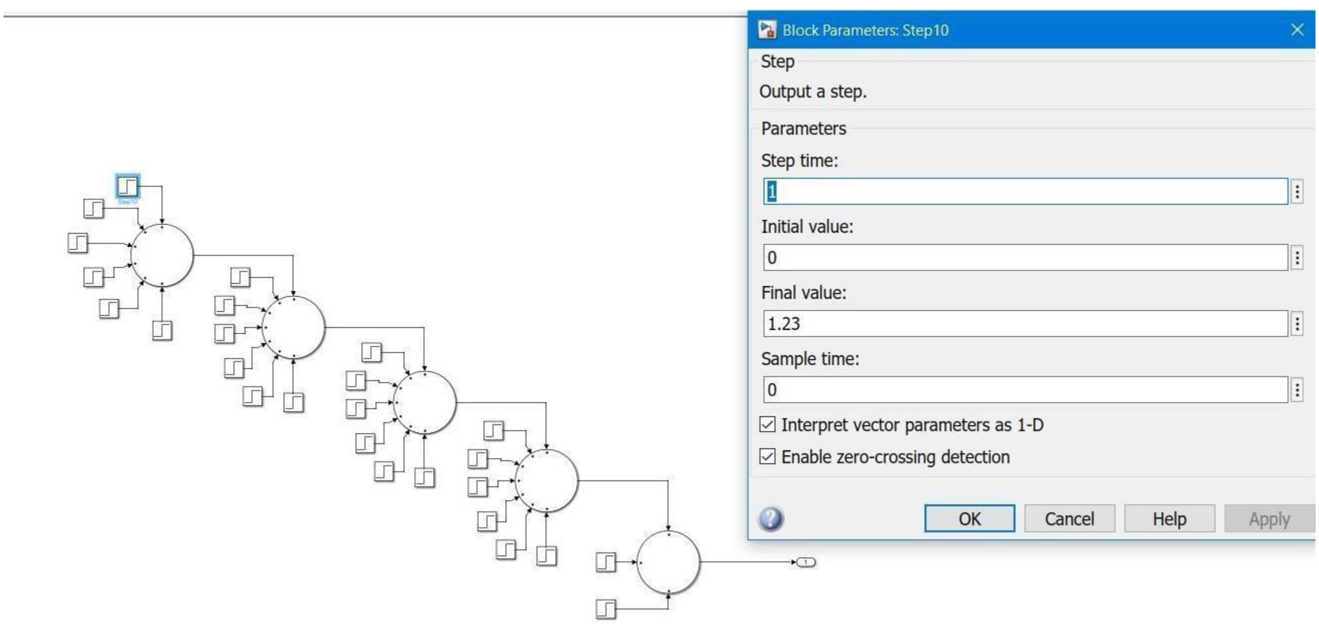
Name Plate Details
MOTOR
RATED VOLTAGE :
RATED CURRENT :
RATED POWER :
RATED SPEED :

Simulation Diagram -

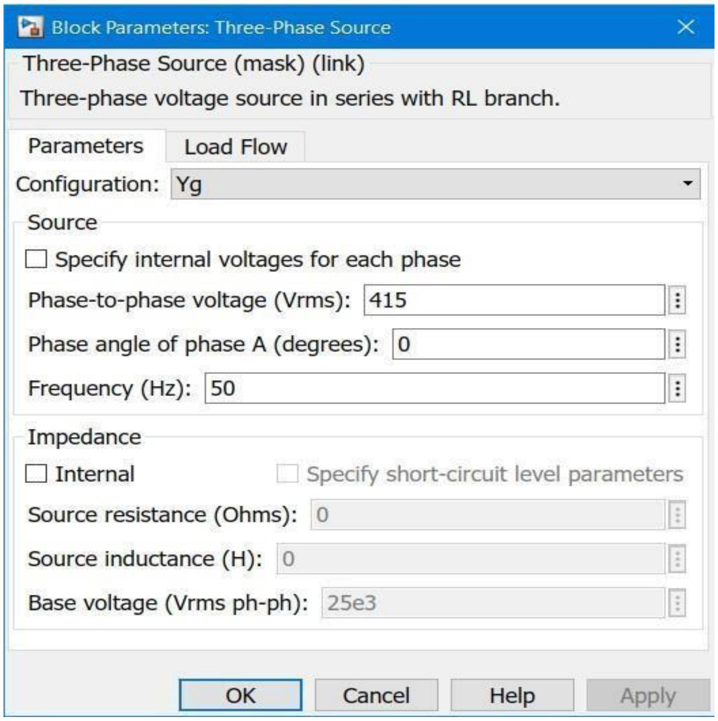


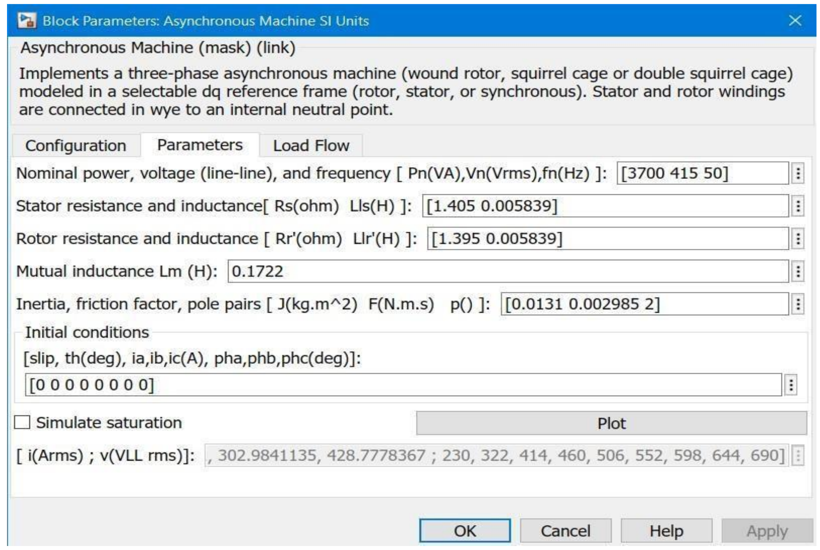
Sub-Systems used-

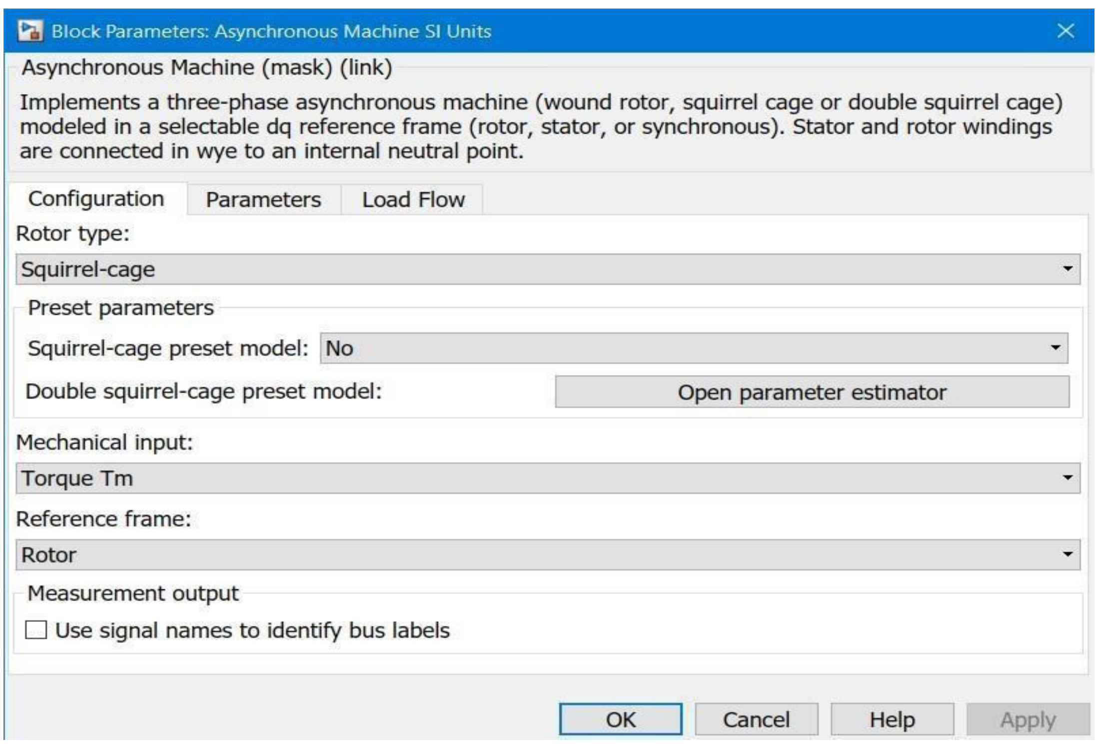




Operating Conditions -



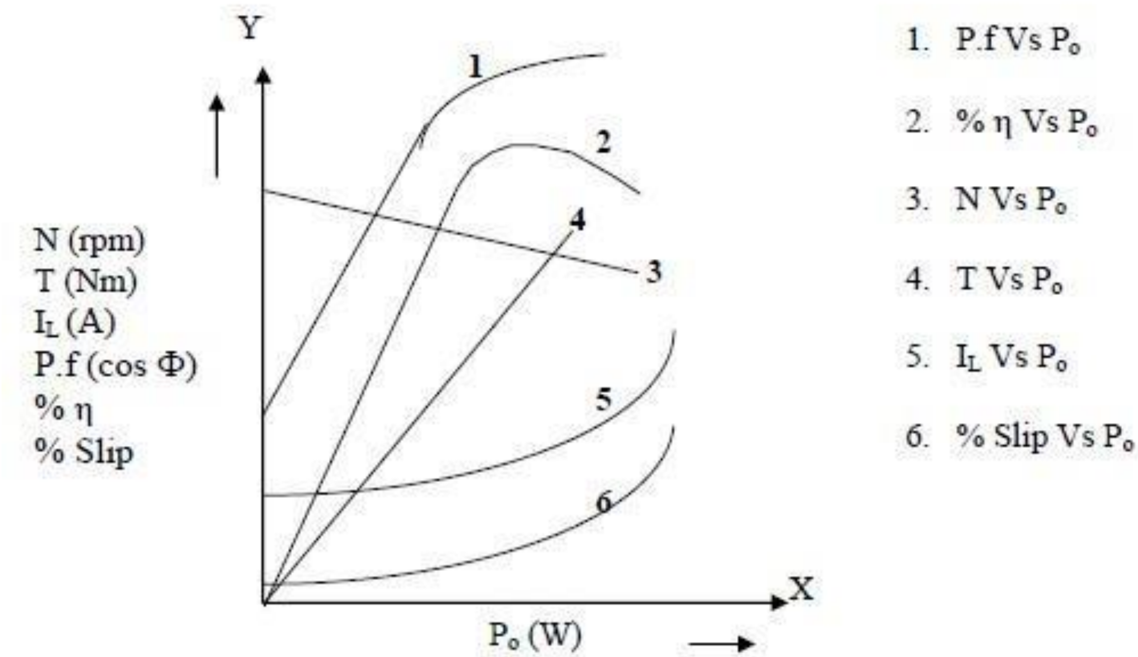




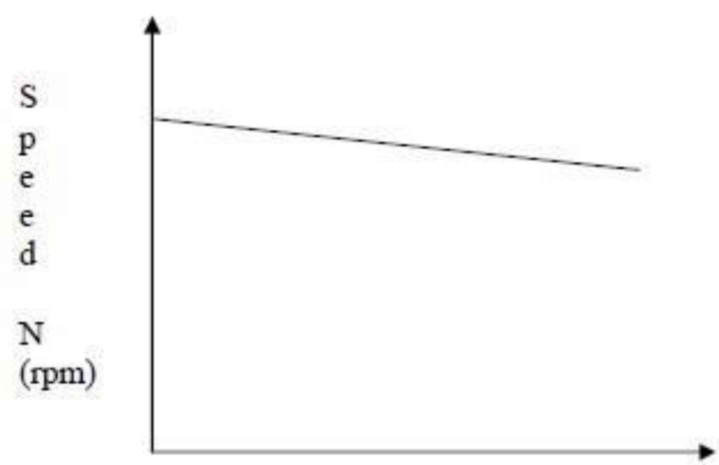
Characteristic Curves -

Theoretical -

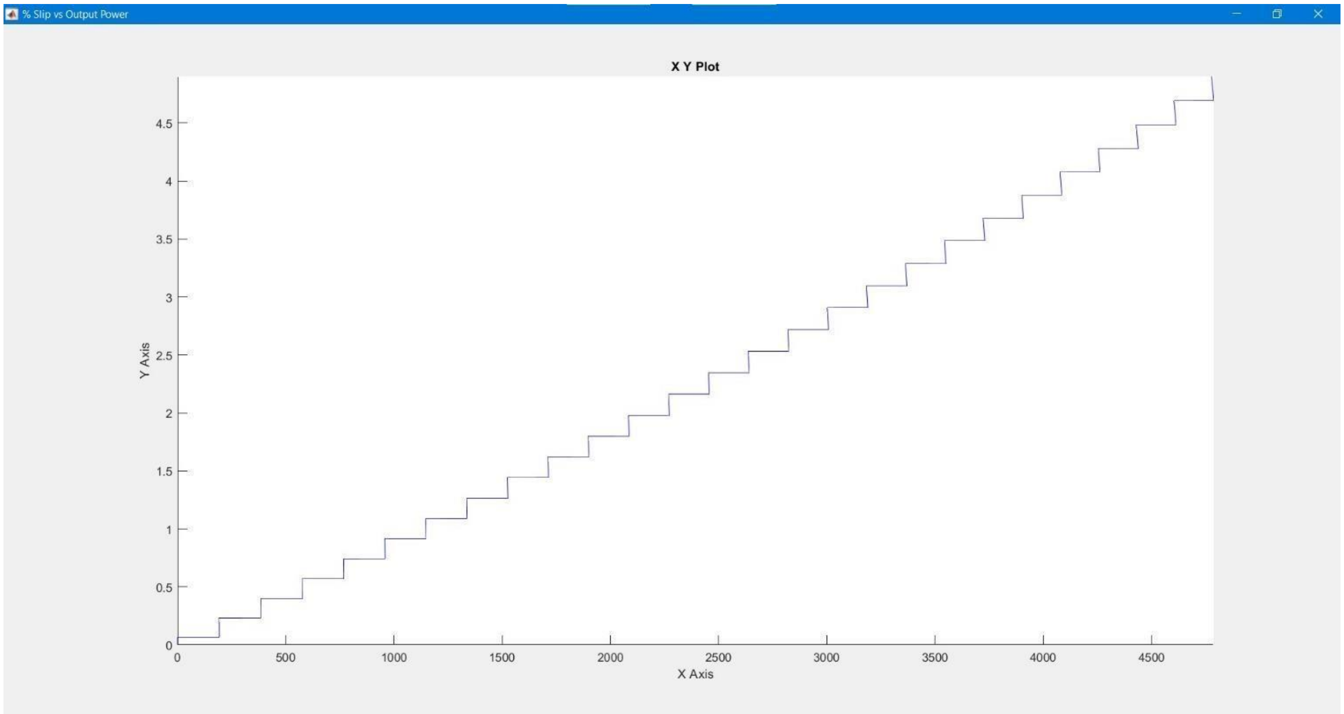
PERFORMANCE CHARACTERISTICS



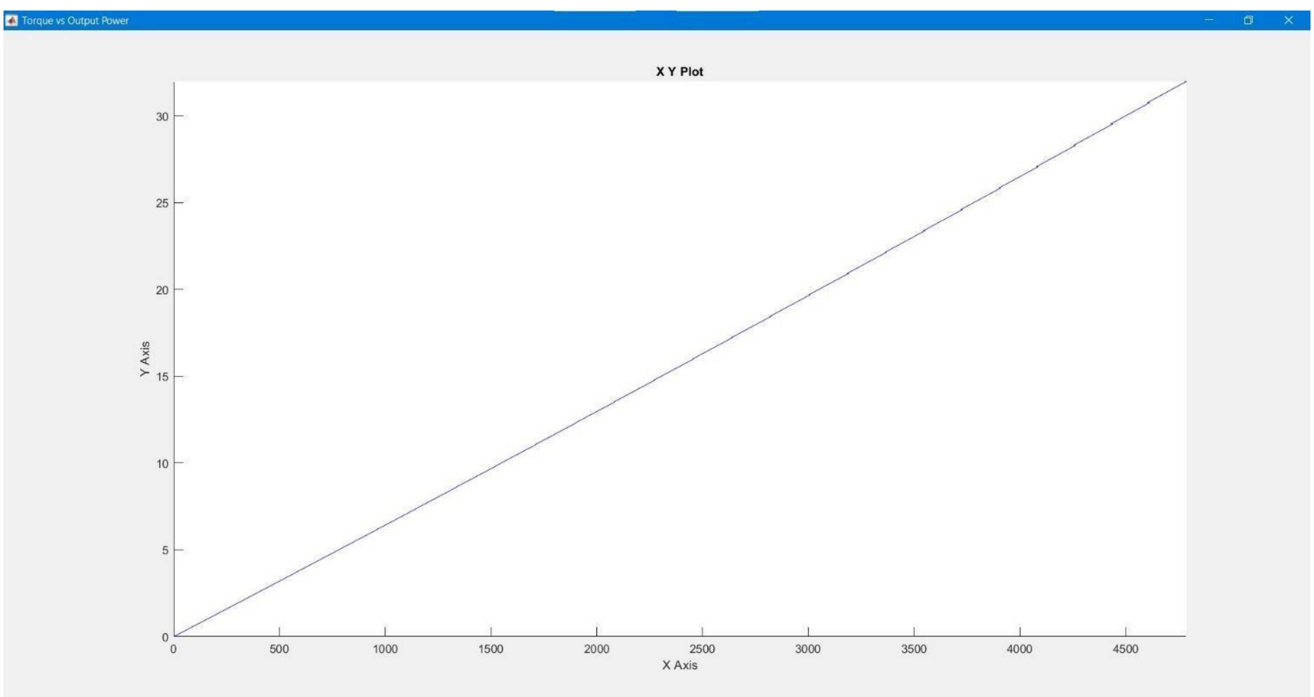
SPEED Vs TORQUE

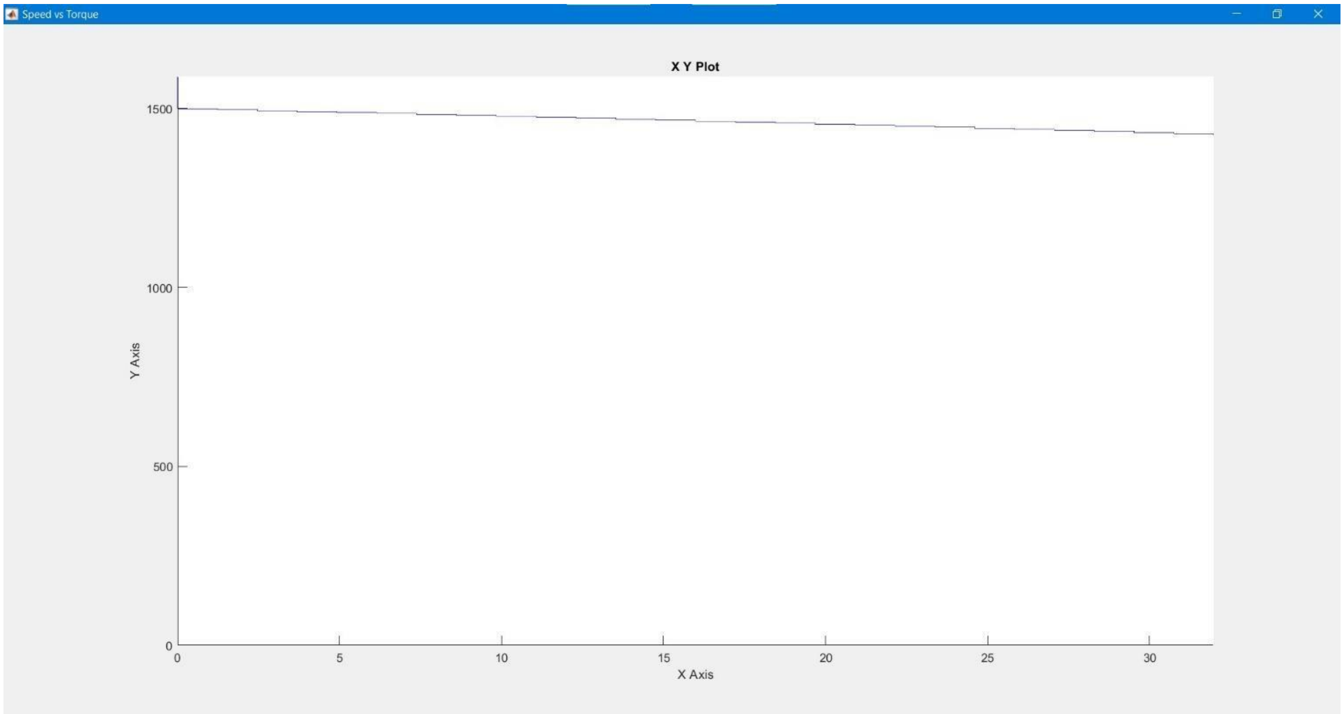


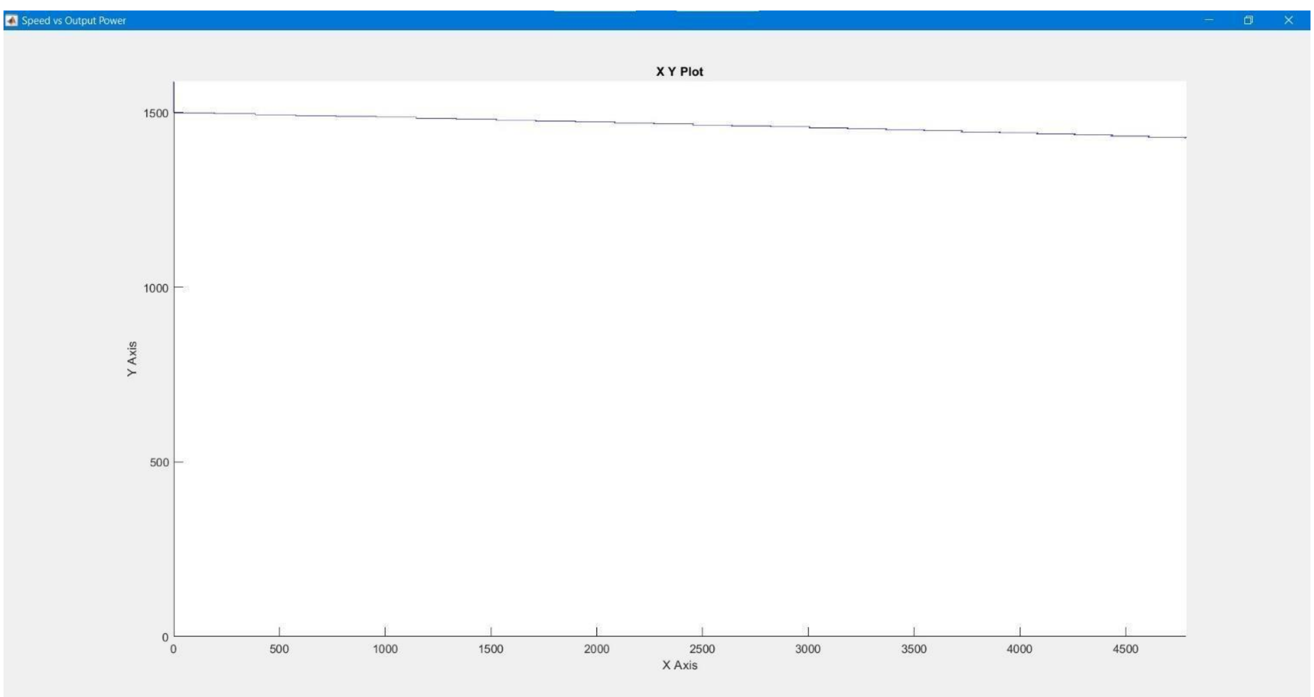
Simulated -

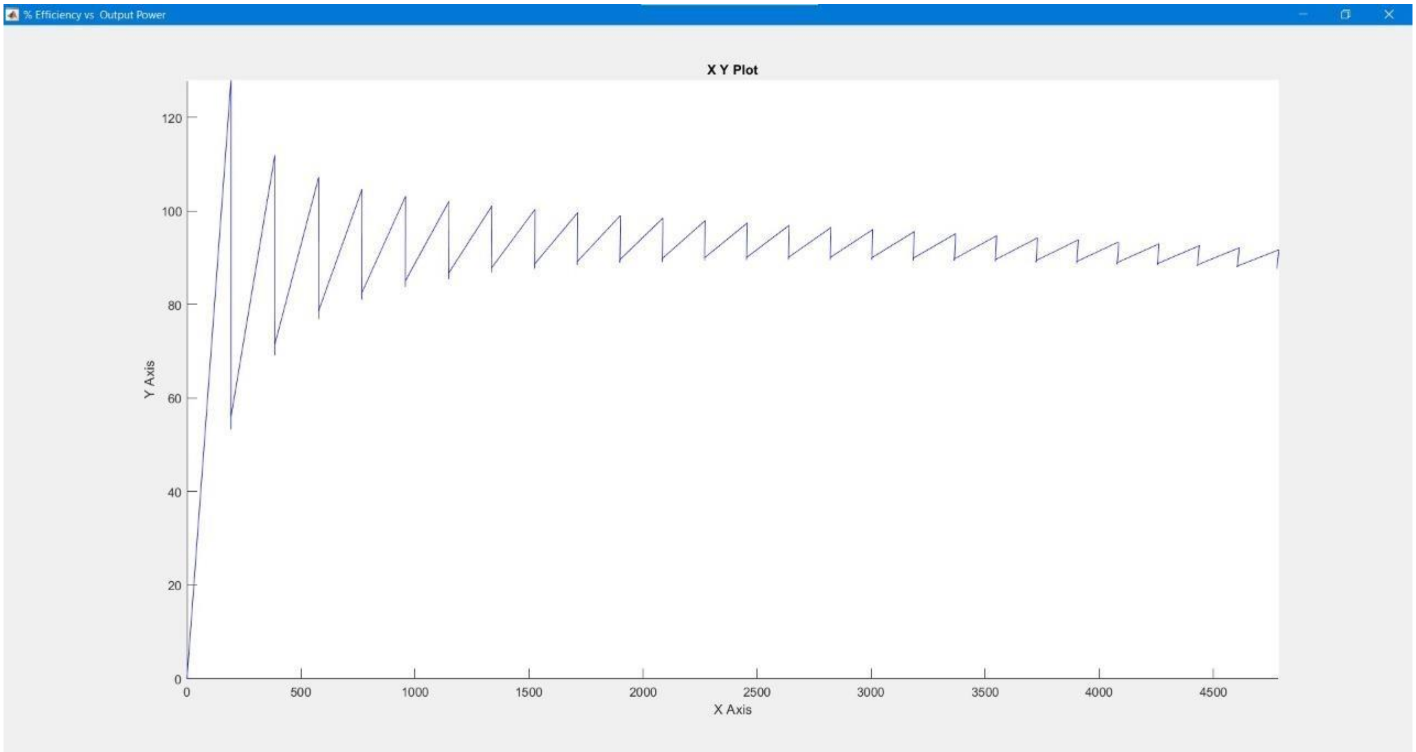


Full load slip=4.902%




Speed vs Torque
X Y Plot
1500
1000
500
0
Y Axis
0
5
10
15
20
25
30
X Axis


Speed vs Output Power
X Y Plot
1500
1000
500
0
Y Axis
0
500
1000
1500
2000
2500
3000
3500
4000
4500
X Axis


% Efficiency vs. Output Power
X Y Plot
Y Axis
X Axis
0
20
40
60
80
100
120
0
500
1000
1500
2000
2500
3000
3500
4000
4500

Inference -

Power Factor vs Output Power -

1. As can be observed, the power factor curve demonstrates a linear nature but then it follows a curved path.
2. Power factor of induction motor on NO-LOAD is very low because of the high value of magnetizing current. With the increase in load the power factor increases because the power component of the current is increased. Low power factor operation is one of the disadvantages of induction motor. An induction motor draws heavy amount of magnetizing current due to presence of air gap between the stator and rotor. Thus, to reduce the magnetizing current in induction motor the air-gap is kept as small is possible.
3. Input power factor can also be calculated from the readings of two wattmeters for balanced load.
4. When the induction motor is on NO-LOAD speed is slightly below the synchronous speed. The current due to induced emf in the rotor winding is responsible for production of torque required at NO-LOAD. As the load is increased the rotor speed is slightly reduced. The emf induced in the rotor causes a surge in current to produce higher torque, until the torque developed is equal to torque required by load on motor.

Speed vs Torque -

1. The said curve follows a linear nature having a negative slope.
2. The marginal drop in speed (~2-5%) happens as we load the machine from zero (No load) to maximum (Full load).
3. The load torque is dependent on the load connected to the shaft. As the load increases then the electromagnetic torque (responsible for the shaft rotational speed) decreases as well as speed decreases. This can be derived by the formula

$P = \omega\tau$

Power is always same for constant power operation. So, if the load torque increases the speed decreases and vice versa.
In this way speed of the motor decreases with the increasing of load in rotor shaft.

Dichotomy -

Simulation	Practical
1. Being an ideal machine, the term "rated power" is irrelevant as there are no limits to amount of current it can withstand.	1. The rated power is a constant value calculated according to the rated current and voltage.
2. Simulation proves to be a much more efficient method of application	2. Practical experiment takes a lot of time and money to be implemented.
3. Efficiency is better since there are no stray losses. $\eta = 95\%$	3. Factors such as windage losses, frictional losses depreciate efficiency. $\eta = 87\%$
4. Virtually no errors.	4. Human error plays a role.
5. Energy efficient since only a computer is run.	5. An induction motor consumes heavy wattage.
6. Risks during a simulation are irrelevant.	6. Running a loaded induction machine comes along with chances of being electrocuted.