

**Electrical Machines Laboratory**  
**Department of Electrical Engineering, IIT Kharagpur**  
**Session: Spring, 2021-22**  
**Experiment # 2**

**A. No-Load and Blocked Rotor Test on Three Phase Induction Motor**

- The name plate details induction machine and DC-machine are given below

<b>3 – <math>\phi</math> Induction Machine</b>		
<b>S.No</b>	<b>Parameter</b>	<b>Value</b>
1.	Output Power	15 <i>kW</i>
2.	Speed	1460 <i>Rpm</i>
3.	Line Voltage	400 <i>V</i>
4.	Current	22 <i>A</i>
5.	Frequency	50 <i>Hz</i>
6.	Connection	<i>Y</i>

<b>DC-Machine</b>		
<b>S.No</b>	<b>Parameter</b>	<b>Value</b>
1.	Rated Power	30 <i>hp</i>
2.	Armature Voltage	350 <i>V</i>
3.	Field Voltage	350 <i>V</i>
4.	Field Current	2.7 <i>A</i>

1. Perform No-Load test on a given 3 –  $\phi$  Induction motor using the provided simulation block and tabulate the below readings for five different operating conditions

<i>S.No</i>	<i>V<sub>S,line</sub></i>	<i>I<sub>S,line</sub></i>	<i>P<sub>in</sub>(3 – <math>\phi</math>)</i>	<i>Q<sub>in</sub>(3 – <math>\phi</math>)</i>	<i>N<sub>r</sub></i>
1.					
2.					
3.					
4.					
5.					

2. Calculate the relevant parameters of the equivalent circuit from the no load test data
3. Perform Blocked-Rotor test on a given 3 –  $\phi$  Induction motor using the provided simulation block and tabulate the below readings for five different operating conditions

$S.No$	$V_{S,line}$	$I_{S,line}$	$P_{in}(3 - \phi)$	$Q_{in}(3 - \phi)$
1.				
2.				
3.				
4.				
5.				

4. Calculate the relevant parameters of the equivalent circuit from the blocked load test data
5. Verify the equivalent circuit parameters obtained from the no load and blocked rotor test calculations are matching with the simulation model parameters or not.

## B. Load Test on Three Phase Induction Machine

1. Perform the load test on the given three phase induction machine as per the instructions given in the experimental manual and tabulate the below readings for five different operating conditions

	Induction Motor					DC Motor	
$Sl.No$	$V_{Ph}$	$I_{Ph}$	$N_r(rpm)$	$P_{out}(watt)$	$T_e(Nm)$	$V_a$	$I_a$
1.							
2.							
3.							
4.							
5.							

## C. Grid Connected Operation of Three Phase Induction Machine

1. Operate the grid connected induction motor above synchronous speed as per the instructions given in the experimental manual. Without overloading the dc machine and induction machine, tabulate the below readings for five different operating conditions

	Induction Motor					DC Motor			
<i>Sl.No</i>	$V_{Ph}$	$I_{Ph}$	$N_r(rpm)$	$P_{out}(watt)$	$T_e(Nm)$	$V_a$	$I_a$	$V_f$	$I_f$
1.									
2.									
3.									
4.									
5.									

2. Plot below figures by combining the data obtained from load test and grid connected operation
  - Output Power ( $P_{out}$ ) vs Slip
  - Torque vs Slip

## D. Discussion Questions

- While conducting No-Load test, even though there is no-load, why watt-meter reading is not zero?
- Which loss in the machine is significant in no load test and why?
- Which loss in the machine is significant in blocked rotor test and why?
- When  $\frac{r'_2}{s}$  is split into a series connection of  $r'_2$  and  $r'_2\{\frac{1}{s} - 1\}$  in the rotor equivalent circuit of an induction machine, what do the power absorbed by the individual resistors physically represent?
- What are the different losses that are present in an induction machine?
- Back calculate the power delivered to the rotor at rated slip condition and Comment the calculated power is matching with the name plate details or not.