Electrical Machines II (ET-222)
Semester / Session: 4ᵗʰ / Fall2018
Mid-Term Exam: Spring-2020
Date: 16 – 04 - 2020

Time Allowed: _150_ minutes   Total Marks = 30

Note:

1. **Attempt all questions.**
2. **Midterm is close book and close notes/Lecture slides.**
3. **Attempt the question in 150 Minutes and during that time make sure your books and notes are closed.**
4. **Try to explain your solutions in clear unambiguous words or figures/ diagrams or mathematical expressions. Marks will not be awarded on what you intended to write but what you actually wrote down.**
5. **Scan the hand written midterm question paper and answer book and send through email at ateeq.shaheen@uos.edu.pk on Friday dated 17/04/2020 before 10:00AM in morning.**
6. **Name the scan file as "Mid_your name_your ID.pdf" e.g. Mid_Ateeq_BEEF19M003.pdf**

Q # 01   **Marks: 10**   **PLO: 02 , CLO: 01**

A 460-V, 60-Hz, four-pole, Y-connected induction motor is rated at 35 hp. The equivalent circuit parameters are

R1= 0.15Ω   R2= 0.154Ω   XM = 20 Ω   X1= 0.852 Ω
X2= 1.066 Ω   PF&W = 400 W   Pmisc= 150 W   Pcore= 400 W

For a slip of 0.5, find

a) The input current
b) The stator power factor
c) The rotor power factor
d) The rotor frequency
e) The stator copper losses P_{SCL}
f) The air-gap power P_{AG}
g) The power converted from electrical to mechanical form P_{conv}
h) The induced torque
i) The load torque
j) The overall machine efficiency

Q # 02   **Marks: 10**   **PLO: 02 , CLO: 01**

An induction motor is running at the rated conditions. If the shaft load is now increased, how do the following quantities change?

a) Mechanical speed
b) Slip
c) Rotor induced voltage
d) Rotor frequency
e) P_{RCL}

  f) Synchronous speed

Q # 03   **Marks: 5+5**   **PLO: 02 , CLO: 01**

A. A 240 V, 3-phase, 60 Hz, two-pole induction motor is running at a slip of 3.5 percent. Find:
  a) The speed of the magnetic fields in revolution per second
  b) The revolution of the rotor in revolution per second
  c) The slip speed of the rotor
  d) The rotor frequency in hertz

B. Write brief answers for the following questions.
  e) What happened if voltage are not adjusted in variable frequency speed control method of induction motor?
  f) What will happen if induction motor is started through direct line?
  g) What will be the rotor frequency when the rotor is stationary?
  h) Draw induction motor power flow diagram?