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//*   A three phase Y connected, 220V (line to line) 7.5kW, 60 Hz, 6 pole
induction motor is under study.
//    Performing No Load test and Blocked Rotor test, following parameters are
found out in ohm/phase.
//    r1=stator resistance= 0.294 ohm
//    r2=rotor restistance referred to stator 0.144 ohm,
//    stator reactance @ 60 Hz = x1 =0.503 ohm
//    magnetising reactance @ 60 Hz = xm = 13.25 ohm
//    rotor reactance @ 60 Hz as referred to stator = 0.209 ohm
//    A VFD (Variable frequency drive) is used to change the supply frequency
from 30 Hz to 90 Hz.
//    We assume that the output of the VFD is sinusoidal at this stage.
//    At a later stage, the stepped waveform will be analysed and its harmonic
components will be considered.

//     <indmot.sce>  Copyright (C) <2011>  <Prasad Mehendale>
//     This program comes with ABSOLUTELY NO WARRANTY; for details, refer to the
GPL-3.0.txt on www.gnu.org .
//     This is free software, and you are welcome to redistribute it under the
conditions
//     of GNU-GPL V3.0.



clc
disp ("This programme evaluates performance of a 3-phase induction motor")
disp ("Using VFD, (variable frequency drive), we are changing the supply
frequency")
disp ("You will supply the necessary parameters")
disp ("These parameters are found from No Load test and Blocked Rotor test on
Induction motor")
disp ("The programme assumes that the friction, windage and core losses are 6.5%
of the input power.")
disp ("Provide the rated parameters of the motor")

//Motor rating parameters asked to the user
v1=input("What is LINE TO LINE supply voltage AT RATED FREQUENCY?  ");
p_rated=input("Give the RATED FREQUENCY POWER OUTPUT of the motor in Watts: ");


//collecting motor parameters from the user
disp ("Now give the physical parameters of the motor")

poles=input("Give number of poles: ");
r1=input ("Give the stator resistance R1:  ");
//r1=0.294
r2=input ("Give rotor resistance as reffered to stator R2:  ");
//r2=.144
l1=input("Give stator inductance L1:  ");
//l1=.001334
l2=input ("Give rotor inductance as referred to stator L2:  ");
//l2=0.000554
lm=input ("Give the mutual (magnetizing) inductance M:  ");
//lm=0.03514

//asking about the loading condition of the motor
disp ("More is the slip - more is the motor load. Give slip in the range 0 to
0.05")
slip=input("Give slip in percentile:  ");


//check the performance for the range of frequencies between 30 and 90
//total 11 frequency points are  considered
var_f=linspace(30,90,61);
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n=11
for i=1:n
    x1=2*%pi*var_f*l1;
    x2=2*%pi*var_f*l2;
    xm=2*%pi*var_f*lm;

// zf is per phase impedance presented to the stator by the magnetising
reactance of the rotor
//so zf=((r2/slip)+j*x2) in parallel with j*xm

    zf1=(xm*%i).*((r2/slip)+(x2*%i));
    zf2=(r2/slip)+((xm+x2)*%i);
    zf=zf1./zf2;
//zin=total stator input impedance is (r1+jx1)+zf
    zin=(r1+x1*%i)+zf;

//phase voltage = (var_f/60)*(line voltage/sqrt3)
//when vfd is used, voltage is adjusted depending upon frequency
    vph=(var_f/60)*v1/sqrt(3);
//i1 = stator current = vph/zin

    i1=vph./zin;
//magnitude of i1= i1mgn ; phase of i1=i1ph
    i1mgn=abs(i1);
//phase in radian
    i1ph=atan(imag(i1)./real(i1));
    pf=cos(i1ph);
//ns=sync speed of the motor
    ns=(120*var_f/poles);
//omega_s=sync angular velocity of the field

    omega_s=4*%pi*var_f/poles;

//rotrpm=rotor speed in rpm
    rotrpm=(1-slip)*ns;

//omega_m=rotor angular velocity omega_m
    omega_m=(1-slip)*omega_s;
//p_gap = air gap power = input power- stator losses
    p_input=3*real(vph.*i1);
    p_gap=3*(i1mgn**2).*real(zf);

    p_shaft=((1-slip)*p_gap)-(p_input*0.065);


//shaft torque is in newton meters
    t_shaft=p_shaft./omega_m;

//efficiency = shaft output power/stator input power
//    p_input=3*real(vph.*i1);
    eta=(100*p_shaft)./p_input

end

//disp (t_shaft,"output shaft torque is :")

subplot(221)
plot(var_f,pf);
xgrid(2);
xlabel("Frequency- Hz");
ylabel("Power Factor");
title("Motor Performance");

subplot(222)
```

```
plot(var_f,t_shaft)
xgrid(2);
xlabel("Frequency- Hz");
ylabel("Output Torque- Nm ");
//title("Motor Performance");

subplot(223)
xgrid(2);
plot(var_f,rotrpm)
xlabel("Frequency- Hz");
ylabel("Rotor RPM");
//title("Motor Performance");

subplot(224)
plot(var_f,eta)
xgrid(2);
xlabel("Frequency- Hz");
ylabel("% Efficiency");
//title("Motor Performance");
```