clc;

clear all;

close all;

%%

%Taking inputs

Power=input('Enter the Rated Power of the motor: ');

choice=input('1. HP 2.kW: ');

if(choice==1)

Po=Power\*0.746;

else

Po=Power;

end

Vin=input('Enter the rated voltage: ');

N=input('Enter the rated speed of the motor(in rpm): ');

Ns = N/60;%in rps

f=input('Enter the rated frequency of the motor: ');

Bav=input('Enter the specific magnetic loading: ');

pf=input('Enter the power factor of the motor: ');

eff=input('Enter the target efficiency of the motor: ');

ac=input('Enter the specific electrical loading: ');

choice2=input('\n1. Delta Connected 2.Star Connected: ');

%%

%Main dimension calculation

phase=3;%assumed

Q = Po/(eff\*pf);%rating in kVA

Kw = .9;%assumed

fprintf('\n SQUIRREL CAGE IND MOTOR DESIGN DATA');

fprintf('\n ——————————————------------');

Co = 1.11\*pi\*pi\*Bav\*ac\*Kw\*(10^-3);

%number of poles

pole = (2\*f)/Ns;

%Q = Co\*Ns\*D2L

fprintf('\nInput power or rating power = ');

disp(Q);

D2L = Q/(Co\*Ns);

%for good overall design consider L/tow = 1

% therefore L\*pole/pi\*D=1 or L\*pole=Pi\*D

D3 = (Q\*pole)/(Co\*Ns\*pi);

D = D3^(1/3);

fprintf('\n MAIN DIMENSIONS ');

fprintf('\n --------------- ');

fprintf('\nHence Diameter D = ');

disp(D);

fprintf('\nHence Length L = ');

L = pi\*D/(pole);

disp(L);

%%

%Other Characteristics Calculation

Va = pi\*D\*Ns;%peripheral speed Va

fprintf('\n CERTAIN OTHER CHARS OF THE MOTOR: ');

fprintf('\n -------------------------------- ');

fprintf('\nPeripheral speed = ');

disp(Va);

if(Va<30)

fprintf('\nAs Peripheral speed is less than 30m/secs so dimensions are permissable');

else

fprintf('\nAs Peripheral speed is not less than 30m/sec the dimensions are not mpermissabel. But still the dimensions will be');

end

phim = Bav\*pi\*D\*L/pole;

fprintf('\nFlux density phim = ');

disp(phim);

fprintf('\n--------------------------------------------------------------');

%%

%Stator Characterisitics calculation

fprintf('\n STATOR CHARACTERISTICS ');

fprintf('\n ---------------------- ');

Ts = Vin/(4.44\*f\*phim\*Kw);%number of stator turns Ts

Ts=ceil(Ts);

%------------------NUMBER OF STATOR SLOTS SELECTION----------------------

p=pole;

q=[2:1:20];

Ss=3\*p\*q;

yss=(pi\*D)./Ss;

reqd=0;

for i=1:20

if(yss(i)>0.015&yss(i)<0.025)

reqd=i;

break;

end

end

yss=yss(reqd);

Ss=round(Ss(reqd));

q=q(reqd);

%-------------------------------------------------------------------------

fprintf('\nNumber of stator turns Ts = ');

disp(round(Ts));

fprintf('\nTotal number of stator slot per phase per pole Ss');

disp(Ss);

fprintf('\nSlot pitch Yss = ');

Yss = pi\*D/Ss;

disp(Yss);

Zss = 6\*round(Ts);

fprintf('\nTotal Coonductors Zss = ');

disp(Zss);

fprintf('\nNumber of Slots = ');

noofslots = Zss/Ss;

disp(noofslots);

if(choice2==1)

Es=Vin;

else

Es=Vin/sqrt(3);

end

Is=Q\*1e3/(3\*Es);

asc=Is/4;%assuming current density to be 4A/mm2

fprintf('\nCross Sectional Area of Stator Conductor= ');

disp(asc);

fprintf('\n--------------------------------------------------------------');

%%

%Rotor Characteristics calculation

fprintf('\n ROTOR CHARACTERISTICS ');

fprintf('\n --------------------- ');

lg=0.2+2\*sqrt(D\*L);

fprintf('\nLength of Air Gap lg= ');

disp(lg);

%------------------CALCULATING Sr-------------------------------

no\_allow=[0,+p,-p,+2\*p,-2\*p,+3\*p,-3\*p,+5\*p,-5\*p,1,-1,2,-2,p+1,p-1,-p-1,-p+1,p+2,p-2,-p-2,-p+2];

Sr=[Ss:1:1000];

diff=zeros(1,length(Sr));

for i=1:length(Sr)

diff(i)=Ss-Sr(i);

end %creating the difference array

for i=1:1000

counter=0;

for j=1:21

if(diff(i)==no\_allow(j))

counter=counter+1;

end

end

if(counter==0)

break;

end

end %calculating the required value of Ss-Sr

Sr=round(Ss+diff(i));

fprintf('\nRotor Slots Sr=');

disp(Sr);

%---------------------Sr CALCULATED-------------------------------

%Diameter of rotor

Dr=D-2\*lg;

Lr=L;

fprintf('\nLength of Rotor Lr=');

disp(Lr);

fprintf('\nOuter Diameter of Rotor Dr=');

disp(Dr);

Angle\_bw\_adj\_poles=360/(Ns\*p);

fprintf('\nAngle Between Adjacent Poles= ');

disp(Angle\_bw\_adj\_poles);

Electric\_angle\_skew=(2\*pi)/Ns;

fprintf('\nElectrical Angle Skew= ');

disp(Electric\_angle\_skew);

Ib=(0.85\*6\*Is\*Ts)/Sr; %bar current

fprintf('\nBar Current of Rotor Ib= ');

disp(Ib);

delb=6;%Assumption of 6A/mm2

ab=Ib/delb;% bar area

fprintf('\nBar Area of Rotor ab=');

disp(ab);

Ie=(Sr\*Ib)/(pi\*p); %end ring current

dele=7;%Assumption of 7A/mm2

ae=Ie/dele; %end ring area

ysr=pi\*Dr/Sr;

Doer=Dr;

de=10;%depth of the ring is considered 10mm

Dier=Doer-2\*de; % inner dia of ring

fprintf('\nInner Diameter of the Rotor= ');

disp(Dier);

Dme=(Doer+Dier)/2; % mean dia

re=0.021\*pi\*Dme\*1e-3/ae;

ohmlossER=2\*(Ie^2)\*re ;% copper loss in end ring

ohmlossTR=ohmlossER; %neglecting the copper loss at bar

fprintf('\nTotal Copper Loss in rotor= ');

disp(ohmlossTR);

% (rotor copper loss/rotor output)=s/(1-s)

s=ohmlossTR/(Po\*1e3+ohmlossTR); % full load slip

fprintf('\nFull Load Slip s=');

disp(abs(s));

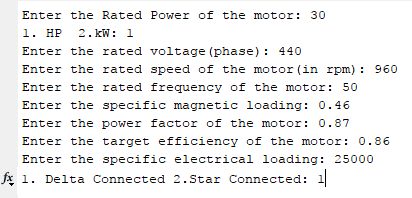
fprintf('\n---------------------THE END--------------------');

# OUTPUT

### Problem 1

### 

### Input 1

****

### Output 1

### SQUIRREL CAGE IND MOTOR DESIGN DATA

### ——————————————------------

### Input power or rating power = 29.9118

### MAIN DIMENSIONS

### ---------------

### Hence Diameter D = 0.3201

### Hence Length L = 0.1609

### CERTAIN OTHER CHARS OF THE MOTOR:

### --------------------------------

### Peripheral speed = 16.0904

### As Peripheral speed is less than 30m/secs so dimensions are permissable

### Flux density phim = 0.0119

### --------------------------------------------------------------

### STATOR CHARACTERISTICS

### ----------------------

### Number of stator turns Ts = 185

### Total number of stator slot per phase per pole Ss 56

### Slot pitch Yss = 0.0180

### Total Coonductors Zss = 1110

### Number of Slots = 19.8214

### Cross Sectional Area of Stator Conductor= 5.6651

### --------------------------------------------------------------

### ROTOR CHARACTERISTICS

### ---------------------

### Length of Air Gap lg= 0.6539

### Rotor Slots Sr= 53

### Length of Rotor Lr= 0.1609

### Outer Diameter of Rotor Dr= -0.9877

### Angle Between Adjacent Poles= 3.6000

### Electrical Angle Skew= 0.3927

### Bar Current of Rotor Ib= 403.3987

### Bar Area of Rotor ab= 67.2331

### Inner Diameter of the Rotor= -20.9877

### Total Copper Loss in rotor= -11.0506

### Full Load Slip s= 4.9401e-04

### ---------------------THE END-------------------->>

### Problem 2

Design a 3 phase delta connected induction motor for the following specifications:

11kW, 400V, 1425 rpm, Bav= 0.45, ac=23000, full load efficiency=0.85, power factor= 0.88

### Input 2

### 

### Output 2

SQUIRREL CAGE IND MOTOR DESIGN DATA

——————————————------------

Input power or rating power = 14.7059

MAIN DIMENSIONS

---------------

Hence Diameter D = 0.2011

Hence Length L = 0.1500

CERTAIN OTHER CHARS OF THE MOTOR:

--------------------------------

Peripheral speed = 15.0043

As Peripheral speed is less than 30m/secs so dimensions are permissable

Flux density phim = 0.0101

--------------------------------------------------------------

STATOR CHARACTERISTICS

----------------------

Number of stator turns Ts = 198

Total number of stator slot per phase per pole Ss 38

Slot pitch Yss = 0.0166

Total Coonductors Zss = 1188

Number of Slots = 31.2632

Cross Sectional Area of Stator Conductor= 3.0637

--------------------------------------------------------------

ROTOR CHARACTERISTICS

---------------------

Length of Air Gap lg= 0.5474

Rotor Slots Sr= 35

Length of Rotor Lr= 0.1500

Outer Diameter of Rotor Dr= -0.8937

Angle Between Adjacent Poles= 3.6000

Electrical Angle Skew= 0.2646

Bar Current of Rotor Ib= 353.5714

Bar Area of Rotor ab= 58.9286

Inner Diameter of the Rotor= -20.8937

Total Copper Loss in rotor= -9.4131

Full Load Slip s= 8.5647e-04

---------------------THE END-------------------->>