Question number (3) **(28 Marks)**

A three-phase induction motor, operating at rated voltage and frequency has a starting torque of 135 percent and a maximum torque of 220 percent, both with respect to the rated-load torque. **Neglecting** the effect of stator resistance and rotational losses, **determine**:

(i) the slip at maximum torque.
(ii) the slip at rated torque.
(iii) the rotor current at starting (as a percentage of rotor current at rated load).

(8 Marks)

A three-phase wound rotor induction motor takes 1.65 times full-load current when started by a star/delta starter.

(i) **What** are starting code letters? **Explain briefly how** the starting current of this type of induction motor can be controlled.

(ii) **Determine** the auto-transformer tapping for starting the motor so that the starting current should not exceed twice the full-load current.

(iii) **Calculate** also the starting torque in terms of full-load torque corresponding to the above percentage of tapping at auto-transformer starter, given that the full-load slip is 5 %.

(10 Marks)

A double-cage, 3-phase, 6-pole, Y-connected, induction motor has an inner cage impedance of 0.1+j0.6 ohm/phase and an outer cage impedance 0.4+j0.1 ohm/phase.

(i) **Give short notes** on this type of squirrel-cage rotor.
(ii) **Determine** the ratio of torques developed by the two cages at standstill and at 5 % slip.
(iii) If the motor is connected across a 230-V power source and has a stator impedance of 1.5+j2.5 ohm/phase, **obtain** the torque developed by the motor at standstill.

(10 Marks)

Question number (4) **(28 Marks)**

Prove that the output kilo volt-ampere of an ac machine can be expressed in terms of the output coefficient, main dimensions and synchronous speed. **(6 Marks)**

A 20 HP, 400-V, 50 Hz, 4-pole, 1420 rpm, 3-phase star connected induction motor has the following design data: specific magnetic loading 0.5 wb/m^2, specific electric loading 300 ac/m, full load efficiency 88 %, power factor 0.85, winding factor 0.955, current density 3.5 A/mm^2, core length to pole pitch 1.2.

(i) **Discuss briefly** the factors affect the choice of specific magnetic loading and specific electric loading of the three-phase induction machine.
(ii) **Determine** the approximate bore diameter, core length, stator turns per phase and stator conductor cross sectional area.
(iii) **Calculate** the magnetizing current per phase if the *MMF* required for flux density at 30° from the pole axis is 300 ampere-turn. **(18 Marks)**

Derive an expression for the rotor winding resistance (*actual total value*) of a 3-phase squirrel-cage induction motor in terms of rotor bar and end-ring resistances. **(4 Marks)**

WISH YOU ALL THE BEST

Dr. Said M. Allam

Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 120 Marks

Faculty of Engineering

Course Title: Electrical Machines (3)	Course Code: EPM3215	Year: 3rd
Date: June 3rd 2012 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer the following questions... assume any missing data... answers should be supported by sketches if possible)

Question number (1) **(34 Marks)**

Consider a 3-phase 400-V, 50-Hz, 6-pole, squirrel-cage induction motor runs at 940 rpm.

(i) Aiding with the *torque-speed* curve, **name** the different modes of operation of a three-phase induction motor. **Draw** the power flow diagram for **ONE** mode only.
(ii) **Define** the synchronous speed. **Explain** why it is impossible for an induction motor to operate at this speed. **How** can the direction of this speed be determined and reversed?
(iii) **Determine** the speed of the stator field with respect to the stator structure and the revolving rotor structure.
(iv) **Determine** the speed of the rotor field with respect to the rotor structure, the stator structure, and the stator field. **(14 Marks)**

A three-phase, 440-V, 50-Hz, 4-pole, Y-connected induction motor has the following equivalent circuit parameters: $R_1 = 0.25\ \Omega$, $X_1 = X_2 = 0.95\ \Omega$, $X_m = 35\ \Omega$. The motor drives a load for which $T_L = 1.6\ \omega_m$ **N.m** and develops the maximum torque at a speed of **1320** rpm. **Neglect** the rotational losses and **assume that** *near the synchronous speed the motor torque is proportional to slip.*

(i) **Determine** the referred rotor resistance.
(ii) **Determine** the starting torque, the breakdown torque and the corresponding power.
(iii) **Determine** the speed at which the motor drives the load.
(iv) **Determine** the rated line current and power factor.
(v) **Determine** the rated air-gap power.
(vi) **If** the rotor resistance of this machine is doubled, **calculate** the new value of starting torque and breakdown torque. **Sketch** the *torque-speed* curve both with the original rotor resistance and with the doubled value. **(20 Marks)**

Question number (2) **(30 Marks)**

Give short notes on the following:

(i) Crawling and cogging.
(ii) Time and Space harmonics. **(8 Marks)**

Explain why it is necessary to reduce the voltage applied to an induction motor as the electrical frequency is reduced? **How** do the changes in the supply voltage and the supply frequency affect the torque-speed characteristics of an induction motor for the following two cases? *(Illustrate your answer with suitable sketches).*

(i) Neglect the effect of the stator resistance and leakage reactance.
(ii) The effect of the stator resistance and leakage reactance is included. **(12 Marks)**

A 4-pole, 50 Hz, 3-phase, wound-rotor induction motor has a rotor resistance and standstill reactance referred to stator of 0.22 ohm and 0.84 ohm per phase respectively. Its full-load slip is 4 %. *Neglect stator resistance and leakage reactance.* **How much** stator voltage should be reduced to get a speed of 1260 rpm **if:**

(i) Load torque remains constant, and
(ii) Load torque varies as the square of the speed. **(10 Marks)**

P.T.O.

Question (3) (15 Marks)

Consider the problem of designing a **PID** controller for the open-loop control system with forward loop transfer function that is given by:

$$G(s) = \frac{(s+10)}{(s+1)(s+2)(s+12)}$$

By using the **Ziegler-Nichols (Z-N)** tuning method, **design** a PID controller and **draw** the electrical circuit of PID controller using operational amplifiers.

Question (4) (15 Marks)

Consider speed control system of a DC motor that is shown in **Fig.** (3). The goal is to design fuzzy PID controller in order to achieve best control of the system (i.e. motor angular speed $\omega(t)$ well tracks the constant reference desired speed ω_{ref}).

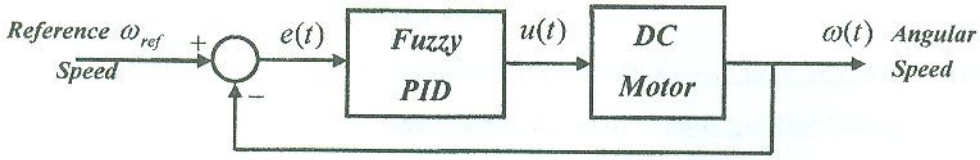

Fig. (3) Speed control of DC motor

Design **fuzzy PID** with configuration consists of **fuzzy PD + Fuzzy PI**. In this configuration, there are two inputs and one output control signal for each controller. The inputs are error e and rate of error $\dot{e}$ such that: $e(t) = w_{ref} - w(t)$ and $\dot{e}(t) = -\dot{w}(t)$. In designing this system, you should do the following:

a) **Define** and **draw 7 triangular membership functions** for each linguistic variable such that all variables are **normalized in the interval (-1, 1).**

b) **Write** and **explain** how the fuzzy rule table is constructed.

Question (5) (10 Marks)

a) Find the Z-transform of a discrete-data signal $f(k)$ that is defined by:

$$f(k) = \begin{cases} 1 & for\ k = even = 0,2,4,6,..... \\ 0 & for\ k = odd = 1,3,5,7,..... \end{cases}$$

b) Fin the inverse Z-transform of the function: $F(z) = \dfrac{z}{(z-1)(z-0.3)(z-0.1)}$

Good Luck

Dr. Eng. W. M. Elawady

Course Title: Control of Electrical Power Systems	Course Code: EPM3216	Year: 3rd
Date: 10 /6 /2012 (Second term)	Allowed time: 3 hrs	No. of pages: (2)

Answer the following questions

Question (1) (15 Marks)

Consider a unity negative feedback system that is shown in **Fig.** (1)

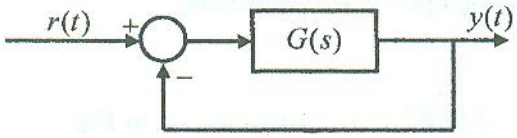

Fig. (1) Closed–loop system

The forward loop transfer function is given by:

$$G(s) = \frac{k}{s(s+3)(s+6)}$$

Design a ***suitable compensating circuit*** to meet the following specifications:

- The step response **settling time** is to be less than **5 sec.**
- The step response **overshoot** is to be less than **17 %.**
- The **steady-state error** to a unit ramp input must not exceed **10 %.**

Question (2) (20 Marks)

A servomechanism position control has the plant transfer function which is given by:

$$G(s) = \frac{k}{s(s+1)(s+10)}$$

You are to **design** a **proper compensating circuit** that is inserted in series with plant transfer function as shown in the compensated closed-loop system that is depicted in **Fig.** (2)

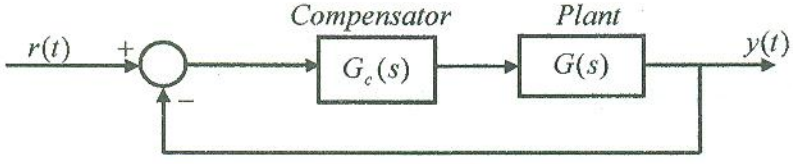

Fig. (2) Compensated system

The compensator is required to achieve the following desired specifications:

- The response to a reference step input is to have no more than **16%** **overshoot.**
- The response to a reference step input is to have a **rise time** of no more than **0.4 sec.**
- The **velocity error constant** k_v to a unit ramp reference input must be greater than **50**

B) Draw the circuit of class chopper describing how when this circuit feeds dc machine may operates in four quadrant. (5 Marks)

Problem number (4) **(15 Marks)**

A) A 3-ϕ bridge inverter is supplied from a 900V dc source & supply an inductive load star connected of (R=20 Ω ,L =37mH, f_o=50Hz) per phase. Using 180° conduction control to fined

(i) the useful power

(ii) the rating of the switch (iii) supply current (10 Marks)

B) Design a firing circuit using linear control for 1-ϕ full converter .

(5 Marks)

Good Luck

Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 60 Marks

Faculty of Engineering

Course Title: Power electronics (2) | Course Code: EPM3213 | Year: 3rd
Date: June 14th 2012 (second term) | Allowed time: 3 hrs | No. of Pages: (2)

Remarks: (answer the following questions… assume any missing data… answers should be supported by sketches…etc)

Problem number (1) (15 Marks)

A three phase ac voltage controller supplies a wye-connected resistive load of R=25Ω. The supply voltage is 380V at 50Hz. Sketch the phase o/p voltage (v_a) & v_{T1} for the delay angle 75° then determine :

(a)the rms o/p phase voltage v_o

(b)input power factor

(c) $I_{sw\ rms}$ &$I_{sw\ peak}$

(d) the rating of SCR .

Problem number (2) (15 Marks)

A) Explain by using 1-ϕ full converter how the speed of ac motor can be controlled using frequency control method and determine the range of frequency.

B) An RL load is controlled by a step down chopper.If the resistance R=0.5 Ω, inductance L=20mH , supply voltage Vs =20v and chopping frequency F=2 KHz . Determine the minimum and maximum load current ,peak to peak load ripple current and average load current for k=0.5.

C) What are the methods for voltage control of inverter.

Problem number (3) (15 Marks)

A) Design a chopper circuit to feed a load with dc voltage of 25 V.(with maximum variation of 34 mV) and dc current of 0.6 A ripple free from dc supply 6 V and the maximum value of supply current is 2.68 A, using chopper frequency 20 KHz .Then determine $I_{sw\ av}$ &$I_{sw\ peak}$. (10 Marks)

P. T. O

b) Compare in details between interrupt and polling techniques? Explain the steps of executing an interrupt? (6 Marks)

(Question 3) **(14 Marks)**

a) Write **an 8051 C** program to continuously get the status of 8 relays connected to port 2 of 8051 microcontroller and logically XOR with 6DH then output on 8 servo motors connected to port 3. Wait 0.1 sec before sending the data to the servo motors (assume that XTAL= 11.592 MHz). Explain your solution? (8 Marks)

b) Explain what will happen if the following code is executed showing the output of each instruction:

(6 Marks)

```
# include <reg51.h>
sbit b2= P0^3;
sbit A= ACC^4;
void main(void)
{
unsigned char con=0x14;
unsigned char y;
P1=0x04 | 0x58;
ACC=con ^ 0x46;
For (y=0;y<=7;y++)
{
b0= A;
ACC=ACC >>1;
}
}
```

(Question 4) **(14 Marks)**

a) Write a 8051 C program to do the following: (7 Marks)

- Receive data serially and send it to P2.
- Generate a 25 kHz frequency on P1.4 using Timer 0 8-bit auto reload.

Explain your solution assuming XTAL= 11.0592 MHz and 9600 baud rate.

b) Write **an 8051 assembly** program to look for a number N in 100 memory locations starting from 00H to 31H (50 locations) and from 60H to 91H (50 locations). The accumulator is either loaded with the number (if it is exist) or Zero. (7 Marks)

(Question 5) **(16 Marks)**

(a) Write **an 8051 assembly** program that either finds the product or sum of two numbers NUM1 and NUM2 as follows: (7 Marks)

If NUM1< NUM2, find the product

If NUM1> NUM2, find the sum.

Store the product, or sum in memory location LOC1, and LOC2 respectively.

(b) Write **an 8051 assembly** program to read the P2.1 and P2.2 bits and issue an action on port 1 according to the following: (9 Marks)

P2.1	P2.2	P1
0	0	Invert bit 2
0	1	Output '2'
1	0	reset bit 3
1	1	Turn on DC- motor connected to P3.1 if bit 4 of P1 is 1

Good Luck ***Dr. Ahmed Elmogy***

Tanta University

Department: Electrical Power & Machines

Faculty of Engineering

Course Title: Microprocessors	Course Code: CCE32H4
3th year	Allowed time: 3 hrs

Answer the following questions:

(Question 1) **(15 Marks)**

a) With the help of block diagram, explain the structure of 8051 microcontroller? Explain the memory structure? (6 Marks)

b) What is the function of the following registers? (9 Marks)

SBUF register, SP register, TMOD register, TCON register, SCON register.

(Question 2) **(12 Marks)**

a) Show the contents of stack for the following code? (6 Marks)

```
0000                    ORG 0
0000   7453     BACK:   MOV A,#53
0002   F590             MOV P1, A
0004   7C33             MOV R4, #33H
0006   7D34             MOV R5, #34H
0008   120400           LCALL  DELAY
000B   7466             MOV A,#66H
000D   F590             MOV P1, A
000F   120400           LCALL  DELAY
0012   80EC             SJMP BACK
.....
0500                    ORG 500
0500   C004     DELAY:  PUSH 4
0502   C005             PUSH 5
0504   7CFF             MOV R4, # FFH
0506   7DFF     SSS:    MOV R5, #FFH
0508   DDFE     AGAIN:  DJNZ R5, AGAIN
050A   DCFA             DJNZ R4, SSS
050C   D005             POP 4
050E   D004             POP 5
0510   22               RET
                        END
```

Tanta University

Department: Electrical Power & Machines Engineering

Total Marks: -125 Marks

Faculty of Engineering

Course Title: Power System Analysis	Course Code: EPM3214	Students: 3rd year Elec. Power
Date: 7/6/2012	Allowed time: 3 hours	No. of Pages: (1)

Remarks: (Answer the following questions, assume any missing information, solve in details and show all your steps)
ALL IMPEDANCES/REACTANCES ARE GIVEN IN PER-UNIT ON A COMMON SYSTEM BASE.

Question (1) (50 Marks)

Figure (1) shows single-line diagram of a three-bus power system with generation at buses 1 and 2 and load at bus 3. Buses data are given in per unit in the figure. All shunt elements are capacitors with an admittance j0.01 pu, and all series elements are inductors with an impedance j0.08 pu.

(a) Find the bus voltages using Newton-Raphson method (Do at least ONE iteration).

(b) Calculate the power flow through lines and the total power losses.

(c) Find the active and reactive power generations at slack bus and reactive power generation at voltage control bus.

(d) If 3-phase symmetric fault is occurred at bus 3, calculate fault current and buses voltages during fault using Z_{bus} method. Take the direct-axis sub-transient reactance for each synchronous machine as j0.2 pu. Assume unloaded pre-fault with voltages $=1.0\angle 0$ p.u.

Question (2) (40 Marks)

For line-to-ground (L-G) fault at bus 3 of Figure (2), calculate the fault current and phase voltages at each bus (Use Z_{bus} method). Given the following Positive, negative and zero sequence impedances in per unit: For the generators $Z^+ = Z^- = j0.2$; $Z^0 = j0.05$. For the transformers $Z^+ = Z^- = Z^0 = j0.05$. For the lines $Z^+ = Z^- = j0.1$; $Z^0 = j0.3$. Assume unloaded pre-fault with voltages $=1.0\angle 0$ p.u. Re-calculate the fault current and phase voltages at each bus for the (L-L) and (L-L-G) fault types using Z_{bus} method. Compare the results.

Question (3) (35 Marks)

A three-phase, 60-Hz synchronous generator connected through a transformer and double-circuit transmission line to an infinite bus. One of the T.L. circuits has impedance of j0.2 pu and the other circuit has j0.3 pu. The generator has a transient direct-axis reactance of j0.3 pu and the transformer has a j0.1 pu impedance. The slack bus voltage is $1.0\angle 0$ pu. The internal voltage of the generator is $1.28\angle 23.95°$ pu. The synchronous generator is initially operating in the steady-state. A three-phase-to-ground short circuit occurs at the bus between the transformer and the T.L. circuits. Three cycles later, the circuit breakers at the ends of j0.3 pu line permanently open to clear the fault. Use the equal-area criterion to determine the maximum value of the power angle δ. Take H=3.0 p.u.-second, P_m=1.0 p.u., and $\omega_{p.u.}$=1.0 in the swing equation.

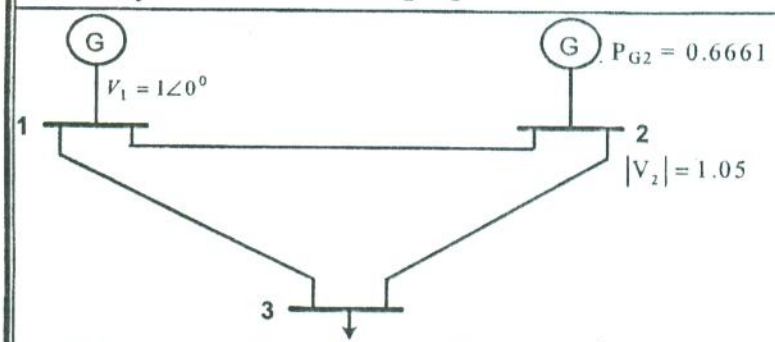

Figure 1

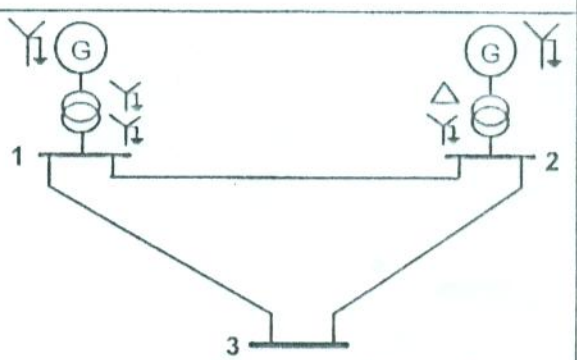

Figure 2

With the best wishes

Dr. Eng. Hany Ahmed Abdelsalam

خوص كهربية ٢٠١٢

جامعة طنطا
كلية الهندسة
قسم هندسة الإنتاج والتصميم الميكانيكي

المادة/ دراسات الجدوى للمشروعات
(EPM32H4)
الفرقة الثالثة(قوى كهربية)

بسم الله الرحمن الرحيم
التاريخ :١٩/٦/ ٢٠١٢
الزمن : ساعتان

أجب عن الأسئلة الآتية:- (٤٠ درجة)

السؤال الأول:-

١ - وضح باختصار المراحل التي يمر بها المشروع المقترح للاستثمار؟

٢ - تكلم باختصار عن الجدوى الفنية للمشروع.

٣ - تكلم بالتفصيل عن عناصر التصنيع.

السؤال الثاني:-

١ - تختلف المشروعات وفقا للأنشطة الاقتصادية التي تقوم بتنفيذها .. أكتب باختصار ما تعرفه عن أنواع تلك المشروعات؟

٢ - عرف التخطيط ؟ وما هي العناصر التي تشتمل عليها عملية التخطيط؟

٣ - عرف المقصود بعملية التنظيم؟ - عملية التوجيه؟ وما الغرض من عمليتي التنظيم والتوجيه؟

السؤال الثالث:-

تقوم إحدى شركات آلات القطع بتأجير آلة بالشروط التالية : يدفع مبلغ ٢٥٠٠ $ في البداية وتدفع قيمة الإيجار في نهاية كل سنة ، وتكون قيمة الإيجار في السنة الأولى ٢٨٠٠ $ ، وفى السنة الثانية ٢١٠٠ $ ، ثم تقل قيمة الإيجار السنوي في السنوات التالية بمقدار ٤٠٠ $ عن السنة السابقة لها. وبعد ذلك تعاد الآلة إلى الشركة في نهاية الست سنوات.

فما هي التكلفة السنوية المكافئة للإيجار إذا كان الربح هو ٨%؟

اوجد القيمة الحالية لمصروفات الإيجار الكلية لمدة ٨سنوات.

المعطيات :

$(a / p)_6^8 = 0.21632$, $(a/ g)_6^8 = 2.276$

$(p/ a)_6^8 = 4.623$, $(p/ g)_6^8 = 10.523$

السؤال الرابع:-

١ - كيف يمكن لصاحب المشروع أن يزيد من كفاءة عوامل الإنتاج؟

٢ -اكتب نبذة عن المخزون؟ وما هي وظائف المخزون؟

٣- تكلم عن أهم مزايا وعيوب الجودة الشاملة.

٤ -تكلم باختصار عن أهم مراحل تطبيق نظام إدارة الجودة الشاملة.

مع أطيب التمنيات بالنجاح
ا.د/عبد الفتاح مصطفى خورشد