University	Menoufia		Date	26/05/2019
Faculty	Electronic Engineering		Time	From 10 am to 1 pm
Department	Industrial Electronics and Control Engineering		No.of Pages	4
			No. of Questions	3
Academic Term	2nd Term, 4th Year		Full Mark	70
Course Name	Industrial Control Syst.		Exam.	Final Exam.
Academic Year	2018/ 2019		Examiner	Dr. Ramy Farid

Answer all the following Questions

Question 1

Draw a schematic diagram for typical SCADA system for the system with the following specifications.

1.1   The field sit contains

A. 3 Magnetic Flow-meters.	H. 10 programmable pressure switches.
B. 5 Flow switches	I. One temperature transmitter.
C. 20 Flow gauges (indicator)	J. 10 temperature gauges.
D. 5 Ultrasonic level transmitters.	K. 2 push-buttons for start/ stop
E. 2 Inductive Level switches, each one has 4 electrodes with different lengths	L. 10 AC three phase motors rotate in two directions (forward / Reverse)
F. 2 pressure transmitters.	M. 5 DC motors rotate forward only.
G. 16 pressure gauges	N. 20 butterfly valves operated manually.

1.2   It's recommended to use M304 PLC as RTU.

1.3   Each RTU is constructed from:
- A.   Rack M340 - 8 slots – BMX XBP 0800
- B.   Power supply module M340 - 100….240 V AC - 20 W – BMX CPS 2000
- C.   Processor module M340 - max 1024 discrete + 256 analog I/O – BMX P34 2020
- D.   Discrete input module M340 - 24 V DC positive – BMX DDI 1602
- E.   Discrete output module M340 - solid state - 24 V DC positive- BMX DDO 1602
- F.   Analog input module M340 - high speed – BMX AMI 0410.
- G.   Flash memory card 8 Mb - BMX RMS 008MP.

1.4   25% spares for all inputs & outputs must be considered in each RTU.

1.5   Now you must determine the number of RTUs with full capacity required to cover all system requirements.

1.6   First three RTUs are connected together as the LAN topology is designed with each node connected directly to a central network hub, or switch before continuing to its destination, the hub, or switch manages and controls all functions of the network.

1.7   Second three RTUs are connected together as the LAN topology consists of main run of cable with terminator at each end, all nodes are connected to this cable.

A Modbus TCP frame, as shown in Fig. 1, is composed of two main components, A Modbus Application Protocol (MBAP) header followed by a Protocol Data Unit (PDU).

3.1   Explain briefly the main purpose of <u>each element</u> in <u>both</u> MBAP and PDU

3.2   Give an illustrative example for both the Modbus Master request and the corresponding Modbus slave reply. Your example shall respect the following:

- The Master requests the Slave device with an IP address <u>192.168.1.15</u>
- The Master is to read the Digital Inputs (DI) starting from the memory address <u>0x0080</u> and the number of registers to read are <u>5</u>
- The function code to read DI registers is <u>0x02</u>
- The binary values of DI registers in the Slave the time of preparing a reply are <u>10110</u>
- Your example shall include a table for both the Master request and Slave rely with all values in <u>Hexadecimal</u>. Each table cell is filled by <u>one byte only</u>.
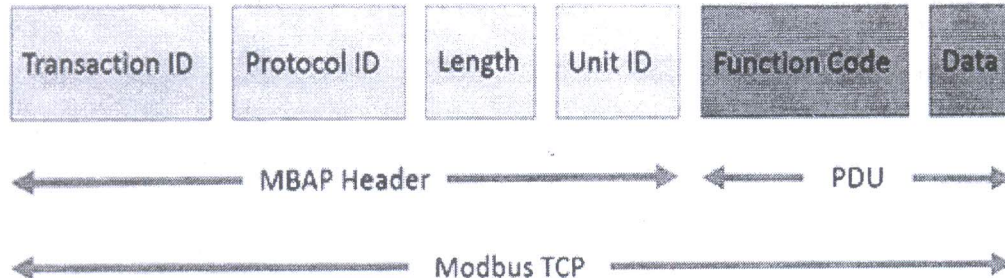

Fig. 1 Modbus TCP Transmission Frame

<u>My best wishes for success</u>

Dr. Ramy Farid

Write Comments as You Can.

The <u>Factory Integrated Automation System</u> can be represented as <u>Four Layers</u>.

2.1   Draw a diagram to indicate the components and/or the functions concerned to each layer.

The <u>Manufacture Execution System (MES)</u> is a collection of computer programs, when executed; give the necessary bidirectional information between the <u>Enterprise Resource Planning (ERP)</u> layer, at a side, and the <u>Control and Monitoring</u> layers, at the other side.

2.2   Draw a diagram to indicate the components and/or the functions concerned to <u>each part</u>.

The <u>Process Management</u> is focused on <u>Dock-to-Dock</u> solutions for real-time applications in about12 (<u>twelve</u>) plant systems areas.

2.3   Choose <u>five</u> of the above areas; find the <u>MES</u> solutions for <u>Pharmaceuticals</u> factory.

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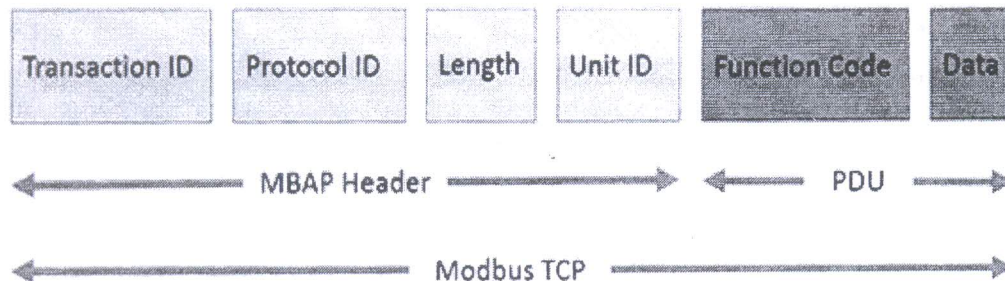
Transaction ID	Protocol ID	Length	Unit ID	Function Code	Data

MBAP Header ←→ PDU

Modbus TCP

Fig. 1 Modbus TCP Transmission Frame

<u>My best wishes for success</u>

Dr. Ramy Farid

Answer the following questions:

Question No. (1): [15 Degree]

Consider *a temperature controller* with two inputs; *temperature* ($°C$) and *humidity (%)* and one output; *fan speed (%)*. The input (temperature) is divided into three fuzzy sets as COOL, WARM and HOT. The input (humidity) is divided into three fuzzy sets as LOW, MEDIUM and HIGH. The output (fan speed) is divided into three fuzzy sets as ZERO, MEDUIM and HIGH. The fuzzy sets for input temperature are defined as $\mu_{COOL} = trapezoid\,(0,0,20,30)$, $\mu_{WARM} = triangular\,(20,30,40)$ and $\mu_{HOT} = trapezoid\,(30,40,50,50)$.

The fuzzy sets for humidity input are defined as $\mu_{LOW} = trapezoid\,(0,0,30,40)$, $\mu_{MEDUIM} = trapezoid\,(30,40,60,80)$ and $\mu_{HIGH} = trapezoid\,(60,80,100,100)$.

The fuzzy sets for the output fan speed are defined as $\mu_{ZERO} = triangular\,(0,0,50)$, $\mu_{MEDUIM} = triangular\,(10,50,70)$ and $\mu_{HIGH} = triangular\,(60,100,100)$. The fuzzy rule-base system is summarized in the following table:

Note that: The fuzzy inference is based on the individual rule based (*Mamdani implication method*). Use the **approximated COA** defuzzification method.

	COOL	WARM	HOT
LOW	ZERO	ZERO	MEDUIM
MEDUIM	ZERO	MEDUIM	HIGH
HIGH	MEDUIM	HIGH	HIGH

Find the value of the fan speed if the temperature equals $32°C$ and the humidity equals 62 %? Show graphically the inference, the fuzzy output for each fired rule and total fuzzy output?

Question No. (2): [20 Degree]

A) Draw the block diagram for the various structures of the PID-like fuzzy logic controller. Which one is the best? And why?

B) Consider a system, which is described by the following difference equation:

$$y(k+1) = 0.5\,y(k) - 0.25\,y(k-1) + 0.01u(k) + 0.1u(k-1)$$

A PI-like fuzzy logic controller is designed to regulate this system around a set-point $R = 3$. Five fuzzy sets are used to represent the linguistic variables *NB, NS, Z, PS* and *PB* for controller variables. *Symmetrical triangular membership functions with 50 % overlap* are used and defined on the normalized domain [-1, 1]. The fuzzy rule-base system is summarized in the following table. Using

the initial conditions as $y(0) = 0.1$, $y(1) = 0.85$, $u(0) = 20$ and $u(1) = 25$. Find $u(2)$ and $y(3)$ if the actual domain for the input variables is [-10, 10] and for the output variables is [-30, 30]. Use the *Mamdani inference method and* approximated *COA method*.
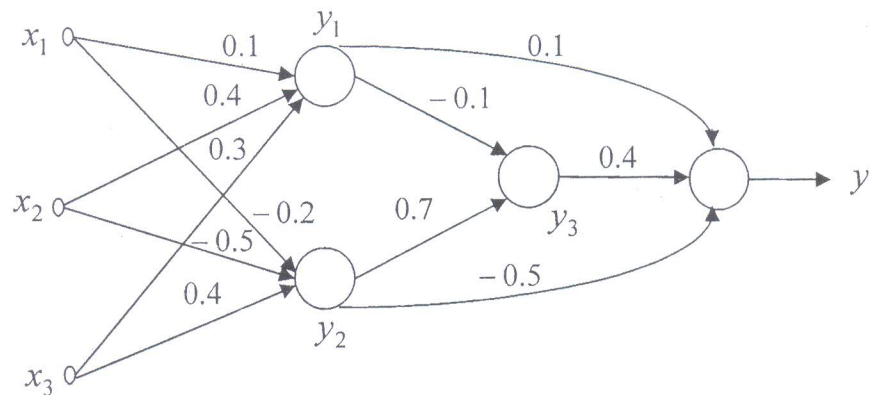
ΔE/E	NB	NS	Z	PS	PB
NB	NB	NB	NB	NS	Z
NS	NB	NB	NS	Z	PS
Z	NB	NS	Z	PS	PB
PS	NS	Z	PS	PB	PB
PB	Z	PS	PB	PB	PB

Question No. (3): [15 Degree]

A) Write short notes about supervised and unsupervised learning in a neural network.

B) *Mention only* the names of the learning rules of the neural networks.

C) Two steps of *Hebbian learning rule* of a single-neuron network with four inputs have been implemented starting with $\mathbf{w}^1 = \begin{bmatrix} 1 & -1 & 0 & 0.5 \end{bmatrix}^T$. The learning constant $c = 0.65$ and the inputs as: $\mathbf{x}_1 = \begin{bmatrix} 1 & -2 & 1.5 & 0 \end{bmatrix}^T$ and $\mathbf{x}_2 = \begin{bmatrix} 1 & -0.5 & -2 & -1.5 \end{bmatrix}^T$. Find the final weight vector for **unipolar continuous activation function** where $\lambda = 5$.

Question No. (4): [20 Degree]

A) Draw the block diagram of a direct adaptive neural control and an indirect adaptive neural control.

B) For the network shown in the following Figure, **Find only the update weights for the output layer** using the *Back Propagation method*. Where the input vector is $\mathbf{x} = \begin{bmatrix} 0.4 & 0.6 & 0.1 \end{bmatrix}^T$, desired output $d = 0.7$, learning constant $\eta = 0.4$, and **unipolar continuous activation function** where $\lambda = 1$.

With our best wishes.......Prof. Nabila El-Rabaie and Dr. Ahmad M. El-Nagar

ANSWER ALL THE FOLLOWING QUESTIONS

First Question: (25 Marks)

Write comments as you can.

(1 – a) For the ***step-up – step-down*** (Buck – Boost) DC to DC converter:
Write a complete report on its operation; your report must include:

(1) Explain the converter operation steps using the suitable Circuit Diagrams.
(2) Draw the Voltage and Current timing diagrams wave forms of the converter components.
(3) Proof the relations of the Input / Output Voltage as a function of Duty Ratio.
(4) Proof the relations of the Input / Output Current as a function of Duty Ratio.
(5) Proof the inductor Current equations as a function of time.
(6) Proof the inductor Voltage equations as a function of time.
(7) Proof the average value of the Transistor, Diode and Load current.

(1 – b) A (Buck – Boost) converter has the design parameters $L = 200\ \mu H$, $C_{out} = 250\ \mu F$, and $f_s = 25\ kHz$. It operates from a 50 V DC battery in the continuous current mode, supplying a load resistance $R = 1.85\ \Omega$.
Calculate the average load voltage and current for duty cycles:
      (a) $k = 0.25$ and   (b) $k = 0.75$.
At the above two values of the duty cycle, calculate:
      (c) The peak-to-peak input current ripple and
      (d) The peak-to-peak output voltage level.

Second Question: (25 Marks)

Write comments as you can.

(2 – a) Discuss the problem of the power factor in electric distribution network.
Use an example of power angle equals to 45°.
(2 – b) An active power load of 250 kW and power factor of 0.67 lagging:
Calculate the ***Penalty*** that applied to this load.
(2 – c) Calculate the capacitive power to correct the power factor to be 0.92 lagging.
(2 – d) Calculate the capacitive power to correct the power factor to be 0.95 lagging.
(2 – e) Calculate the ***Bonus*** that applied to this load.

Penalty and Bonus (for every step of 0.01)

Less than 0.7	From 0.7 to 0.9	From 0.9 to 92	From 0.92 to 0.95	Above 0.95
Penalty 1.0 %	Penalty 0.5 %	NON	Bonus 0.5 %	NON

→ → → ... / ... ***PLEASE TURNOVER*** ... / ... ← ← ←

Third Question: *(25 Marks)*

Write comments as you can.

(3 – a) What are the industrial problems that can be solved when using the **Soft Start Soft Stop (SSSS)**?

(3 – b) Draw the **Internal Circuit Diagram** of the **(SSSS)**. Explain the function of each part or component of the **(SSSS)**.

(3 – c) Draw and discuss the characteristics of the **Torque/Speed** and **Current/Speed** family of curves of the **(SSSS)**. Explain the operating point conditions on the above two family of curves.

(3 – d) What are the industrial problems that can be solved when using the **Varible Speed Drive (VSD)**?

(3 – e) Draw the **Internal Block and Circuit Diagrams** of the **(VSD)**. Explain the function of each part or component of the **(VSD)**.

(3 – f) Draw and discuss the characteristics of the **Torque/Speed** and **Current/Speed** family of curves of the **(VSD)**. Explain the operating point conditions on the above two family of curves.

→ → → ... *** *BEST WISHES* *** ... ← ← ←

Menoufia University
Faculty of Electronic Engining
Departement of Industrial &
Control Engineering

Elective Course Mecha-
Tronics For 4th year students
Final Exam.
Date: 12/6/019, T.A. 3 Houres

Answer The Following Questions:-

1. a. Derive the expression for steady state conduction Through a plane wall

1. b. The interior of an oven is maintained at a temperature of 850°c by means of a suitable control apparatus. The oven walls are 500 mm thick and are fabricated from a material of thermal conductivity 0.3 w/m-deg. For an outside wall temperature of 250°c, work out the resistance to heat flow and the heat flow per square meter of wall surface. Also calculate the temperature at a point 200 mm from the interior side.

2. a. Derive the temperature distribution form for plane wall with Uniform Heat Generation in case of both surfaces are maintained at a common temperature.

2. b. The rear window of an automobile is made of 5 cm thick glass of thermal conductivity 0.8 w/m-deg. To defrost this window, a thin transparent film type heating element has been fixed to its inner surface. For the condition given below, determine the electric power that must be provided per unit area of window if a temperature 5°c is maintained at its outer surface.
Interior air temperature and the corresponding surface coefficient, = 20°c and 12 w/m²-deg.
Surrounding air temperature and the corresponding surface coefficient, = -15°c and 70 w/m²-deg.
Electric heater provides uniform heat flux.

Please turn over !!
←

بسم الله والسلام عليكم الأخير !!

3.a. Derive the Steady - Flow Equation for open system.

3.b. In a gas turbine unit the gases flow through the turbine at
17 kg/s and the power developed by the turbine is 14 MW. The
specific enthalpies of the gases at inlet and outlet are 1200 kJ/
kg and 360 kJ/kg respectively, and the velocities of the gases
at inlet and outlet are 60 m/s and 150 m/s respectively. Calcul-
ate the rate at which heat is rejected from the turbine. Find
also the area of the inlet pipe given that the specific volume
of the gases at inlet is 0.5 m^3/kg.

4.a. With respect to the properties of wet vapour, derive the
relation between the dryness fraction and specific volume,
enthalpy and internal energy.

4.b. Calculate the dryness fraction, specific volume, and specific
internal energy of steam at 7 bar and specific enthalpy 2600 kJ/kg
Considering that at 7 bar, h_g = 2764 kJ/kg.

5.a. For a reversible adiabatic Non-Flow Processes, for a perfect
gas, derive the relation between W (the work done) and the
specific volum.

5.b. 1 kg of steam at 100 bar and 375°c expands reversibly in a
perfectly thermally insulated cylinder behind a piston until
the pressure is 38 bar and the steam is then dry saturated.
Calculate the work done.
Considering that from superheat tables at 100 bar and 375°c,
h_1 = 3017 kJ/kg & v_1 = 0.02453 m^3/kg.
Also Saturated vapour at 38 bar u_g = 2602 kJ/kg.

With Best wishes !!
Prof. Dr. Eng. Gaber Allam

University	:	Menoufia		Date	:	16/06/2019
Faculty	:	Electronic Engineering		Time	:	3 Hours
Department	:	Industrial Electronics and		No. of pages	:	1
		Control Engineering		No. of Questions	:	2
Course Name	:	Applications of control systems 4		Exam	:	Final

Question No 1 : Sensors Interfacing for Chemical Factory

If you have a chemical factory with boiler tank as shown in the figure; according to your study, select the appropriate sensor and design its interfacing circuit to get its output for the following:

A) Measure the average temperature inside the factory.

B) Measure the temperature inside the boiler tank.

C) Measure the weight of the tank.

D) Measure the fluid level in the tank.

E) Measure the water evaporation in the tank.

F) Measure if there are any gas leakage in the factory or not.

G) Measure if there are sunlight or not.
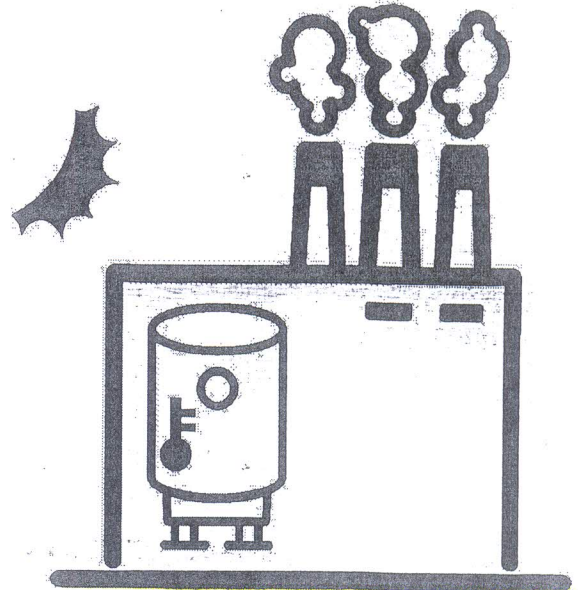
Note: you can clear your answer with any drawing you want

Question No 2 : NI DAQ NI-USB 6009

According to your study:

A) 1- What are the general types of NI DAQ analog modes?

2- Explain each one.

B) 1- How many analog inputs in this DAQ?

2- What are its types?

3- How many analog outputs?

4- How many digital inputs? And outputs?

C) Pressure sensor:

1- draw its symbol, explain its supply, input and output

2- how to be interfaced with this DAQ?
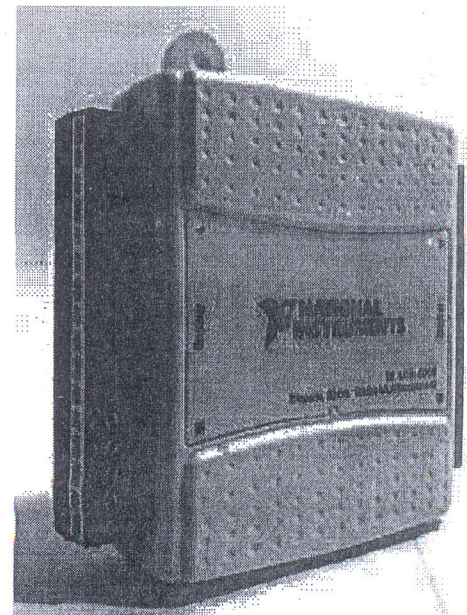
Best Wishes

Dr. Ahmed El-Sherbeny

اﻻمتحان بريكه مك

Minoufia University		Final Term Exam. – 4th year (2017/2018)
Faculty of Electronic Eng.		Intelligent Control Systems – ACE 423
Dep. of Ind. Electronics and Control Eng.		Time Allowed: 3 Hours
		27-5-2018

Answer the following questions:

Question No. (1): [15 Degree]

Consider **an intelligent sprinkler system** with two inputs; *air temperature* ($^\circ C$) and *soil moisture (%)* and one output; *watering duration (min.)*. The input (*air temperature*) is divided into four fuzzy sets as COOL, NORMAL, WARM, HOT. The input (*soil moisture*) is divided into three fuzzy sets as DRY, MOIST and WET. The output (*watering duration*) is divided into three fuzzy sets as SHORT, MEDUIM and LONG. The fuzzy sets for the *air temperature* input are defined as:

$\mu_{COOL} = trapezoid\,(0,0,5,15)$, $\mu_{NORMAL} = triangular\,(5,15,25)$, $\mu_{WARM} = triangular\,(15,25,35)$

$\mu_{HOT} = trapezoid\,(25,35,40,40)$. The fuzzy sets for the *soil moisture* input are defined as:

$\mu_{DRY} = trapezoid\,(0,0,5,10)$, $\mu_{MOIST} = trapezoid\,(5,10,25,30)$, $\mu_{WET} = trapezoid\,(25,30,35,35)$.

The fuzzy sets for the *watering duration* output are defined as: $\mu_{SHORT} = trapezoid\,(0,0,10,15)$,

$\mu_{MEDUIM} = trapezoid\,(10,15,25,30)$, $\mu_{LONG} = trapezoid\,(25,30,40,40)$. The fuzzy rule-base

system is summarized in the following table:

Note that: The fuzzy inference is based on the **individual rule based** (*Larsen implication method*). Use the **approximated COA** defuzzification method.

	COOL	NORMAL	WARM	HOT
DRY	LONG	LONG	LONG	LONG
MOIST	SHORT	MEDIUM	MEDIUM	LONG
WET	SHORT	SHORT	SHORT	MEDIUM

Find the value of the water duration if the air temperature equals $12^\circ C$ and the soil moisture equals 8 %? Show graphically the inference, the fuzzy output for each fired rule and total fuzzy output?

Question No. (2): [20 Degree]

A) How can select the input and output scaling factors for the PD-like fuzzy logic controller?

B) Consider **a DC motor** is described by the following difference equation:

$$y(k+2) = 1.3\,y(k+1) - 0.3\,y(k) + 0.11\,u(k+1) + 0.075\,u(k)$$

where y is the position of the motor (degree) and u is the control signal (volt).

A PD-like fuzzy logic controller is designed to regulate the motor position around a set-point $R = 30^\circ$. Five fuzzy sets are used to represent the linguistic variables **NB, NS, Z, PS** and **PB** for controller variables. *Symmetrical triangular membership functions with 50 % overlap* are used

and defined on the normalized domain [-1, 1]. The fuzzy rule-base system is summarized ‚in the following table. Using the initial conditions as $y(1)=15$, $y(2)=20$, $u(1)=3$ and $u(2)=5$. Find $u(3)$ and $y(4)$ if the actual domain for the input variables is [-50, 50] and for the output variable is [-10, 10]. Use the *Mamdani inference method* and the *approximated COA defuzzification method*.

ΔE/E	NB	NS	ZR	PS	PB
NB	NB	NB	NS	PS	PS
NS	NB	NB	NS	PS	PS
ZR	NB	NS	ZR	PS	PB
PS	NS	NS	PS	PB	PB
PB	NS	NS	PS	PB	PB

Question No. (3): [15 Degree]

A) What are the types of learning schemes in neural networks? Explain the difference between them?

B) Compare between the Hebbian and perceptron learning rules.

C) A single neuron with an activation function defined as: $f(net)=net$, where $net=\mathbf{w}^T\mathbf{x}$, has trained using the following data pairs:

$$\left(\mathbf{x}_1=\begin{bmatrix}2 & 0\end{bmatrix}^T, d=-1\right) \text{ and } \left(\mathbf{x}_2=\begin{bmatrix}0 & -2\end{bmatrix}^T, d=1\right)$$

The final weights obtained using the perceptron rule are $\mathbf{w}^3=\begin{bmatrix}3 & 2\end{bmatrix}^T$, suppose the learning rate equals 1. Find the weight vectors $\mathbf{w}^2$ and $\mathbf{w}^1$ at the previous steps by back-tracking the training.

Question No. (4): [20 Degree]

A) Discuss how to choose the learning factor for the back-propagation training algorithm.

B) Draw the block diagram of direct model reference neural adaptive control.

C) Identify the following system using the feed-forward neural network:

$$y(k+1)=0.75\sqrt{y(k)}+0.4\,u^2(k)$$

Train the network for *one-step* using the *back-propagation algorithm*. Assume the input vector is $\begin{bmatrix}u(k) & y(k)\end{bmatrix}$, learning rate is 0.5, unipolar continuous activation function with $\lambda=1$, the initial weights for hidden and output layers, respectively are:

$$V=\begin{bmatrix}0.3 & 0.2\\ 0.5 & 0.6\\ 0.7 & 0.4\end{bmatrix}, \quad W=\begin{bmatrix}0.2 & 0.4 & 0.1\end{bmatrix}$$

Consider the initial values for the input and output are $u(1)=0.2$ and $y(1)=0.5$.

With our best wishes.......Prof. Nabila El-Rabaie and Dr. Ahmad M. El-Nagar

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جامعة المنوفية
كلية الهندسة الإلكترونية بمنوف
قسم هندسة الإلكترونيات الصناعية والتحكم
الفرقة : الرابعة
الفصل الدراسي الثاني للعام الجامعي ٢٠١٧/ ٢٠١٨
امتحان نهاية الفصل ٢٣ مايو ٢٠١٨

مقرر : اقتصاد هندسي وتشريعات
الزمن : ٢ ساعة

اجمالي الدرجة ٥٠ (اعمال فصل ١٥ + نهائي ٣٥)

السؤال الاول (١٥ درجة)

قارن بين (باستخدام جدول لكل فقرة):

أ- مميزات وعيوب قانون الخدمة المدنية الجديد الصادر اكتوبر ٢٠١٦.

ب- واجبات المهندس تجاه المهندسين وتجاه صاحب العمل.

ج- الصيانة الوقائية وعمليات الإصلاح في نظام الامن الصناعي للمهندس

السؤال الثاني (١٠ درجة)

وجدت شركة نقل من خبرتها السابقة، أن كلفة التشغيل السنوية لسيارة ثمن شرائها ٦٠,٠٠٠ جنيه هي كما يلى (تشمل البيانات كذلك سعر إعادة البيع، والأرقام بمئات الجنيهات) :

السنة -	١	٢	٣	٤	٥	٦	٧	٨
كلفة التشغيل	١٠٠	١٢٠	١٤٠	١٨٠	٢٣٠	٢٨٠	٣٤٠	٤٠٠
سعر إعادة البيع	٣٠٠	١٥٠	٧٥	٣٧,٥	٢٠	٢٠	٢٠	٢٠

<u>باستخدام نماذج الاحلال وضح متى يجب استبدال السيارة؟</u>

السؤال الثالث (١٠ درجة)

ترغب شركة تصنيع أجهزة التحكم في بناء ورش ُللتصنيع طبقاً للإمكانيات التالية:

البدائل	مساعدة المحافظة ومنافسة ضعيفة س١	مساعدة المحافظة ومنافسة قوية س٢	لا مساعدة من المحافظة ومنافسة ضعيفة س٣	لا مساعدة من المحافظة ومنافسة قوية س٤
		الحالات الأربع		
أ١= ٣٠ورشة	١٠	٥	٤	٢
أ٢=٤٠ورشة	١٧	١٠	١	١٠-
أ٣=٥٠ورشة	٢٤	١٥	٣-	٢٠-

حيث س١،س٢،س٣،س٤: حالات منافسة السوق الضعيفة، المتوسطة، القوية، القوية جداً على التوالي.
باستخدام معيار الندم طبقا لنظرية اتخاذ القرار حدد أفضل بديل يمكن للشركة أن تستخدمه.

مع خالص التمنيات بالتوفيق

استاذ دكتور / محمد احمد فكيرين

Part. 1

Answer the following :

Q1. A - Concerning controlled variables and control signals what are the main differences between direct digital control DDC and supervisory control systems. Draw the block diagram for each mentioning function of each element.   (6 M)

B- The coil resistance of two identical solenoids – one rated for 220 V dc and the other rated for 220 V ac - are measured using an ohmmeter. How should the resistance of the two compare ? why ?. (5 M)

C- Complete the empty places in the following:

" The toggle switch , normally operated by hand , is an example of a …(1)..switches. Switches that are actuated automatically are called …(2)… switches. Switch often used to start and stop motors is ….(3)….. A switch that can sense the existence of the object without physical contact is ………(4)… "   (6 M)

Q2 : A- Draw and explain the basic structure of a remote terminal unit (RTU) showing different types of signals that received and transmitted from the local field .   (8 M)

B- Calculate the suitable can interval for a SCADA system with ten RTUs , the largest of them has the following :

       100 status points ,

       25 alarm points ,

       5 measurement meters ,

       12 analog points .

The MTU will send the following point counts to that RTU :

       50 discrete control points ,

       5 stepper motor positions ,

       10 analog control points .

The communication system uses UHF radio (efficiency 40%) with 2400 bps rate .   (10 M)

أ.د. محمد مبروك اشرف

Third Question: *(15 Marks)*
The Best Subject of This Term

Recently the ***Manufacturing Execution System (MES)*** is in a mature situation. This is according to especial type of software, which is introduced by some expertise in the ***MES*** domain. Design an advanced ***MES*** using the following steps:

(3 – a) Define the function of upcoming software: Component Object Model (COM), Object Linking and Embedding (OLE), OLE for Process Control OPC, and eXtensible Markup Language XML.

(3 – b) Use a sketch to explain concept of OPC interface between hardware and ***MES***.

(3 – c) Draw a diagram that explains the three components of the advanced ***MES***, in which the ***MES*** is an intermediate layer, which has five components. The top layer is the Business Systems, which has five components. The bottom layer is the Field Based Architecture, which has five components.

(3 – d) When is the place of XML and OPC? And what is the role of them?

(3 – e) Write brief notes on each advanced ***MES*** component (fifteen components).

Fourth Question   *(10 Marks)*

The starting point of the production in any factory is the ***Planning System***. In the recent ***Modern Factories***, the ***Manufacturing Execution System (MES)*** core consist the ***Interface*** between the ***Planning System*** and the other production components of the factory production. All of these construct the ***Integrated Factory Automation System***.

(4 – a) What is the meaning of execution? Explain in ***Ten Items*** this meaning.

(4 – b) What are the benefits offered by the (MES); as reported by the system users? Write and explain these benefits in ***Ten Items***.

(4 – c) Draw a graphical representation of the (MES) core.

(4 – d) Write and explain the ***Six Items*** of the (MES) core and the ***Planning System***.

(4 – e) Draw a graphical representation of the ***Integrated Factory Automation System***.

(4 – f) Write and explain the ***Eight Items*** that added to the MES core to construct the ***Integrated Factory Automation System***.

Fifth Question   *(10 Marks)*

(5 – a) Draw, ***in details with time frame***, the block diagram of ***ISA-S95***; with its 5-levels from 4 down to 0.

(5 – b) Define and explain in, ***details***, the ***Key Performance Indicator (KPI)*** of the ***Manufacturing Execution System (MES)***.

(5 – c) What are the parameters of a machine data flow to measure the ***Overall Equipment Efficiency (OEE)***?

(5 – d) Define and explain in details: [1] Inspection, [2] Quality Control, [3] Quality Assurance, and [4] Total Quality Management. What are the gain of these progresses.

(5 – e) Draw a supply chain model with its three parts and Business Logistics; indicate the physical supply (with its elements) and the physical distribution (with its elements).

→ → *** ... *** ***BEST WISHES*** *** ... *** ← ←

تابع العرقة الرابعة

Menoufia University

Faculty of Electronic Enging

Departement of Industrial Electronics

and Control Engineering

Final Term Examination of

Elective Topics - MechaTronics

For 4th year Students

Date: 3/6/2018, T.A. 3 Houres

Answer The Following Questions:-

1.a. What do you mean by "Reversible Work"?

- -

1.b. A unit mass of a certain fluid is contained in a cylinder at an initial pressure of 20 bar. The fluid is allowed to expand reversibly behind a piston according to a law $p \cdot V^2 =$ constant until the volume is doubled. The fluid is then cooled reversibly at constant pressure until the piston regains its original position, heat then supplied reversibly with the piston firmly locked in position until the pressure rises to original value of 20 bar. Calculate the net work done by the working fluid, for an initial volume of 0.05 m^3.

2.a. Explain the Wet loop on a (p-v) diagram.

- -

2.b. Steam at 110 bar has a specific volume of 0.0196 m^3/kg, Calculate the temperature, the specific enthalpy, and the specific internal energy, knowing that: from the super-heat tables at 110 bar, the specific volume is 0.0196 m^3/kg at a temperature of 350°C, and from tables the enthalpy, h, is 2889 kJ/kg.

3.a. Explain the Fourier Conduction law.

- -

3.b. A wall with an area of 25 m^2 is made up of four layers. on the inside is plaster 15 mm thick, then there is brick 100 mm thick, then insulation 60 mm thick and finally brick 100 mm thick. The thermal conductivity of plaster is 0.1 W/mk, for brick is 0.6 W/mk, and for the insulation is 0.08 W/mk. The inner surface temperature

Please Turn over !!   بقية الأسئلة على الصفحة الأخرى !!

of the wall is 18°C and the outer is -2°C.
Calculate the heat loss and the temperature at the interface between the plaster an the brick.

4.a. Explain the operation of steady state conduction through a plane wall.

4.b. The interior of an oven is maintained at a temperature of 850°C by means of a suitable control apparatus. The oven walls ar 500 mm thick and are fabricated from a material of thermal conductivity 0·3 W/m-deg. For an outside wall temperature of 250°C, work out the resistance to heat flow and the heat flow per square meter of wall surface. Also calculate the temperature at a point 200mm from the interior side.

5.a. Explain the conduction in plane wall with uniform heat generation.

5.b. The rear window of an automobile is made of 5 mm thick glass of thermal conductivity 0·8 W/m-deg. To defrost this window, a thin transperent film type heating element has been fixed to its inner surface. For the conditions given below, determine the electric power that must be provided per unit area of window if a temperature 5°C is maintained at its outer surface. Interior air temperature and the corresponding surface coefficient is 20°C and 12 W/m²-deg, surrounding air temperature and the corresponding surface coeff- icient is -15°C and 70 W/m²-deg. Electric heater provides uniform heat flux.
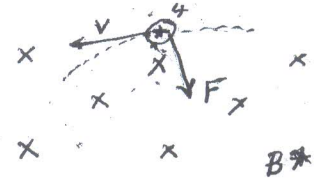
With Best Wishess !!
Prof. Dr. Eng. Gaber Allam

. Menoufia University
Faculty of Electronic Engineering Menouf
Industrial Electronics and control Eng. Department

4ᵗʰ year – Jan 2018
Elective 4
Time: 3 hours

Given the following :

Mass of proton = 1.7 x 10exp-27 kg & charge on proton = 1.67 x 10exp–19 C

$$KE = \frac{1}{2}mv^2 \qquad v = \sqrt{\frac{2E}{m}} \qquad F = \frac{mv^2}{r} = Bqv \qquad v \propto \frac{\sqrt{KE_1}}{\sqrt{2}}$$

$$r = \frac{mv}{QB}$$

Answer the Following Questions:

Q1:

Cyclotron is an accelerator in which charged particles (as protons, deuterons, or ions) are propelled by an alternating electric field in a constant magnetic field.

1. Is the above statement correct or wrong?
2. Explain the above statement according to your study
3. Draw schematic diagram for a cyclotron
4. What are Nuclear Reactors? Can you give an example?

Q2:
1. What is the velocity of a proton with energy of 80 ke V?
2. The largest possible path had a radius of about 50 mm.
    What strength of magnetic field   must have been used?
3. What would be the radius of the path followed by a proton with
    half this maximum energy in the same field?

Q3:

1. What is meant by ionizing radiation?
2. Write the sources of the natural background radiation ?
3. Write the sources of the artificial radiation2 ?-
4. What are radiation hazards you studies?
5. Which of the following is ionizing and which is not ionizing?

I.   MRI   II. PET   III. CT   IV. Ultrasound

Q4: define the following:

I. Fission   II. Inhalation   III. PET detector   IV. PET tracer

Q5:   A cyclotron can accelerate protons to a maximum kinetic energy of 1 MeV. You want to design a new, improved model with higher maximum proton energy. Which of the following changes would help?

A: Double the magnetic field

B: Double the diameter of the Dees

C: Double the proton current

D: Double the voltage of the voltage supply

Q6. Compare among: FMRI, PET, and gamma camera. Draw when possible.

Dr. Samir

Menoufea University
Faculty of Electronic Engineering
Indus. Elec. and Control Eng. Dept.
Final year exam.

Control systems applications.
Time Allowed: 3 hours
Date: June. 2018

Answering the following questions:-   60 degrees

Q1:

1. Show two methods to convert a gray image to a binary image?
2. What are the benefits and applications of the following:
   a. Image segmentation?   2- Image registration
3. Explain with equations and figures the Hall effect
4. Draw the electronic circuit for current source
5. Draw the electronic circuit for AD590 sensor

Q2:

6. What are the image noise types you studies in your Lab. Course?
7. Write matlab code to add _and remove_ any of the above noise types to an image.
8. Write matlab codes for two of the digital filters you studied in lab course.
9. Draw flow chart to clean an image from salt and pepper noise.
10. Write MATLAB code to calculate the distance between two points having the following (x.y) coordinates (3.34) & (8.9).

Q3:

11. What are the inputs and outputs of oscilloscope you worked on in you lab?
12. Which one of the following statements **is not correct**:
   a) histograms may be used to count the number of occurrence of RGB color values   ·
   b) the sum of histogram values equals the image size
   c) X probability density function is the histogram normalized by mean grey value

13. 23- Which one of the following statements is **correct**:
   a) histogram equalization always results in a flat probability density function
   b) the best way to identify moving objects is by multiplication of images
   c) X quantization can be thought of as multi-level thresholding

14. Intensity levels in amplifier 8 bit image are

      a) 128   b) 255   c) 256   d) 512

15. **What is the name of the following operation (applied in succession to the image on left)?**

      a) dilation   b) erosion   c) Closing

Q4:

16. In an image accentuating a specific range is called

    a) Slicing   b) color slicing   c) cutting   d) color enhancement

17. Black color in image processing is usually represented by the
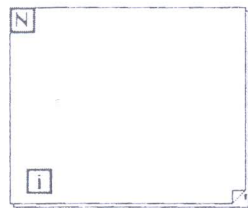
    1- 0   2- 1   3- 255   4- 256

18. Compare between labview and matlab programs according to your lectures in lab.

19. Hall voltage is directly proportional to

    1. Current   2-electric field   3-magnetic flux density   4- all of above

20. What is this? Chose the correct answer and explain.

a) While Loop   b) Case Structure   c) For Loop

21. What is the Answer? Chose the correct answer and explain.
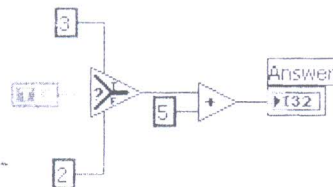
a) 8   b) 7   c) 5

**22. What is this? Chose the correct answer and explain.**

a) While Loop   b)Case Structure   c)For Loop

Course: Elective-4 ACE415 (Medical)	Final Exam	Duration: 3 hours
Instructor: Dr Mohamed El-Brawany	No of Pages: 2	Date: 2 Jan 2019

Please answer the following questions

Question_1) [15 Marks]

a) Compare between pulsed wave and continuous wave doppler in terms of minimum number of transducers, their Q-factor, maximum velocity, and range?

b) If blood is flowing at a constant velocity in a vessel in the direction of the arrow shown in the following figure, then <u>answer the following and give reason</u>:
   i. Which transducer measures the greatest Doppler shift?
   ii. Will the Doppler shift be positive or negative?
   iii. Which transducer measures a reflection with the greatest amplitude?

c) In the following figure, a sound beam from the transducer is going to the right. All the blood cells (RBC) are traveling at 2 m/s in a direction identified by the small arrows.
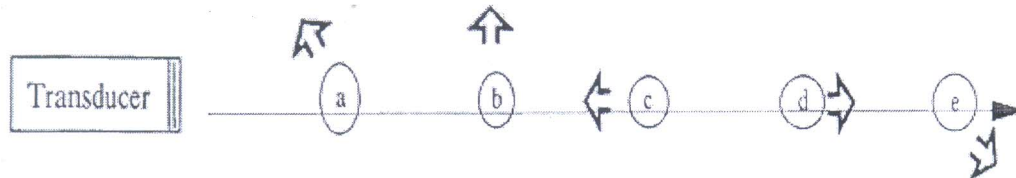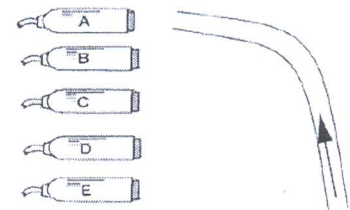
<u>Answer the following and give reason</u>:
   i. Are the red blood cells traveling at the same velocity?
   ii. Which RBC produces the maximum negative Doppler shift?
   iii. Which RBC produces the maximum positive Doppler shift?
   iv. Which RBC produces a reflection with no Doppler shift?
   v. Which two RBCs produce negative Doppler shifts?
   vi. Which RBC creates a reflection with the highest amplitude?
   vii. Which RBC creates a reflection with the lowest amplitude?

Question_2) [20 Marks]

a) Draw the equivalent circuit of an ultrasound piezoelectric transducer at resonance and off-resonance? Define each element in this circuit.

b) How would you efficiently match this transducer to a driving voltage source?

c) List the different types of array transducer and then explain the basic principle of beam steering and focusing of a phased array transducer. Support your answer with drawings and/or diagrams.

Question_3) [20 Marks]

a) Draw a diagram depicting the A-Mode ultrasound system and discuss one of its clinical applications. Include all the necessary information on the diagram.

MENOUFIYA UNIVESITY FACULTY OF ELECTRONIC ENGINEERING – MENOF	SUBJECT: PLC COURSE	DEPARTMENT OF INDUSTRIAL ELECTRONICS AND CONTROL ENGINEERING
	25 / 12 / 2017	
B. Sc. GRADUATE EXAMINATION	FIRST TERM EXAMINATION	TIME ALLOWED: THREE HOURS

ANSWER ALL THE FOLLOWING QUESTIONS

First Question: (30 Marks)

The Best Report of This Term

The irrigation in Egypt has many types of complete structure of control and monitoring systems. One of these systems is the **Canal Lock Navigation**. The part of navigation control contains the following sensors and actuators: 8 limit switches, 4 proximity sensors, 3 analog level sensors; 2 motors for the ports, 4 motors for the gates and 2 traffic (two lights) signs.
Design a PLC controller, which can be used for this process control.

The design Must Follow the Procedures Indicated Below:

(1 – a) Define the system objective, and detailed descriptions of the system functions.
(1 – b) Draw the side and plane views of both the bridge and canal lock navigation; on the plane view, distribute all the above sensors and actuators.
(1 – c) The motors used are three phase squirrel cage induction motors. For all of these actuators draw the power circuit diagram.
(1 – d) For both sensors and actuators: draw the PLC controller circuit diagram.
(1 – e) What is the reasonable staring point of the PLC control program? Due to this starting point, explain the initial or (idle) situation of the control system.
(1 – f) Draw corresponding **GRAFCET**, of this PLC control system, for both **Description** and **Addressing**, and use the case of the ship motion from **Low to High Water Level**.

Second Question: (25 Marks)

In an industrial automated factory, at some place on a production line, it is found that:
The period between two of the **Incoming Product** is very smaller than the time period of the operations on the product at this place.

To decrease the operations time, one of the engineering solutions is to use three work stations at this place. These work stations are named, **Work Stations A, B and C**. Also, a **Rotating Arm Robot** is used for the management of the product flow among the **Incoming Product**, the **Three Work Stations** and the **Product Delivery**.

Design a **Sequential Flow Chart SFC or GRAFCET** for programming this solution.
Your design must include a **Reasonable Concept**, which has four different levels of the problem analysis during the design process.

(2 – a) Draw the production line schematic diagram for the above group.
(2 – b) Indicate each one of the four levels, and draw its corresponding GRAFCET.
(2 – c) Draw the total designed GRAFCET.
(2 – d) Explain the advantages of this reasonable concept.
(2 – e) How we can modify and enhance the flexibility of the designed GRAFCET?

→ → → ... / ... **PLEASE TURNOVER** ... / ... ← ← ←

Third Question: (20 Marks)

(3 – a) What are the industrial problems that can be solved when using the **Soft Start Soft Stop (SSSS)**?

(3 – b) Draw the **Internal Circuit Diagram** of the **(SSSS)**. Explain the function of each part or component of the **(SSSS)**.

(3 – c) Draw and discuss the characteristics of the **Torque/Speed** and **Current/Speed** family of curves of the **(SSSS)**. Explain the operating point conditions on the above two family of curves.

(3 – d) What are the industrial problems that can be solved when using the **Varible Speed Drive (VSD)**?

(3 – e) Draw the **Internal Block and Circuit Diagrams** of the **(VSD)**. Explain the function of each part or component of the **(VSD)**.

(3 – f) Draw and discuss the characteristics of the **Torque/Speed** and **Current/Speed** family of curves of the **(VSD)**. Explain the operating point conditions on the above two family of curves.

Fourth question: (20 Marks)

(4 – a) The following table contains the **Name Plate Parameters** of **Two Speeds**, **Squirrel Cage Induction Motor**. What are the main features of this motor?

Supply	Hz	Conf.	V	A	Cos Φ	kW	RPM
3 ~	50	YY	400	4	0.84	1.6	2780
3 ~	50	Δ	400	3	0.84	1.3	1390

(4 – b) Design a PLC control program for the possible operations of this motor using the well known **Ten Program Design Steps**.

Program Design Steps:
1. Description of system objectives.
2. Detailed description of system functions.
3. Circuit diagram and/or block diagram of the system.
4. Separation of function steps.
5. Choice of PLC Function.
6. PLC input/output connection.
7. Input/output addresses.
8. Program list or diagram.
9. Program test and verification.
10. System verification.

→ → → ... *** **BEST WISHES** *** ... ← ← ←

University	:	Menoufia	Date	:	06/01/2019
Faculty	:	Electronic Engineering	Time	:	3 Hours
Department	:	Industrial Electronics and Control Eng.	No. of pages	:	1
Academic level	:	4th Year	No. of Questions	:	4
Course Name	:	Medical Instrumentation	Full Mark	:	90 Marks
Course Code	:	ACE 413	Exam	:	Final Exam
Academic Year	:	2018/2019	Examiner	:	Dr. ME Karar

Answer all the following questions :

Question No 1 :   (20 Marks)

a) **What are** techniques utilized in physiological measurements ?   (10 Marks)
b) **Give short notes** on respiratory measurements.   (5 Marks)
c) **What are** the possible future technologies of medical sensors?   (5 Marks)

Question No 2:   (30 Marks)

a) **Compare between three** different blood flowmeters.   (10 Marks)
b) **How is the extravascular blood pressure sensor** being tested **in frequency-domain**? (5 Marks)
c) **Design** a critically damped extravascular blood pressure measurement system **with intentional liquid leak** to operate in the frequency response: dc-92 Hz, using a P23Dd sensor at 20 °C. Assuming the catheter has no air bubble. (**Constants:** Density of water at 20°C is 1000 Kg/m^3, water viscosity at 20°C is $\eta = 0.001$ Pa.s, 1 cm of water pressure is 98.5 N/m^2, volume modulus of elasticity of the diaphragm is 0.49 x 10^{15} N/m^5). يمكنك فرض أي قيم ممكنة لتحقيق هذا التصميم (15 Marks)

Question No 3 :   (20 Marks)

a) **Describe** the basic four generations of CT imaging system.   (10 Marks)
b) **Draw and explain** the block diagram of automatic exposure control (AEC) unit. (10 Marks)

Question No 4 :   (20 Marks)

a) **What are the levels** of medical equipment maintenance?   (10 Marks)
b) **How to plan** a preventive maintenance strategy for medical instrument in hospitals ? (10 Marks)

Best Wishes...

Dr. Mohamed Esmail Karar

Determine the following:

A. The interface circuit that shows the inputs and outputs connections with ARDUINO UNO kit.

B. The program flowchart that shows the operation of the system.

C. An ARDUINO program.

Q3	30 degree

Design a control system for controlling the DC motor using PI controller (*discrete form*) where the motor supply is 12 V, sampling period is 0.01 sec., the proportional and integral gains are 1.5 and 0.5, respectively. The set-point is 300 rpm in clockwise direction for 60 sec.

Note that:

- The speed of the motor is measured using tacho-generator, which the transfer function has 1V/100 RPM.

- The design must include the following items:

A. The interface circuit that shows the inputs and outputs connections with ARDUINO UNO kit.

B. The program flowchart that shows the operation of the system.

C. An ARDUINO program.

With my best wishes………….. Dr. Eng. Ahmad M. El-Nagar

Minoufia University
Faculty of Electronic Engineering
Industrial Electronics and Control Eng.
Course: Control Systems Application-3
Course Field: Specialization Requirements
Academic Level: Fourth Year, 1st Semester
Academic Year: 2018 / 2019
Course Code: ACE 414

Final Term Exam
Date: 20 / 1 / 2019
Exam Type: Written
No. of Exam Pages: 2
No. of Exam Questions: 5
Exam Marks: 60 Points
Exam Time: 3 Hours

Answer the following questions:

Question-1: [12 Points]

1. What happened when we applied + Vx on hydraulic valve?
2. What happened when we applied - Vx on hydraulic valve?
3. What is the relation between flow & Vx?
4. What is the relation between flow & pressure valve?
5. Draw block diagram of velocity servo mechanism?
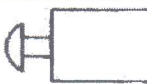6. Stat the Basic Components of a Pneumatic System.
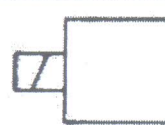
Question-2: Put True (√) or False (×) signs for the following expressions: [10 Points]

1. The characteristic feature of stationary hydraulics is that valves are mainly solenoid operated.
2. The characteristic feature of mobile hydraulics is that the valves are frequently manually operated.
3. Fluid logic control: This type of system is controlled by hydraulic oil or air. The system employs fluid logic devices such as AND, NAND, OR, NOR, etc.
4. Electronic control: This type of system is controlling the fluid power systems by switches, relays, timers and solenoids.
5. Electrical control: This type of system is controlled by microelectronic devices. The electronic brain is used to control the fluid power muscles for doing work.
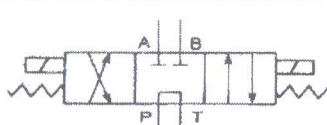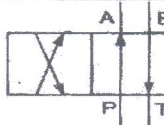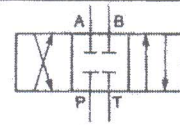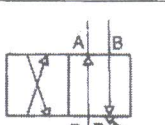6. Hydrodynamic systems use fluid motion to transmit power. Power is transmitted by the kinetic energy of the fluid.
7. A hydrostatic system uses fluid pressure to transmit power. Hydrostatics deals with the mechanics of still fluids and uses the theory of equilibrium conditions in fluid.
8. Pneumatic and hydraulic systems require relief valves to direct and regulate the flow of fluid from compressor or pump to the various load devices.
9. Check valves only allow flow in one direction.
10. The simplest pressure regulating device is the control valve.

Question-3: stat the name of each Graphic symbols [10 Points]

(1)	(2)	(3)	(4)	(5)
(6)	(7)	(8)	(9)	(10)

_Question-4: Fill in the Blanks_ [10 Points]

1. ----------- is the desired amplitude of an output variable from a process.

2. -------- is the elapse time between the instant an error occurs and when the corrective action first occurs.

3. -------- is the time required for a control system to return a measured variable to its set point after there is a change in the measured variable.

4. ----------- is a set hysteresis between detection points of the measured variable when it is going in a positive or a negative direction.

5. ---------- is the difference between a set reference point and the amplitude of the measured variable

6. --------------is the signal path from the output back to the input to correct for any variation between the output level from the set level.

7. ----- is the monitored output variable from a process.

8. ------------ is the input variable or parameter to a process that is varied by a control signal from the processor to an actuator.

9. ----------- are devices that can change one form of energy to another.

10. ------ are devices that can detect physical variables.

Question-5: [18 Points]

1. Write the types of sensors and actuators and controllers used in PCS (Process Control System) TRAINING SET and explain the working principle of temperature PT100 sensor.
2. Explain in details and draw the block diagram of pressure control experiment.
3. State the type of the control which is used in each process and draw the block diagram of each of them.

(a)   (b)
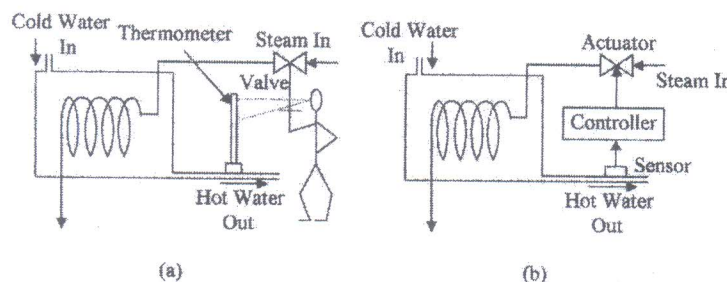
4. Draw the block diagram of the elements that make up the feedback path in a process-control loop.
5. Fig shows the block diagram of a closed-loop flow control system.
Identify the following elements: (a) the sensor, (b) the transducer, (c) the actuator, (d) the transmitter, (e) the controller, (f) the manipulated variable, and (g) the measured variable.
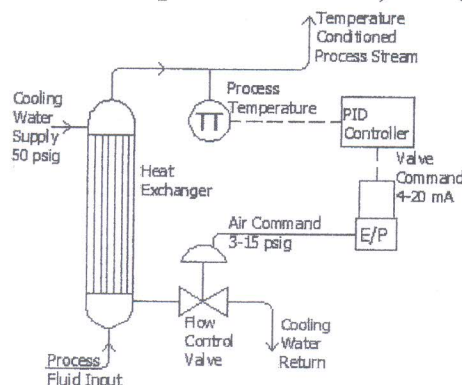
6. A voltage of 14.82 mV is measured with a type J thermocouple with a 25 °C reference temperature. Find the temperature of the sensing junction. (From the table for J-type thermocouples, it is found that V_M= 14.677mV is between V_I = 14.67mV and VH_H = 14.94mV. These voltages have corresponding temperatures of T_I = 270.0 °C and T_H = 275.0 °C. The temperature of the reference junction is 25 °C, and from the J-type table is 0.143mV.)

With best wishes

University	:	Menoufia		Date	:	13/1/2019
Faculty	:	Electronic Engineering		Time	:	3 Hours
Department	:	Indust Elec.&cont.Eng.		No. of pages	:	4
Academic level	:	4rd Year		No. of Questions	:	3
Course Name	:	Real Time Control Systems		Full Mark	:	100 Marks
Course Code	:			Exam	:	Final Exam
Academic Year	:			Examiner	:	Dr. El Bardini

Answer all the following questions:

Q1 (20)   1- What are the advantages and the disadvantages of windows operating system based on real time applications.?

2- Explain the hardware and the software requirements to implement a real time control system.

Q2 (30)

Rewrite the following table containing only the header statement in the A column and the corrected statement in the B column only

A	B
The automated teller system is	-Soft real time system -Hard real time system -Clock based system -Firm real time system -Sensor based system
The autopilot system is	-Soft real time system -Hard real time system -Clock based system - Firm real time system -Sensor based system

For shorter the time constant of the process	-The faster the required sampling rate. - The slower the required sampling rate. -Any sampling rate can be chosen.
One of the main requirements to control a system in real time	-The type of the system. - The location of the system. -The sampling rate based on the system.
Action based on alarm conditions is	-Interactive real time system. -Sensor based real time system. -Clock based real time system. -Distributed control system.
Real time system (Type 1) is	-A system that has a mean execution time. -A system in which the computation must be completed within a specified maximum time. -A system in which the computation must be completed with a minimum time.
Real time system (Type 2) is	-A system that has a mean execution time. -A system in which the computation must be completed within a specified maximum time. -A system in which the computation must be completed with a minimum time. -A system in which the sampling rate is fast

A batch process is	-A process in which a sequence of operation is carried out to produce a quantity of product. - A Type of an operating system - A process in which one step of the operation is carried out to produce a quantity of product. - A process in which the production is maintained for long periods of time.
The general purpose computer is	-Ideal platform for real time applications. - Not ideal platform for real time applications. - Not support real time applications.
The ruggedized computer is	-Ideal platform for real time applications. - Not ideal platform for real time applications. - Not support real time applications.
The important features of the CPU, which determine the processing power is	-The information transfer rates. -The types of the operating system. -The types of data transfer technique.
The interrupts techniques are essential in the case of	-Power failure -Increasing the speed of operation . -Centralized computer control.
For a first order system that has a pole equal to -0.5 , the time constant is	-Less than 0.5 - Equal to 0.5 - Equal to 2 -Equal to - 2

راجعة نكم

Menoufia University
Faculty of electronic engineering
Industrial Electronics and Control Dept.

Minufiya Univ.

Faculty of Electronic Eng.

Course: selected topic(5}   Jan. 2019
Fourth year   **Time: 3-Hours**

Answer all of the following questions

Question (1)   *(20 Marks)*

1- Sketch the on-grid solar energy system block diagram.
2- Explain how can you synchronize the output of the inverter with the grid voltage?
3- Design a three phase inverter with the following specs:
   a- 50 Hz   b-220 Output voltage   c-48 volt input voltage
   i- Draw the circuit diagram- base control signals- current wave forms.
   ii- Draw also the arduino i/o connection.

Question (2)   *(20 Marks)*

1- Explain in details the modified sine wave inverter, draw then the different signals and the corresponding circuits.
2- Explain why we perform maximum power point tracking? Illustrate with curves
3- Explain Perturb and observe (P&O) algorithm then sketch the MPPT P&O algorithm?

Question (3)   *(30 Marks)*

Design A solar energy system for the computer education institute in delta region. The institute contains 5 computer class room . each room contains the following equipment with the specs:

	Load	quantity	Power (watt)	Hrs/day	days/week
1	computer	20	100	6	5
2	printer	1	10	2	5
3	Projector	1	200	3	5
4	Internal lamps	10	10	4	5
5	Air condition	1	4000	5	5

The institute has also an additive power which specs are given in the following table:

	Load	quantity	Power (watt)	Hrs/day	days/week
1	Coffee machine	1	1000	3	5
2	furnace	1	1000	2	5
3	Water heater	1	2000	5	5
4	Internal lamps	10	10	4	5
5	External lamps	10	10	10	5

The design should include the number and specs of each of the following:

a) Solar modules   b) Charge controller
c) Inverters   d) Batteries
e) Array supports size   f) Transistor ratings of the Inverter

Good Luck

Battery Temperature Multiplier

Temperature	Multiplier
80°F/26.7°C	1.00
70°F/21.2°C	1.04
60°F/15.6°C	1.11
50°F/10.0°C	1.19
40°F/4.4°C	1.30
30°F/-1.1°C	1.40
20°F/-6.7°C	1.59

12. Multiply line 11 by line 10. This is your optimum battery size in amp-hours.

13. Amp-hours of battery chosen. example = 104Ah/24 hrs. and 120Ah/120 hrs. etc.)

(Note: The faster the discharge the less total reserve amp-hour capacity)

14. Divide line 12 by line 13. This is the total number of batteries in parallel required.

15. Round off to the next highest whole number.

Global Solar Power Map of North Africa

| 0 - 1 | 1 - 2 | 2 - 3 | 3 - 4 | 4 - 5 | 5 - 6 | 6 - 7+ |

Average Low Peak Sun Hours
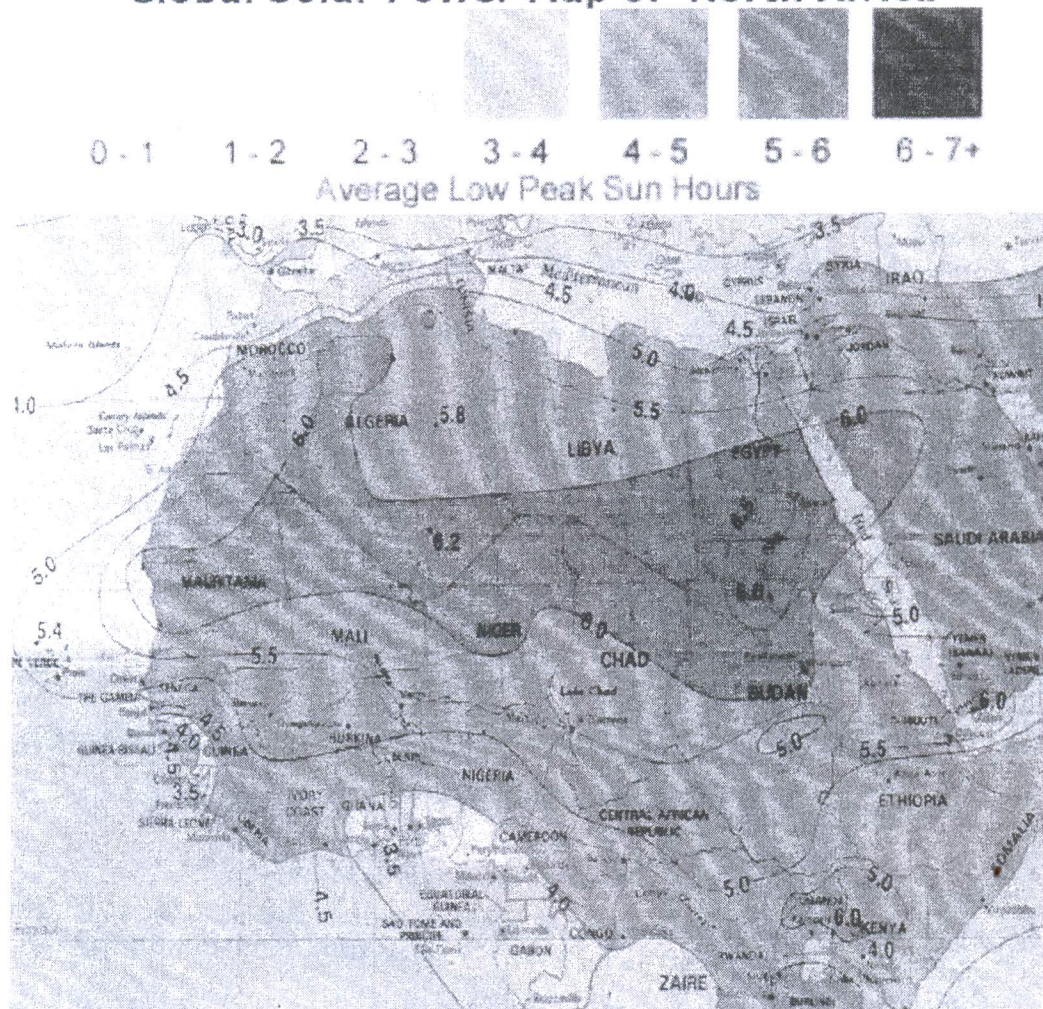
3. Solar Array Sizing Work Form

1. Total average amp hours per day from the System Loads Workform, line 10.

2. Multiply line 1 by 1.2 to compensate for loss from battery charge/discharge.

3. Average sun hours per day in your area.

4. Divide line 2 by line 3. This is the total solar array amps required.

5. Optimum or peak amps of solar module used. See module specifications.

6. Total number of solar modules in parallel required. Divide line 4 by 5.

7. Round off to the next highest whole number.

8. Number of modules in each series string to provide DC Battery voltage:

9. Total number of solar modules required. Multiply line 7 by 8.

4. Battery Size Work Form

1. Total average amp hours per day from the System Loads Worksheet, line 10.

2. Maximum number of continuous cloudy days expected in your area.

3. Multiply line 1 by line 2.

4. Divide line 3 by (maximum) 0.8 to maintain a 20% reserve after deep discharge period.
To prevent less than a maximum 80% discharge divide by a lessor number in #4 above.

If no special conditions below apply, skip lines 5 through 9 and proceed to line 10.
Special Conditon #1: Heavy electrical load
5. Maximum amperage that will be drawn by the loads for 10 minutes or more.

6. Discharge rate of battery. If unknown, check with battery supplier.

7. Multiply line 5 by line 6.

Special condition #2: High Charge Current
8. Maximum output amperage of PV array or other battery charger.

9. Multiply line 8 by 10.0 hours.

10. Amp hours from line 4, 7, or 9, whichever is largest.

11. If you are using a lead-acid battery, select the multiplier below which corresponds to the battery's winter time average ambient temperature:

Menoufia University

Faculty of Electronic Engineering

Department of Industrial Electronics and Control Engineering

Fourth Year   2018 - 2019

Course Title: Elective-4 (Mechatronic-3)	**Final Exam**
Course Code: ACE 415 – B4	**Exam Date:** Jan. 2, 2019
Semester: Fall 2018	**Time:** 10:00 AM - 01:00 PM
Course Instructor: Dr. Alaa Khalifa	**Total Marks:** 70
Pages: 3	**Questions:** 4

Question 1: (20 Marks)

(1.1) Design a four-bar crank-rocker mechanism for 70° of output rocker motion with a quick-return time ratio 1.4:1. The length of the rocker arm equals 5 cm. Is your linkage a Grashof type I or Grashof type II? **(10 Marks)**

(1.2) What is the transmission angle and what effect does it have on design? Use sketches to support your answer. **(5 Marks)**

(1.3) Figure 1 illustrates a linkage that operates a water nozzle at an automatic car wash. Calculate the mobility of the linkage? Can the motor continuously rotate? Why? **(5 Marks)**
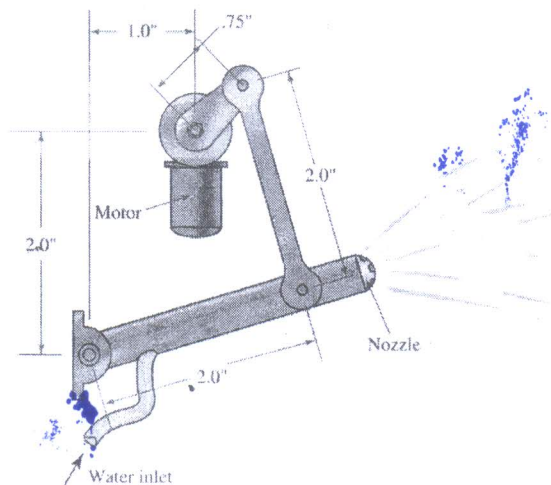

Figure 1:   Water nozzle linkage.

Question 2: (15 Marks)

Using your own words, answer briefly the following questions:

(2.1) Differentiate between function, path, and motion generation for linkage synthesis.

(2.2) Mention the limiting conditions for linkage synthesis.

(2.3) Mention some practical applications of the electronic amplifiers (Op-Amp).

(2.4) Write short notes about potentiometers and how they are used to measure the position.

(2.5) A shunt generator delivers 450 A at 230 V to the load. The resistance of the shunt field and armature are 50 Ω and 0.03 Ω, respectively. Calculate the generated e.m.f?

Question 3:	**(20 Marks)**

Figure 2 shows kinematic diagram of a four-bar mechanism. Redraw it in your answer sheet. Assume that the center of mass CG for each link is located at the middle of the line of centers.
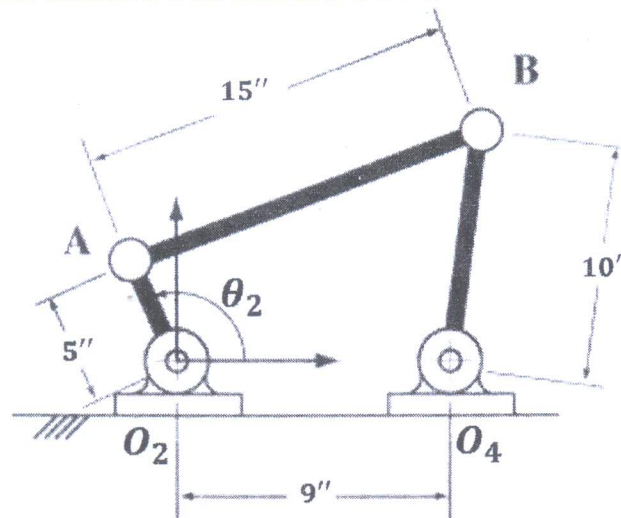

Figure 2: Four-bar linkage.

Assume the configuration where the angle $\theta_2 = 60^\circ$, derive an expression to find:

(3.1) Angles θ_3, and θ_4.

(3.2) Write a MATLAB program to solve numerically the equations obtained in (3.1).

(3.3) Angular velocity of each link $(\omega_3, and\ \omega_4)$ if the crank rotates with $\omega_2 = 25\ rad/sec.$

(3.4) Angular acceleration of each link $(\alpha_3, and\ \alpha_4)$ if the crank rotates with $\alpha_2 = -40\ rad/sec^2.$

(3.5) Position of the center of mass CG for each link.

(3.6) Linear velocity of the center of mass CG for each link.

(3.7) The coupler weighs 7.7 lb. Its mass moment of inertia about its CG is 1.5 lb.in.sec². Drive the equations of dynamic force analysis for the **coupler part only**. Consider the data in the following table. The gravitational acceleration $g = 386\ in/sec^2$.

θ_3 deg	ω_3 rad/sec	α_3 rad/sec²	a_{G3} in/sec²
20.9	−5.8	120.9	3646@226°

Question 4:   **(15 Marks)**

Figure 3 shows a mechanism that is designed to push parts from one conveyor to another. A motor is connected to link 2. The slider is placed at 30 cm from the motor axis.
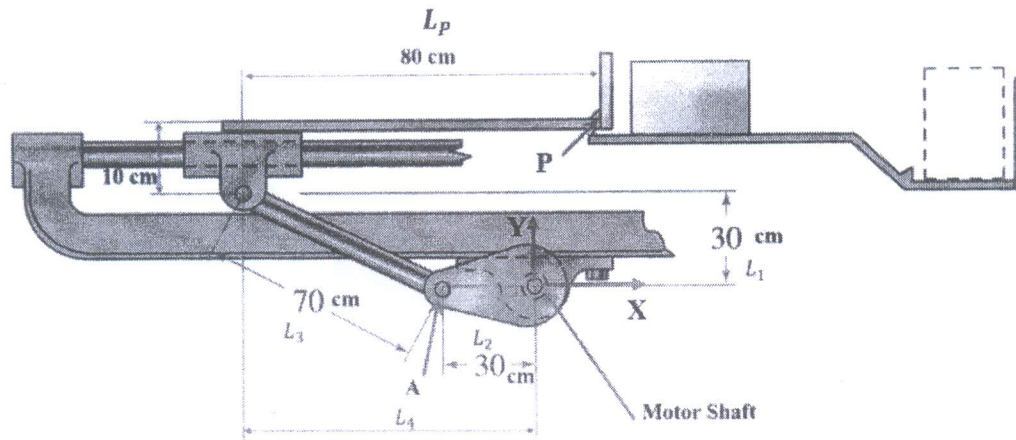

Figure 3: Conveyor feed

Given the links' lengths as shown. Assume the configuration where the angle of link 2 is $\theta_2 = 60^o$, and angular velocity and acceleration of motor as $\omega_2 = 20 \, rad/sec \, and \, \alpha_2 = 10 \, rad/sec^2$, respectively. Derive an expression to find and determine the value of:

(4.1) Position of slider (L_4), and angle of link 3 (θ_3).

(4.2) Speed of slider.

(4.3) Acceleration of slider.

(4.4) Position of point P.

(4.5) Given the total effective force resulted from other links at point A as $10\angle0°$ N (Assume it is denoted as F_{32}), center of mass of link 2 is at 10 cm and lies on the line of centers, and the mass moment of inertia of link 2 is 0.01 N.cm.sec^2. The mass of link 2 is $m_2 = 0.3 \, kg$. Find the required motor torque to derive the system without failure.

Best Wishes ....

Alaa Khalifa
January 2, 2019

Menoufia University   Elective Course (6) - Mecha -

Faculty of Electronic Engineering   Tronics Mid Term Exam.

Dep. of Industrial Electronics &   For 4th year Students

Control Engineering   Date: 2/4/2019, T.A. 1 Houre

Answer The Following Questions :-

1. a. For steady state Conduction, drive the relation of cond-
uction Through A plane wall.

- -

1. b. The interior of an oven is maintained at a temperature of
850°c by means of a suitable control apparatus. The oven walls
are 500 mm thick and are fabricated from a material of therm-
al conductivity 0.3 W/m-deg. For an outside wall temperature
of 250 °c, work out the resistance to heat flow and the heat flow
per squre meter of wall Surface. Also calculate the temperature
at point 200 mm from the interior side.

2. a. Drive the relations which control the Heat flow between Sur-
face and Surroundings: Cooling and Heating of fluids.

- -

2. b. An electric heater of exposed Surface area 0.09 m² and
output 600 Watt is designed to operate fully Submerged
in water. Calculate the Surface temperature of the heater
when water is at 37°c and the surface Coefficient of heat
transfer is 285.3 W/m²-deg. How this value will be affect-
ed if the heater is mistakenly operated at 37°c in air with
a surface Coefficient of 8.5 W/m²-deg?

With Best Wishs!!
prof. Dr. Eng. Gaber Allam

الفرقة الرابعة عمل ق.19 سنة

University	: Menoufia	Date	: 03/04/2019
Faculty	: Electronic Engineering	Time	: 1 Hours
Department	: Industrial Electronics and Control Engineering	No. of pages	: 1
		No. of Questions	: 2
Course Name	: Applications of control systems 4	Exam	: Midterm Exam

Question No 1 : Temperature Measurement

A) What are the types of temperature sensors that you studied?

B) What is the principle of operation of each one?

C) which one is the best to measure the body temperature? And how is can be interfaced with AVR microcontroller.

Question No 2 : Gas Measurement

A) What is the difference between Gas/Smoke & Ethanol Sensors?

B) Draw the symbole with the terminal numbers of TGS822 sensor, and explain the use of each one with characteristics?

C) Design the interfacing circuit to convert the sensor output to related variable voltage?

Best Wishes
Dr. Ahmed El-Sherbeny

University	Menoufia		Date	31/03/2019
Faculty	Electronic Engineering		Time	60 Minutes
Department	Industrial Electronics and Control Engineering		No.of Pages	2
			No. of Questions	2
Academic Term	Second Term		Full Mark	20
Course Name	Industrial Control Syst.		Exam.	Mid-term Exam.
Academic Year	2018/ 2019		Examiner	Pro. Dr. Moh. Ibrahim Dr. Ramy Farid

السكشن/   الاسم/

Question 1

Draw a schematic diagram for typical SCADA system for the following specifications.

1. The field sit contains

A. Three flow-meters (Smart).	F. Two pressure transmitter.
B. Five level transmitter (smart).	G. One temperature transmitter.
C. Ten Level switches	H. Six indication lamps.
D. Three start/stop push-buttons.	I. Five AC pumps 20 KW.
E. One emergency stop push-button.	

2. The over-all sit control is constructed from 6 controllers, 3 of them is connected together in a ring network topology but the others in a star.

3. Redundancy only for the main controller in a ring network topology.

4. Each controller in a ring network topology is connected to the sub-central unit through a radio communication system, but only the main controller in a star network topology is connected through an optical landline network to another sub-central unit.

5. The main central unit consists from the main controller with 3 operation stations that are connected point-to-point to the main controller

6. Final level of SCADA is a commercial data processing system which consists from two levels, the low level is production control but the highest level is production scheduling.

After complete drawing SCADA system, answer all the following

1. Why each sub-central unit contains two separate communication system?
2. Is there any connection between the two sub-central units?
3. Identify the key features of SCADA software and hardware.
4. Identify all components that could need maintenance in SCADA system.
5. Identify the approximately speed of data transfer in each levels of SCADA system.
6. What are the two different licensing patterns used for SCADA Software?
7. Name the Leading SCADA Companies and its SCADA software?
8. Name 3 not open SCADA software.

Minoufia University		Mid-Term Exam – 4th year
Faculty of Electronic Eng.		Intelligent Control Systems – ACE423
Dep. Of Ind. Electronics and Control Eng.		Time Allowed: 1 hour
	جامعة المنوفية	30-3-2019

الإسم :-- الفصل :--------------- الدرجة :------------

Answer the following questions:

1) What is the classifications of fuzzy sets?

2) Consider the two fuzzy sets A_1 and A_2 defined on the following $X = \{0.6, 1.5, 2.5, 3.5, 4.5\}$ and a fuzzy set B defined on the following $Y = \{-0.6, 1, 1.5\}$. The three fuzzy sets are represented by the following:

$$\mu_{A_1}(x) = trapezoid\,(x; 0, 1, 3, 4),\ \mu_{A_2}(x) = triangle\,(x; 2, 4, 5)\ \text{and}$$

$$\mu_B(y) = triangle\,(y; -1, 0, 2)$$

A) Find the following:-

    a) Bounded difference between A_1 and A_2.   b) $B_{0.3}$ c) CON (A_1) d) DIL (B)

B) Determine a fuzzy relation **R** representing the following fuzzy rules:

$$Rule\ 1:\ IF\ x\ is\ A_1\ THEN\ y\ is\ B$$
$$Rule\ 2:\ IF\ x\ is\ A_2\ THEN\ y\ is\ B$$

    using the **Mamdani** implication method.

C) Find the fuzzy output if the input $x_o = 1.5$ using the **Max-Product composition**.

What are the types of activation functions? What are the difference between them?

With our best wishes…….Prof. Nabila El-Rabaie and Dr. Ahmad M. El-Nagar