



مقرر : اقتصاد هندسي وتشريعات
الزمن : ٢ ساعة

جامعة المنوفية
كلية الهندسة الإلكترونية والمنوف
قسم هندسة الإلكترونيات الصناعية والتحكم
المقرعة : الرابعة

المفصل الدراسي الثاني للعام الجامعي ٢٠١٧/٢٠١٨
امتحان نهاية المفصل ٢٣ مايو ٢٠١٨

اجمالي الدرجة ٥٠ (اعمال فصل ١٥ + نهاسي ٣٥)

السؤال الاول

(١٥ درجة)

فازن بين (بامستخدام جدول لكل فقرة):

- مميزات وعيوب قانون الخدمة المدنية الجديد الصادر اكتوبر ٢٠١٦.
- واجبات المهندس تجاه المهنيين وتجاه صاحب العمل.
- العناية الوقائية وعمليات الإصلاح في نظام الامن الصناعي للمهندس

السؤال الثاني

(١٠ درجة)

وجدت شركة نقل من حدرتها المسافة، ان كلفة التشغيل السنوية لسيارة ثمن شرائها ٦٠.٠٠٠ جنيه هي كما يلي (تشمل البنات كذلك سعر اعادة البيع، والارقام بعنات الحنبيات) :

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

بامستخدام نماذج الاحلال وضح متى يجب استبدال السيارة؟

السؤال الثالث

(١٠ درجة)

ترغب شركة تصنيع اجهزة التحكم في بناء ورش للتصنيع طبقاً للإمكانات التالية:

الحالات الأربع				الدائل
لا مساعدة من المحافظة ومناقة قوية	لا مساعدة من المحافظة ومناقة ضعيفة	مساعدة المحافظة ومناقة قوية	مساعدة المحافظة ومناقة ضعيفة	
٤س	٣س	٢س	١س	
٢	٤	٥	١٠	١١ = ٣٠ ورشة
١٠	١	١٠	١٧	٢١ = ٥٠ ورشة
٢٠	٣	١٥	٢٤	٣١ = ٥٠ ورشة

حيث س ١، ٢، ٣، ٤: حالات منافسة السوق الضعيفة، المتوسطة، القوية، القوية جداً على التوالي، باستخدام معيار التدم طبقاً لنظرية اتخاذ القرار حدد أفضل بديل يمكن للشركة أن تستخدمه.

استاذ دكتور / محمد احمد فكيرين

مع خالص التمنيات بالتوفيق



امتحانات الفصل الدراسي الثاني

الفرقة الرابعة
المقرر :- نظم التحكم الصناعية
زمن الامتحان :- 180 دقيقة

2017/2018



جامعة المنوفية
كلية الهندسة الالكترونية بمنوف
هندسة الاكترونيات الصناعية والتحكم
تاريخ الامتحان: 2018/05/20

Part. I

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)

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



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, MEDIUM and LONG. The fuzzy sets for the air temperature input are defined as: $\mu_{COOL} = \text{trapezoid}(0,0,5,15)$, $\mu_{NORMAL} = \text{triangular}(5,15,25)$, $\mu_{WARM} = \text{triangular}(15,25,35)$, $\mu_{HOT} = \text{trapezoid}(25,35,40,40)$. The fuzzy sets for the soil moisture input are defined as: $\mu_{DRY} = \text{trapezoid}(0,0,5,10)$, $\mu_{MOIST} = \text{trapezoid}(5,10,25,30)$, $\mu_{WET} = \text{trapezoid}(25,30,35,35)$. The fuzzy sets for the watering duration output are defined as: $\mu_{SHORT} = \text{trapezoid}(0,0,10,15)$, $\mu_{MEDIUM} = \text{trapezoid}(10,15,25,30)$, $\mu_{LONG} = \text{trapezoid}(25,30,40,40)$. The fuzzy rule-base system is summarized in the following table:

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

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

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:

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

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

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 and 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 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.

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 transparent 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 $12\text{ W/m}^2\text{-deg}$, surrounding air temperature and the corresponding surface coefficient is -15°C and $70\text{ W/m}^2\text{-deg}$. Electric heater provides uniform heat flux.

With Best Wishes!!

Prof. Dr. Eng. Gaber Allam

PART II

Prof. Dr. Mohamed Ibrahim MAHMOUD ANSWER THE FOLLOWING QUESTIONS

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 *** ... *** ← ←

Q4:

16. In an image accentuating a specific range is called

- a) Slcing b) color slcing c) cutting d) color enhancement

17. Black color in image processing is usually represented by the

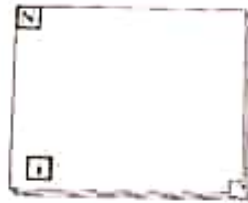
- 1- 0 2- 1 3- 255 4- 256

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

19. Hall voltage is directly proportional to

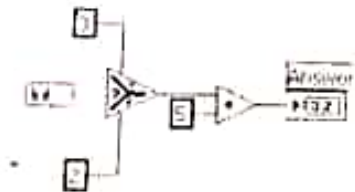
- 1- Current 2- electric field 3- magnetic flux density 4- all of above

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

Answering the following questions:- 60 degree's

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 studied 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



Given the following

Mass of proton = 1.7×10^{-27} kg & charge on proton = 1.6×10^{-19} C

$$KE = \frac{1}{2} mv^2 \quad v = \sqrt{\frac{2E}{m}} \quad F = \frac{mv^2}{r} = Bqv \quad r = \frac{\sqrt{KE}}{Bq}$$



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 keV?
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 radiation?
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

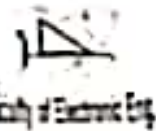
Q6. Compare among: FMRI, PET, and gamma camera. Draw when possible.



Minufiya Univ.

جامعة المنوفية

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



Course: selected topic(5)
Fourth year

oct. 2018
Time: 3-Hours

Answer all of the following questions

Question (1)

(10 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- Explain in details the modified sine wave inverter, draw then the different signals and the corresponding circuits

Question (2)

(10 Marks)

- 1- Design a 3-phase inverter with the following specs:
 - a- 50 Hz
 - b- 380 Output voltage
 - c- 48 volt input voltage
- 2- Sketch the inverter circuit and phase voltage and the phase current
- 3- Draw the control circuit diagram and write an arduino program to operate the 3- phase inverter.

Good Luck

رابع كالم ع-10

Minoufia University
Faculty of Electronic Eng.
Dep. Of Ind. Electronics and Control Eng.

4th Year Ex2018
Real Time Control System
Mid-year Exam
1 hour

Student Name:
Sec. No.:

Q1

- Define: Real Time System
Soft Real Time System
Decentralized control system
Clock based system
Embedded computer

Q2

A Reactor with an input valve A, and an output valve B has a heater, a temperature sensor, and a pressure sensor. The system is controlled online in which the sequence of operation is:

- 1- Open A
- 2- Turn heater on.
- 3- If the temperature is T1 : Turn heater off.
- 4- If the pressure is P1 : Turn heater off.
- 5- Turn heater off.
- 6- Wait 20 min.
- 7- Open B

- (a) Is this system Real Time? Explain
- (b) This system is (Batch – Continuous – Test). {Choose}
- (c) What are the input task, the output task, the control task and the communication task?
- (d) Draw a flowchart to show the sequence of operation to be carried.

Engr. Mohamed Ibrahim Mahmoud

Student Name:

Section:

ID:

MENOUFIYA UNIVERSITY FACULTY OF ELECTRONIC ENGINEERING – MENOF	SUBJECT: PROGRAMMABLE LOGIC CONTROLLER 22 / 05 / 2017	DEPARTMENT OF INDUSTRIAL ELECTRONICS AND CONTROL ENGINEERING
B. Sc GRADUATE EXAMINATION	MED-TERM EXAMINATION	TIME ALLOWED: ONE HOURS

ANSWER THE FOLLOWING QUESTION

Question:

(15 Marks)

One product of your company is the automatic drilling machine. Your team has the order to design the main part of this drilling machine. This part is consisting of: up-down moving part, two speed (reverse rotation) DC motor, three limit switches, start drilling switch, work bench, and the work piece. A second DC motor is used to rotate the drilling tool in a unidirectional constant speed.

- Draw the system components schematic diagram, with the operation comments.
- Draw the two parts of system entity, with the input/output names and comments.
- Write the input/output addressing, names and comments.
- Draw the PLC actuators wiring diagrams.
- Draw the PLC sensors wiring diagrams.
- Draw the two PLC control GRAFDET or SFC, descriptions and addressing.
- Write the PLC GRAFDET program in Nano ladder diagram.
- Write the PLC GRAFDET program in Nano instruction list.

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

Prof: Dr. Mohamed Ibrahim MAHMOUD

2018



Menoufia University
Faculty of Electronic Engineering
Department of Industrial Electronics and Control Engineering

Course Title: Elective-4 (Mechatronic-3)

Midterm Exam

Course Code: ACE 415 – B4

Exam Date: October 31, 2018

Semester: Fall 2018

Time Allowed: 60 min

Course Instructor: Dr. Alaa Khalifa

Total Marks: 20 Marks

Question 1:

(10 Marks)

Choose the correct answer to fill the blank

1. Film advance mechanism is an example of..... generation.
a) function b) path c) motion
2. In the slider-crank mechanism, the stroke equals of the crank.
a) half the length b) the length
c) twice the length d) four times the length
3. The four-bar mechanism is a one-DOF linkage, and it has..... isomers.
a) 1 b) 2 c) 3 d) 4
4. Using Grubler equation, if the mobility of the chain equals zero, the chain called
a) mechanism b) structure c) preloaded structure d) dyad
5. One of limiting conditions for mechanism is the toggle position which is always undesirable.
a) True b) False
6. If there are L number of links in a mechanism then number of possible inversions is equal to.....
a) $L + 1$ b) $L - 1$ c) L d) $L + 2$ e) $L - 2$
7. For a kinematic chain to be considered as mechanism,
a) one link should be fixed b) none of the links should be fixed
c) there is no such criterion d) none of the above.

Student's Name/

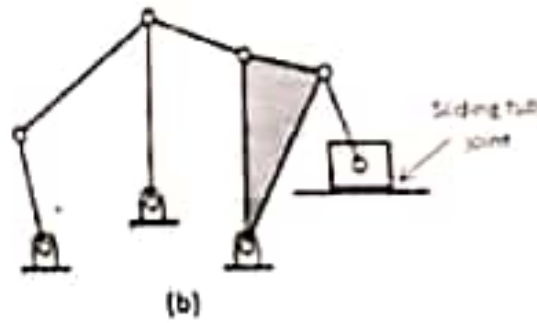
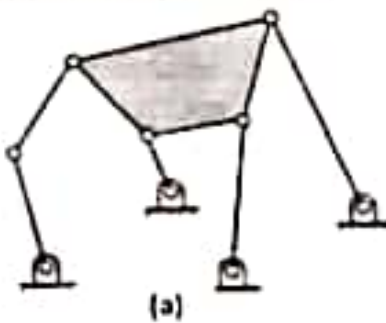
Page 1 of 2

8. _____ synthesis used when a technique exists to directly create a solution.
 a) Type b) Qualitative c) Quantitative d) None of the above
9. A rigid body in plane has _____ degrees of freedom.
 a) two b) three c) six d) eight
10. For one degree of freedom planar mechanism having six links, which one of the following is the possible combination?
 a) Four binary links and two ternary links
 b) Four ternary links and two binary links
 c) Three ternary links and three binary links
 d) One ternary link and five binary links

Question 2:

(6 Marks)

Determine the mobility of each of the planar linkages shown below. Show the equations used to determine your answer.



Question 3:

(4 Marks)

Design a four-bar crank-rocker mechanism for 80° of output rocker motion. The length of the rocker arm equals 5 in. Is your linkage a Grashof type I or Grashof type II?

Best Wishes

Alaa Khalifa
 October 31, 2018

Student's Name/

Page 2 of 2



Question 1 (3-3)

1. State the different sensor classifications?
2. Compare between active and passive sensor. Give some examples for each

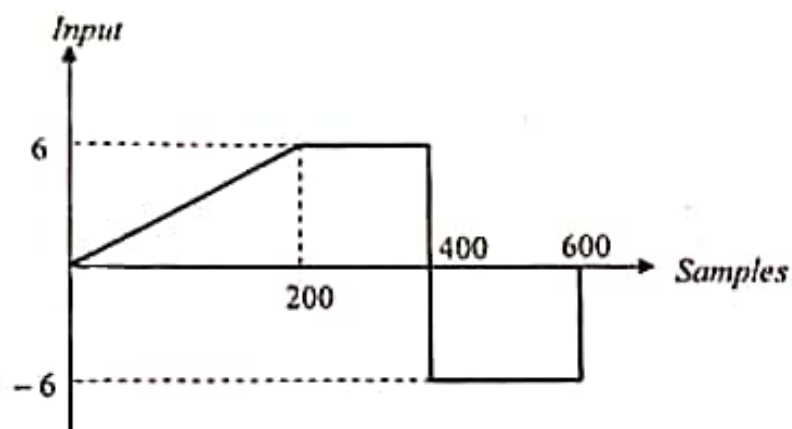
Question 2 (3)

1. Giving the following applications areas
 - a- Health care
 - b- Environmental Sensing applicationsExplain an application in each type

Question 3 (3-3)

1. Explain the sensor classifications according to the:
 - a. Electrical phenomena.
2. Draw and compare between the following communications topologies (Star, Mesh) considering WSN?

- A) What are the several ways of interfacing the DC motor with a microcontroller?
- B) Draw an interface circuit to show how can connect a DC motor with an *ARDUINO UNO* kit where the motor is operated in two directions.
- C) Write an Arduino program for controlling the DC motor using PI controller (*discrete form*) where the motor supply is 12 V, sampling period is 0.01 msec., the proportional and integral gains are 2 and 0.5, respectively. The speed of DC motor is measured using the incremental encoder with 36 pulses. The input signal is shown in the following figure:



me:

Section:

Academic No:

Answer ALL the following questions:

1. **Draw and describe briefly باختصار** the operation of intravascular blood pressure sensor. **[6 points]**

2. The amplifier of an electrocardiograph (ECG) has a first-order time constant of 16 s. The ECG amplifier has a dynamic range of input voltages, but any input voltage greater than ± 1.5 mV will be out the range of its display and cutoff. While recording the ECG of a patient, a transient occurs that has an amplitude of 10 mV, which causes the ECG to fall out of the instrument's display. If the ECG R wave has an amplitude of 1 mV. **How long will take for this entire signal to be visible on the display?**

(First-order exponential decay of the amplifier is given by $V_f = V_0 e^{-t/\tau}$; where V_f is the final voltage, V_0 is the initial voltage, and τ is the time constant.)

[9 points]

ANSWER THE FOLLOWING QUESTIONS

First Question:

(15 Marks)

In the SCADA systems the **Functions of the Operator Interface** is an important part; write a brief notice to explain this part. Your answer Must include:

- (1 – a) Process Graphics.
- (1 – b) Event and Alarm Manager.
- (1 – c) Trends.
- (1 – d) Historian.
- (1 – e) Controller Integration.
- (1 – f) Recipes.

Second Question:

(15 Marks)

In an Industrial Process Control IPC, the Liquid Level Control is an important part; write a brief notice to explain this part. Your answer Must include:

ANSWER THE FOLLOWING QUESTIONS**First Question:****(25 Marks)****The Best Subject of This Term**

In an Industrial Process Control (IPC), a Batch Process (BP) is controlled by a Programmable Logic Controller (PLC) and a Personal Computer (PC) for the Supervisory Control AND Data Acquisition SCADA system.

The controlled system contains three tanks, one silo, six three phase electric pumps, eight proximity sensors, one single phase heater, one temperature sensor, and one product filler.

There are two proximity sensors in each tank, which are located to determine the product volume in that tank. The first tank is used for (Alkaline) product with pump 1 for inlet and pump 2 for discharge. At the same level, the second tank is employed for the (Polymer) product with pump 3 as inlet bump and pump 4 for discharge. Also, a heater and temperature sensor are used to obtain the desired temperature of the polymer.

At the level below the above two tanks, a reaction vessel is located, with its discharge pump 5. Finally, the product passes through the filter to the silo that stores the final product before packaging. The discharge of the (Silo) is done by means of pump 6. Also, use start / stop push buttons and two indicator lamps.

- (1 – a) To design the system controller; draw the assembly of the system components.
- (1 – b) Draw the PLC wiring diagrams: Power and Control circuit diagrams.
- (1 – c) Write the PLC control program in Ladder Diagram.
- (1 – d) Design a SCADA system for this *IPC*.
- (1 – e) Modify the Ladder Diagram according to the requirements of SCADA.

Second Question**(10 Marks)**

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.

- (2 – a) Draw a graphical representation of the (MES) core.
- (2 – b) Write and explain the Six Items of the (MES) core and the Planning System.

Third Question**(12 Marks)**

The Human Machine Interface (HMI) is the main part of the SCADA. In the SCADA

ANSWER ALL THE FOLLOWING QUESTIONS

First Question:

(20 Marks)

The production line in an industrial factory consists of three conveyors, one for incoming products and two for the products delivery, and two work stations. The products are two types Product I and Product II. The incoming product conveyor and the two work stations can manipulate the two types of the products. One of the products delivery conveyors is used for Product I and the other is used for Product II.

One of the engineering solutions for this problem is to use a Rotating Arm Robot for the management of the products flow among the Incoming Products Conveyor, the two Work Stations and the two Products Delivery conveyors.

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

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

Second Question:

(20 Marks)

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

(2 – b) Discuss in brief Five Applications, in which the (SSSS) is used.

(2 – c) Draw the Internal Circuit Diagram of the (SSSS). Explain the function of each part or component of the (SSSS).

(2 – d) Draw and discuss the characteristics of the Torque/Speed and Current/Speed family of curves. Explain the operating point conditions on the above two curves.

(2 – e) What are the industrial problems that can be solved when using the Variable Speed Drive (VSD)?

Third Question:

(20 Marks)

(3 – a) Discuss in brief Five Applications, in which the (VSD) is used.

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

(3 – c) 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 curves

(3 – d) What are the benefits when using the (VSD)

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

Draw and write brief notice on:

- (4 – a) Factory Automation for Competitive Production.
- (4 – b) Factory Automation Progressive Needs.
- (4 – c) Factory automation Technology Selection.

Fifth Question :

(15 Marks).

An industrial Elevator driven by an induction three phase motor, need to be started, stopped and reverses the rotation frequently.

The Star – Delta Operating Mode ; which is used for Medium size, three phase motors may be applied to this motor operation.

First: Design automation scheme of this process using Relay Logic Control RLC.

For only the Star – Delta Operating Mode the design must include:

- (5 – a) Power circuit diagram. Write your comments.
- (5 – b) Control circuit diagram with mechanical timer. Write your comments.
- (5 – c) Ladder diagram; with mechanical timer. Write your comments.
- (5 – d) List of components.

Second:

(5 – e) Draw the power circuit diagram of the:

Star – Delta with Reverse Rotation

Answer all the following questions

1. Select one of the industrial applications (except those in question 3 and 4) and explain its operation with neat drawing and brief description. (10 degrees).
2. Design a pulse width modulation circuit using 555 oscillator that produces a square wave with amplitude 12V and duty cycle of:
a) 0.7, b) 0.5. (14 degrees).
3. Fig. 3 shows the circuit for controlling the recirculation pump of a quench oil temperature controller. Now, if the firing delay angle of the triac is 150° , find the thermistor resistance that corresponds to this case. (14 degrees).

R_1

4. Fig. 4 shows the physical layout of the moistening chamber and water feed pipes with the circuit for detecting and controlling the humidity.

If the electro pneumatic diaphragm control valve is 70% open. Find the hygrometer resistance in this case. (14 degrees).

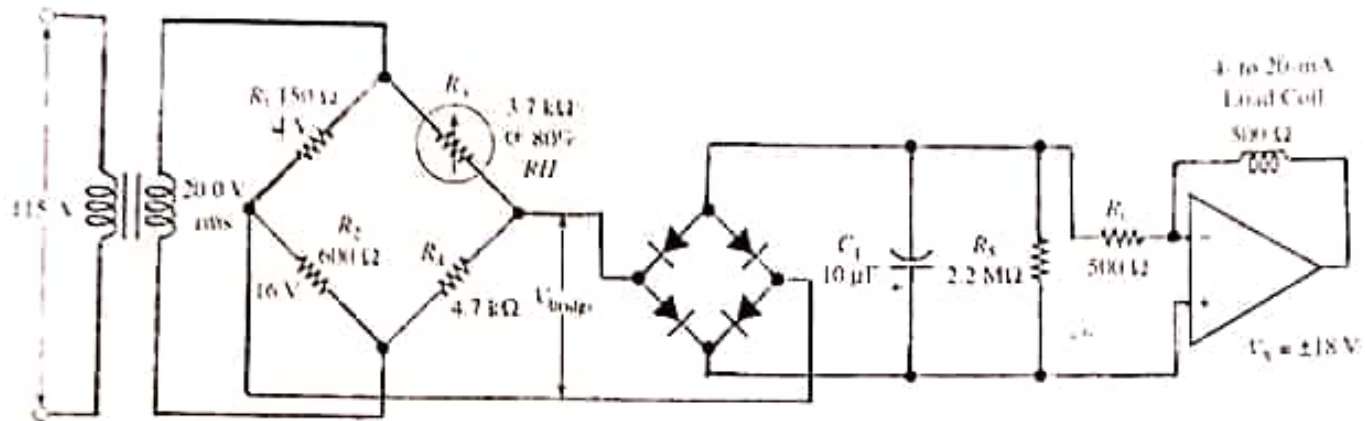


Fig. 4: Circuit for detecting and controlling the humidity

5. a) A single phase motor connected to 400V, 50 Hz supply takes 31.7A at a power factor of 0.7 lagging. Calculate the capacitance required in parallel with the motor to raise the power factor to 0.9 lagging. (6 degrees).

b) A periodic sinusoidal voltage of instantaneous value $v = 200\sqrt{2} \sin \omega t$ is applied to a nonlinear load impedance. The resulting instantaneous current is

$$i = 200\sqrt{2} \{ 24 \sin(\omega t - 45^\circ) + 12 \sin(2\omega t + 60^\circ) + 8 \sin(3\omega t + 60^\circ) + 6 \sin(4\omega t + 60^\circ) \}.$$

Calculate the power components P, Q, D of the apparent volt amperes and hence calculate the displacement power factor, the distortion power factor, and the power factor. (12 degrees).

Answer the following questions;

Question No. (1):

[15 Marks]

True or False and correct the false ones?

1. Mechatronics systems have a low initial cost.
2. In a measurement system, an amplifier and analog to digital converter (A/D) can be considered as signal recorder elements.
3. Sensor's resolution is the measuring instrument's property to respond to the measured quantity changes.
4. Inductive sensors can be used in many security problems.
5. Optical sensors are not affected by environmental conditions such as atmospheric dust, snow, and rain.
6. Rotary potentiometer has a small screw on the left side that can be turned with a screwdriver to accurately make small changes in resistance.
7. Absolute encoder needs external processing of signals to obtain the angular position of a motor.
8. Internal combustion engine transforms a rotary motion into a translational motion.
9. Plate or disk cams converts a translational motion into the reciprocating motion of the follower.
10. The belt's slack side has a larger tension value than the other side.
11. Crossed belt drive is used when the driven and driving pulleys are to be rotated in the same direction.
12. Electromagnet is an object made from a material that is magnetized and creates its own persistent magnetic field.
13. MEMS can be manufactured in traditional fabrication rooms for Integrated Circuits (ICs).
14. MEMS fabrication consume large amount of raw materials and so it has lower cost.
15. Wet chemical etching consists in selective removal of material by dipping a substrate into a solution that dissolves it.

Question No. (2):

[20 Marks]

➤ **Choose the correct answer:**

- 1- A good example of manufacturing applications of mechatronics system is
a- Automobile b- high speed train c- Segway robot d- CNC machines e- all of the above
- 2- The sensor's measures the difference between the measured value and actual value.
a- repeatability b- sensitivity c- precision d- accuracy
- 3- A sensor can be found in Laptop track Pads.
a- capacitive b- inductive c- both a and b d- none of the above

- 4- LVDT can be considered as sensor.
 a- capacitive b- inductive c- resistive d- none of the above
- 5- The gauge factor of a strain gauge is
 a- $\frac{\Delta R/R}{\Delta L/L}$ b- $\frac{\Delta L/L}{\Delta R/R}$ c- $\frac{\Delta R/R}{\Delta D/D}$ d- $\frac{\Delta R/R}{\Delta P/\rho}$
- 6- In the Encoder, is used to filter signal into square wave used by microcontroller.
 a- Mask b- LED c- Photodetector d- Electronic board
- 7- The.....encoder keeps the correct position value in case of loss of power.
 a- single channel incremental b- Dual channel incremental c- absolute d- none of the above
- 8- Degree of freedom of a structure/locked kinematic chain is
 a- 6 b- 4 c- 2 d- Zero e- none of the above
- 9- Links can be classified depending upon their type of connections into.....
 a- binary b- ternary c- quaternary d- none of the above
- 10- Door latch can be considered as a kinematic pairs.
 a- higher b- lower c- medium d- none of the above
- 11- In radial follower, the follower motion is along an axis.....the cam center.
 a- passing through b- away from c- both a and b d- none of the above
- 12- A motor gear has 30 teeth and rotates at 100 rev/min. The driven gear has 60 teeth is connected through a 30 teeth gear to the driver to have the same direction of the driver. The driven rotational speed will be.....of the driver speed.
 a- twice b- half c- equal d- none of the above
- 13- To transfer power between two rotating shafts with distance between them equal to 2 meters, the belt is more desirable.
 a- Flat b- V-shape c- circular d- timing
- 14- The major advantage of a compound gear train over a simple gear train is that.....
 a- much larger gear ratio with a smaller space
 b- smaller gear ratio and big space
 c- smaller gear ratio and smaller space
 d- larger gear ratio with larger space
- 15- A solenoid valve is an operated valve.
 a- electrically b- mechanically c- electromechanically d- none of the above
- 16- Dc motor field system must have number of poles.
 a- odd b- even c- infinity d- all the above
- 17- All of the following can be considered as MEMS systems except
 a- Hard disk Read/write heads b- Micro sensors and actuators c- micro robot d- Laser-Jet printer

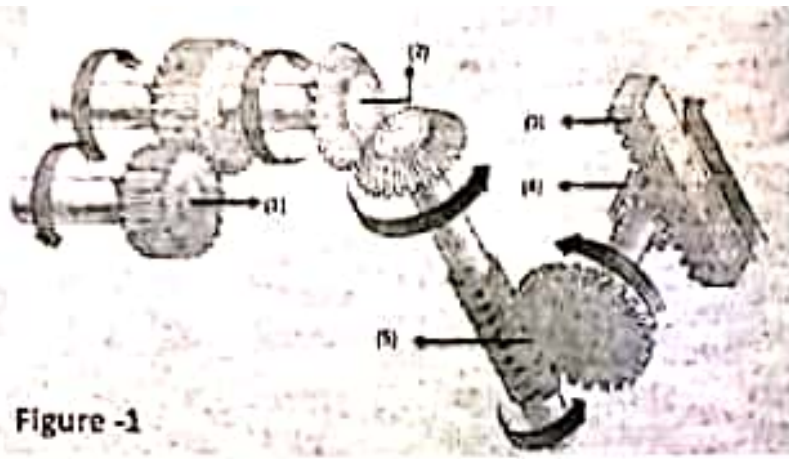


Figure -1

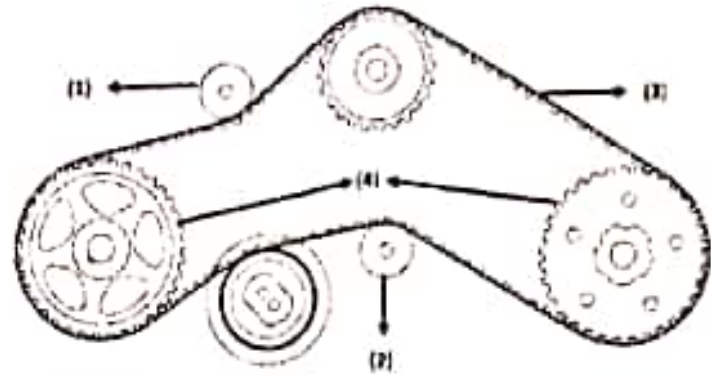


Figure-2

B. For the system shown in the figure-2:

1. What is the name of this mechanism? Give the name of the elements numbered in the figure?
2. Is this mechanism can be used in high power applications? Why?
3. If element 3 is replaced with a flat one, what is needed to be modified for proper operation?

Question No. (4):

[10 Marks]

A. For the mechanism shown in the figure-3:



4. What is the name of this mechanism?
5. What is the function of such mechanism?
6. Determine the direction of rotation of gear 5 and gear 9 in this mechanism if driver direction is as shown in the figure?
7. What is the function of Gear 8 in this mechanism and what is its effect in total gear ratio?
8. Derive (Don't write it directly) a relation for the total gear ratio that relates the driver to driven?

[13 Marks]

A. A resistance wire strain gauge with a GF of 2 is bonded to a steel structural member subjected to a stress of 100 MN/m^2 . The modulus of elasticity of steel is 250 GPa . Find the percentage change in the value of the gauge resistance, due to the applied stress.

B. For the optical encoder code disk shown in the below Figure-4: (10 Marks)

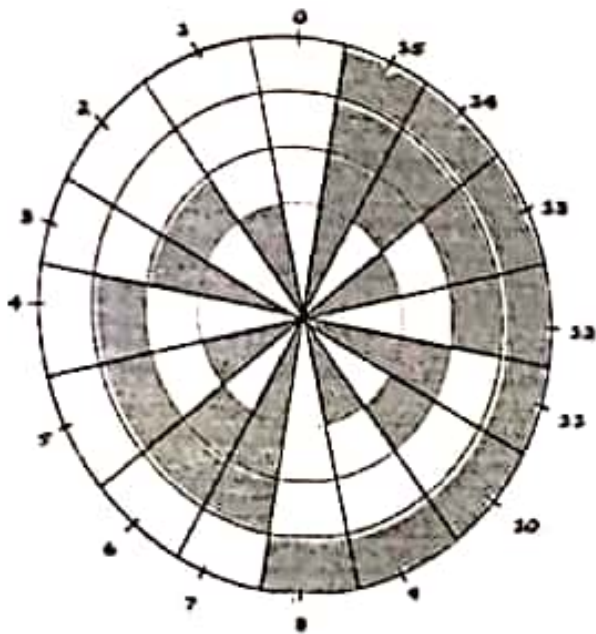


Figure - 4.a

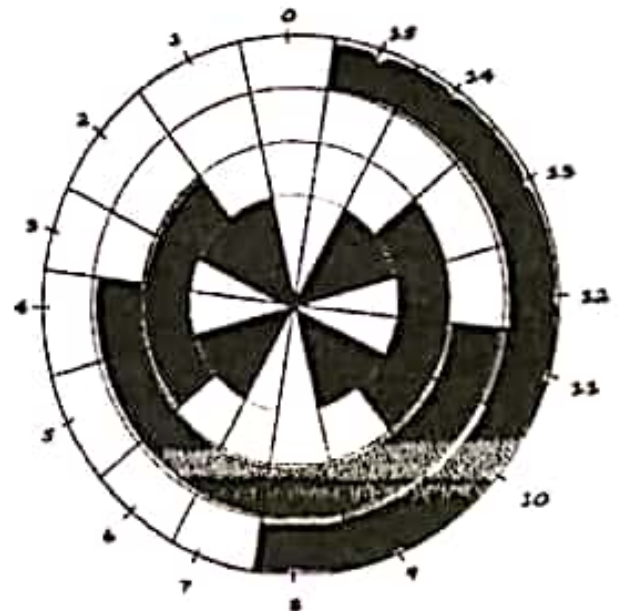


Figure - 4.b

1. What is the type of the code used for the disk in part a and part b of the figure?
2. How many tracks and bits of such encoder?
3. What is the maximum resolution obtained by this encoder?
4. Which type of codes is more desirable than another in such type of encoders? Why?
5. Write down the two codes used in the two disks?

- 1- What is the meaning of the Real Time Control System?
- 2- Compare between Soft Real Time System, Hard Real Time System, and the Firm Real Time System
- 3- What is the embedded operating system?
- 4- What are the applications of real time clock?
- 5- What are the types of data transfer techniques?
- 6- What are the disadvantages of using windows operating system in real time applications?

Clock based system is one type of

- Real time operating system
 - Real time system
 - Not real system
-

One of the feature of the CPU in Real Time Control System is:

- Operating system
 - Instruction set
 - Polling data
-

The Importance of Timing in Real Time Control System is

- The controller must be done after a finite period of time
- The controller must be done within a finite period of time
- The controller must be done within an infinite period of time

A stepper motor is interfaced with a computer. The signals required to drive the four phases of the motor are shown below:

Reverse ↑	1	0	1	0	Forward ↓
	0	1	1	0	
	0	1	0	1	
	1	0	0	1	

The motor is moved for 20 min in the forward and for 10 min for the reverse . The time of each step is 5 ms.

- 1- Write a program to implement this operation.
- 2- What is the type of the interface must be used?

Q4

30

A microcomputer receives three readings, the first is a temperature, the second is a pressure p_1 , and the third is a pressure p_2 from a furnace (the two pressure sensors are located in different locations in the furnace), in which the relation between the temperature and the voltage from the sensor is $V = 0.03 T + 0.003 T^2$, where T is in C° , a PI controller is used to control the temperature , where the set point of the temperature is $60 C^\circ$, if p_1 is greater than p_2 the operation is stopped.

- 1- Write the sequence of the operation.
- 2- Draw a flowchart describing this operation in the real time.
- 3- What are the input tasks, the output tasks, and the control tasks.
- 4- Develop a real time program in which the sampling period is 0.01 sec, $k_p=0.1$, $k_i=0.01$, and the full time of operation is 30 min.

With my best wishes
Dr. M. El-Bardini

Part Two: Hydraulic System

من فضلك أحب عن هذا الجزء من ناحية الميعن من ورقة الإجابة

Answer all the following questions :

(10 Marks)

Question No 1: Choose the correct answer

- 1- A person who has a weight of 100 Kg on the earth will weigh on the moon..... Kg.
a- 100/2 b- 100/3 c- 100/4 d- 100/6
- 2- The pressure measured with respect to a vacuum is defined as the pressure.
a- differential b- gauge c- absolute d- atmospheric
- 3- The systems in which the energy can be stored in batteries are systems.
a- electrical b- hydraulic c- pneumatic d- electro-hydraulic
- 4- Electrical shock is not a disadvantage of the..... systems.
a- electrical b- hydraulic c- pneumatic d- b and c
- 5- Pascal's law states that pressure in a confined body of liquid will act..... in all directions.
a- erratically b- equally c- forward d- sequentially
- 6- Pressure in a hydraulic system is generated by to flow.
a- acceptance b- immunity c- resistance d- compliance
- 7- One of the following is a hydrodynamic pump, it is the pump
a- vane b- gear c- centrifugal d- piston
- 8- Positive displacement must never operate against valves on the discharge side of the pump
a- closed b- opened c- both a and b d- none of the above
- 9- The rotation of gears in internal gear pump takes place in the direction
a- same b- opposite c- both a and b d- none of the above
- 10- The advantages of the internal gear pump is that
a- moderate speed b- moderate pressure c- high viscosity fluid can be used d- all of the above
- 11- pumps are used in food applications as they handle solids without damaging the product.
a- external gear b- internal gear c- lobe d- vane
- 12- The operation principle used in external gear pumps is that it has 2 gears rotate in the direction.
a- same b- opposite c- both a and b d- none of the above
- 13- The capacity of vane pump depends upon
a- eccentricity b- vanes expansion c- vanes width d- rotor speed e- all of the above
- 14- Cam ring of unbalanced vane pump is.....
a- round b- elliptical c- triangular d- both a and b
- 15- The pump has an elliptical cam ring with two inlet and two outlet ports
a- unbalanced vane b- balanced vane c- adjustable vane d- gear
- 16- The arrangement of pistons in piston pumps is
a- radially b- axially c- both a and b d- none of the above
- 17- When the angle of swash plate in the axial piston pump decreases, the flow rate.....
a- decreases b- increases c- does not depend on swash plate angle d- none of the above
- 18- The discharge of oil in axial piston pump, when the angle of swash plate is zero, will be
a- maximum b- minimum c- no oil discharge d- none of the above

Please Turn Over

من فضلك أحب عن هذا الجزء من ناحية الميعن من ورقة الإجابة

19. Valves are basically have two types, they are.....
 a- vane and infinite b- lobe and finite c- both a an b d- none of the above
- 20- A two/two valve has
 a- 3 positions and 2 ports b- 2 ports and 2 positions c- both a and b d- none of the above

Question No 2:

(10 Marks)

(5 Marks)

➤ **True or False and correct the false ones**

- 1) Hydraulic system can provide low power output with very small weight and size.
- 2) The vacuum pressure is larger than the atmospheric pressure.
- 3) Foot, pound and second are the measuring units of length, mass and time respectively in SI system.
- 4) The pressure check valve in hydraulic system can be used to protect the system from overload damage.
- 5) Centrifugal Pumps produce the same flow at a given RPM no matter what the discharge pressure is.

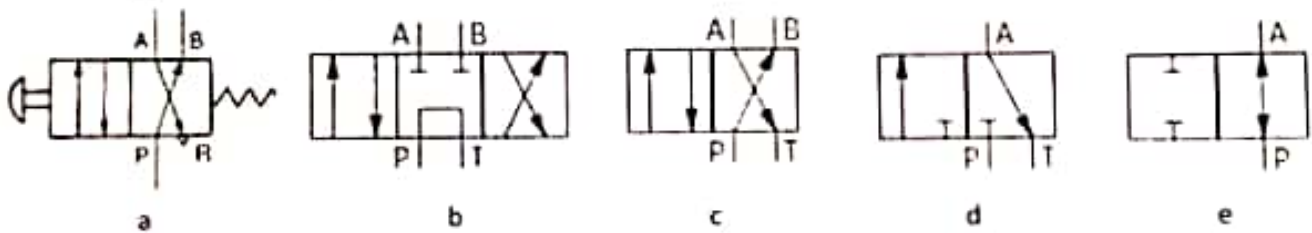
- A simple lifting jack has a pump piston 100 cm radius and a load piston 6000 mm diameter. Calculate the force needed on the pumping piston to raise a load of 40 kN. Calculate the pressure in the oil.

Question No 3 :

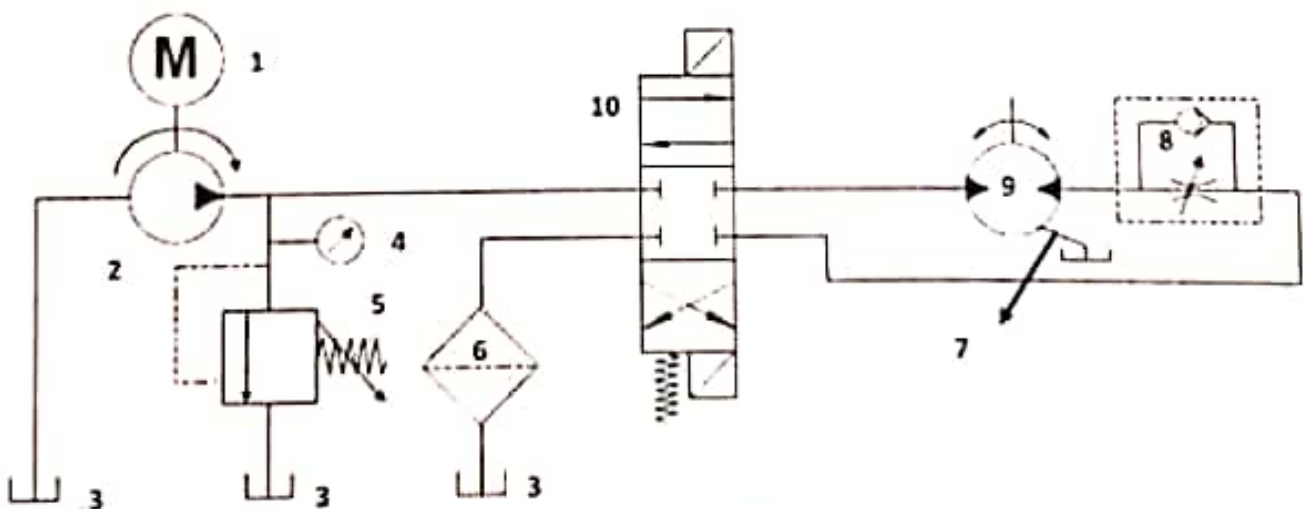
(10 Marks)

- Identify the following schematic symbols.

(5 Marks)



- Identify the numbered components (1-10) in the below figure and **write down** each one function in the system. (5 Marks)



University : Menoufia
 Faculty : Electronic Engineering
 Department : Industrial Electronics
 and Control Eng.
 Academic level : 4th Year
 Course Name : Medical Instrumentation
 Course Code : ACE 413
 Academic Year : 2016/2017



Date : 11/01/2017
 Time : 3 Hours
 No. of pages : 1
 No. of Questions : 4
 Full Mark : 90 Marks
 Exam : Final Exam
 Examiner : Dr. ME Ka

Answer all the following questions :

Question No 1 :

(20 Marks)

- a) What are the common physiological measurements used for diagnosis ? (10 Marks)
- b) Give short notes on optical biopsies. (10 Marks)

Question No 2:

(25 Marks)

- a) Define and describe the leads of an electrocardiography (ECG). (5 Marks)
- b) Define all components of a basic ECG amplifier circuit. (10 Marks)
- c) What are possible reasons if the ECG traces have artefacts but not in all traces ? How can you solve this problem ? (10 Marks)

Question No 3 :

(20 Marks)

- a) How can you test the step response and frequency response of an extravascular blood pressure sensor. (10 Marks)
- b) Draw and define all components of a simplified electrical circuit model with an intentional leak of extravascular blood pressure sensor. (5 Marks)
- c) Why do we sometimes make an intentional leak in the catheter of the extravascular blood pressure measurement system ? (5 Marks)

Question No 4 :

(25 Marks)

- a) What is the basic idea of computed tomography (CT) imaging systems in medicine. (5 Marks)
- b) Describe four generations of CT scanners. (10 Marks)
- c) Give short notes on the data acquisition system of a CT machine. (10 Marks)

Achieved ILOS :

	Question No	Q1			Q2			Q3			Q4	
		a	b	c	a	b	c	a	b	c	a	b
Achieved ILOs	A- Knowledge & Understanding	a17	a17	a17	a17	a17	a17	a17	a17	a17	a17	a17
	B- Intellectual skills	b5		b5	b5	b5	b6	b5		b6	b5	b5
	C- Professional and practical skills	c2	c3		c2		c3		c3			c3
	D- General and transferable skills				d7					d7		

Answer the following questions:

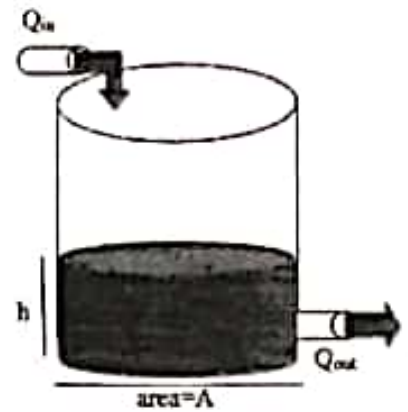
Question (1): [8 Degree]

i) Identify the suitable expression for each of the following:

- 1) It is a short bent tube, closed at one end. When the tube is pressurized, it tends to straighten out.
- 2) When it is used in industrial closed loop systems, the input usually loses control over the output, because it is in phase with the input.
- 3) It is usually defined as the time it takes for the controlled variable to go from 10 to 90% of the way to its new position.
- 4) It is a two-terminal device that changes resistance with temperature. It is made of oxide-based semiconductor materials and come in a variety of sizes and shapes.

ii) Why do we need automatic process control?

iii) Estimate the mathematical model of a tank shown in figure. And draw the block diagram of a tank level.



Question (2): [11 Degree]

i) Complete the empty places in the following:

- a- The two classifications of industrial control systems are (2)..... control and (3)..... control.
- b- (4)..... element converts pressure directly into resistance, and resistance can be converted into voltage
- c- (1)..... level detectors can only detect whether the liquid is at a certain level.

ii) Calculate what the pressure (head) would be at the bottom of a 12-ft deep gas oil tank and the density for gas oil is about 52 lb/ft³ and ambient pressure is 14.7 psi.

iii) Design the circuit



Question (3): [11 Degree]

i) Choose the correct answer.

1) Which of the following parameters is correct?
 - The result transfer function is:

$$H(s) = \frac{2s + 5}{3s^2 + 9s + 12}$$

a. Numerator

b0	b1	b2	b3
2	5		

Denominator

a0	a1	a2	a3
12	9	3	

b. Numerator

b0	b1	b2	b3
5	2		

Denominator

a0	a1	a2	a3
12	9	3	

c. Numerator

b0	b1	b2	b3
5	2		

Denominator

a0	a1	a2	a3
3	9	12	

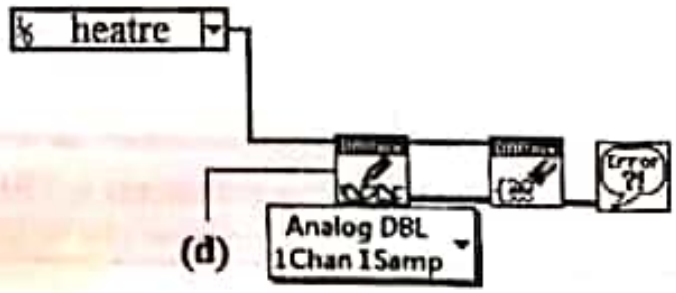
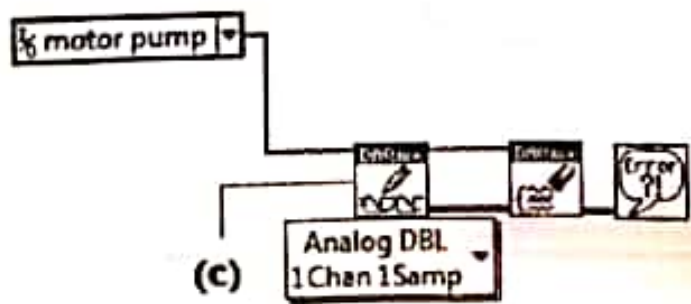
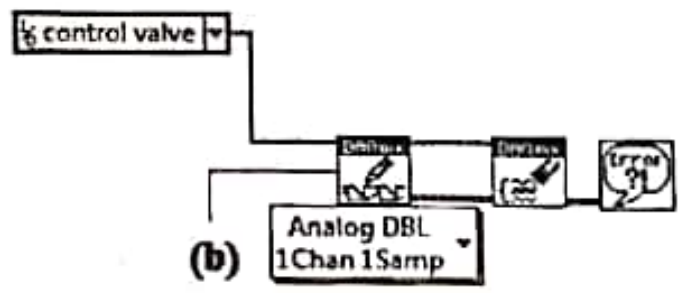
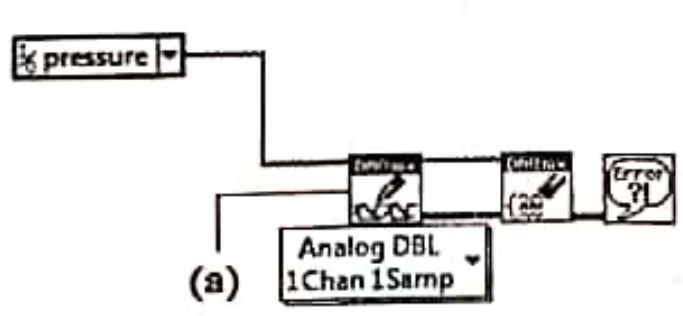
d. Numerator

b0	b1	b2	b3
2	5		

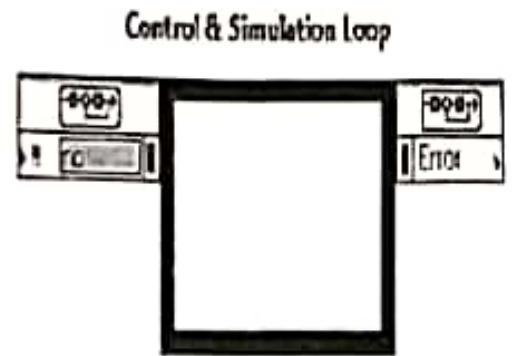
Denominator

a0	a1	a2	a3
3	9	12	

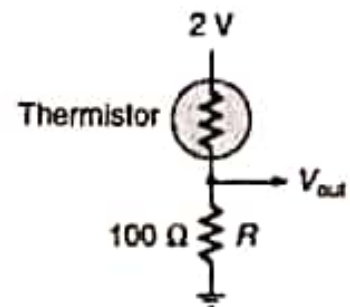
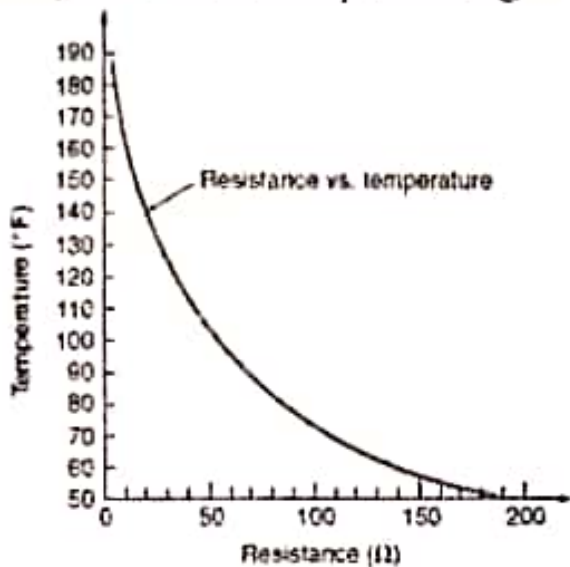
2) What is actuator in the figure for pressure control system?



- b. To plot continuously, it must be enable the Synchronize Loop to Timing Source.
- c. The simulation time and the speed of the simulation can be adjusted by enable the Auto Period
- d. Without this loop, it is possible to place other functions in the Simulation palette in the Block Diagram.



ii) If we were to operate the thermistor in the 110°F temperature, what is the output voltage?



iii) How does a bimetallic strip thermometer work? Explain how it can be used as on/off controller to control room temperature?

iv) What is the flow test elements? and state the experimental order.

Best Wishes

Dr. Ebrahim A. El-hamid

Answer the following questions:

Question.1

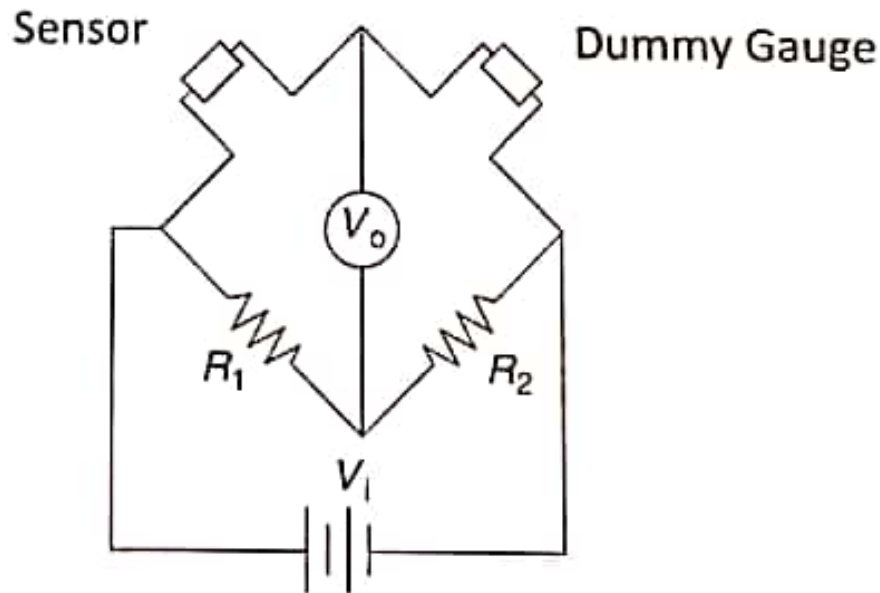
(5 Marks)

- 1- Give two examples or more of Mechatronics systems used in the following applications:
 - Medical Applications.
 - Transportation Applications.
 - Sanitation Applications.
- 2- Draw the block diagram of the key elements of Mechatronics system
- 3- Give **briefly** short notes (function, principle of operation, circuit diagram) about the accelerometer sensor.

Question.2

(15 Marks)

- 1- In the figure shown below, state **the type & function of the sensor** which is used in this circuit and describe **the function of the dummy gauge?**



- 2- Constantan is an alloy (with 55% copper and 45% nickel), which is used in the construction of **strain gauges**. It has a resistivity of $49 \times 10^{-8} \Omega\text{-m}$. The length of the constantan wire is calculated using the formula,

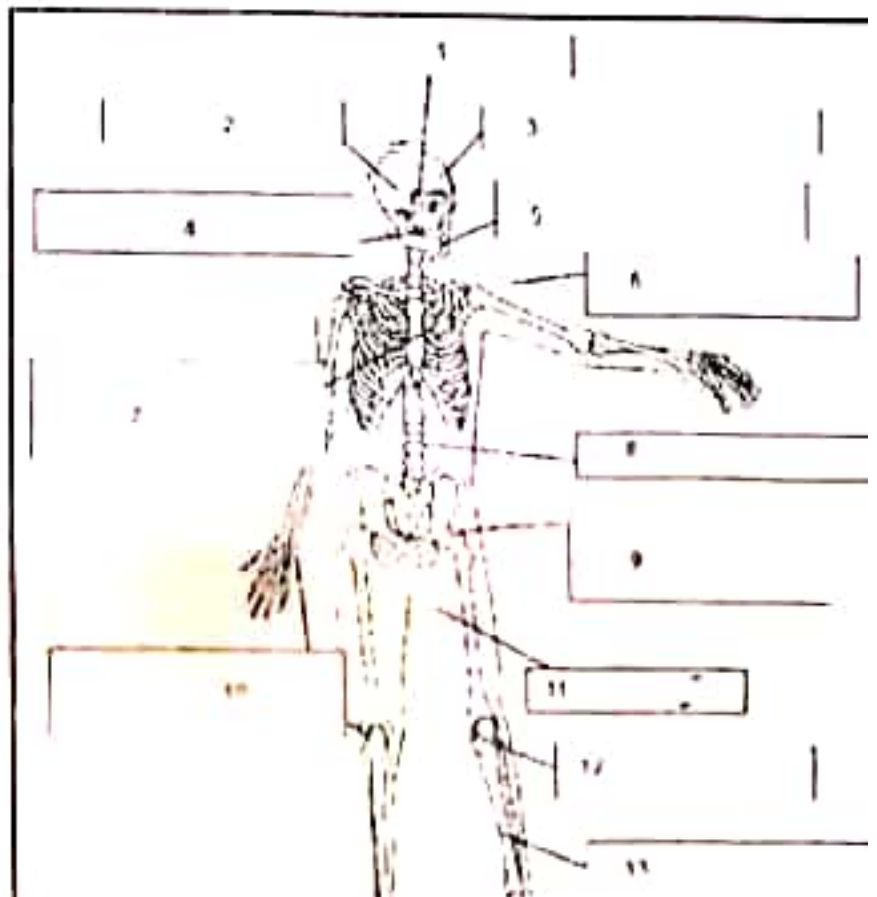
$$L = \frac{RA_c}{\rho}$$

the following questions:

Answer the following statements according to your studies. And give examples:

"Biomaterial is not only becoming one of the most important subjects, but also going to revolutionize the whole medicine technology".

For the following figure choose one section, and explain how biomaterial can help to fix medical problems.



following:

nd PET/CT

ss , gold , acrylic and 316 LSS

on we use ocular-lenses It consist of eye lens and field lens , its material Acrylates
cone

al ligaments and artificial tendonsitmade from polyester

to & Ti-Al-V

amic is.

ic ?

[2] The nonlinear open-loop model of inverted pendulum controlled by a dc motor via a gear of train is given as:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} x_2 \\ -1.9 \sin x_1 - 9x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 10 \end{bmatrix} u$$
$$y = x_1$$

- Obtain the linearized open-loop system model representation for $x_1 \cong 0$.
- Is the obtained linearized open-loop system model is stable?
- If the open-loop system is found stable then design only a full order observer with a characteristics 5 times faster than the open-loop system. But if the system model is found unstable, then design only a state feedback controller with proper characteristics to make the closed-loop system be stable with 15% overshoot and a peak time of 0.4 second.

Fuzzy Membership Functions for The room Size

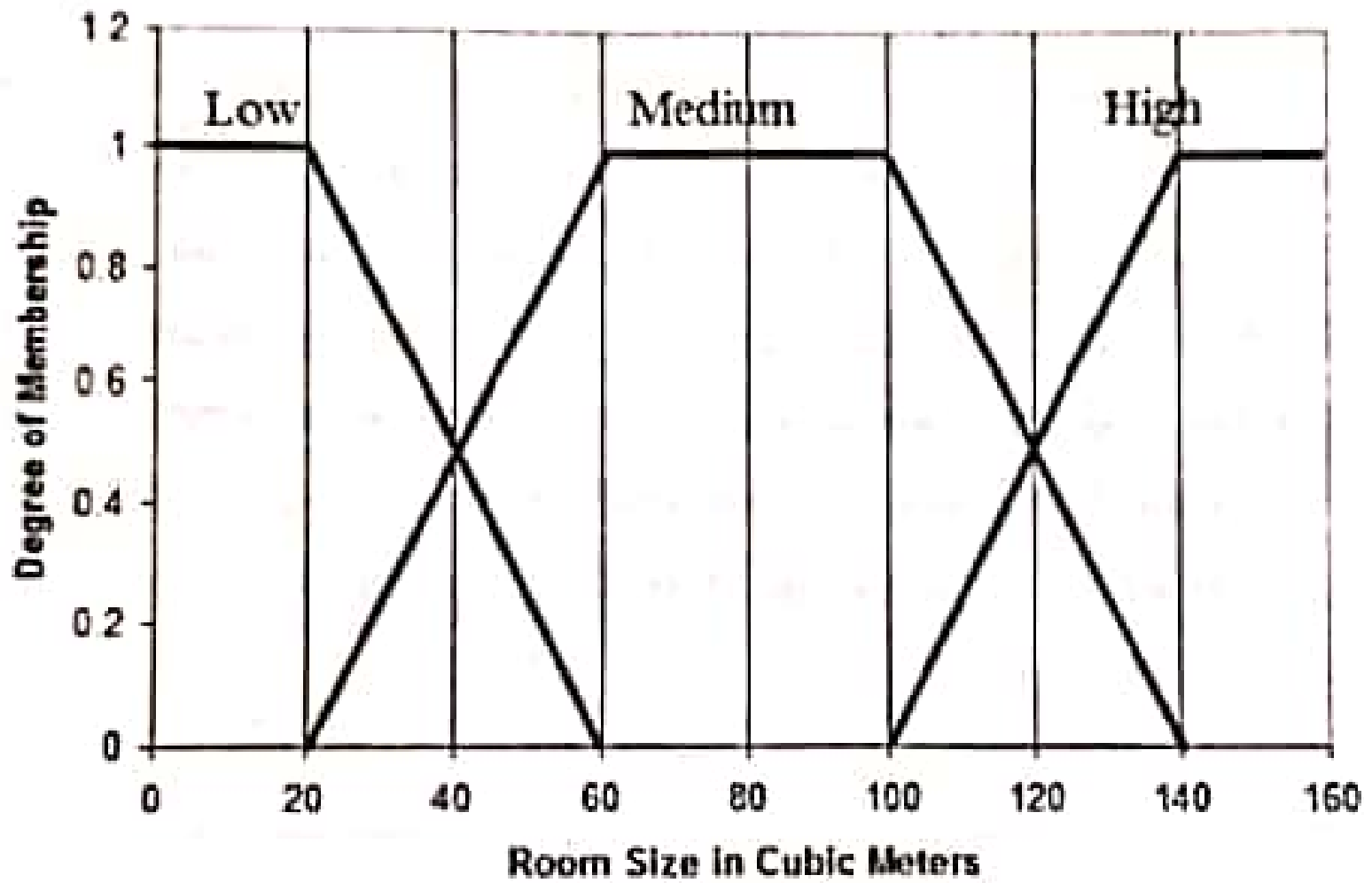
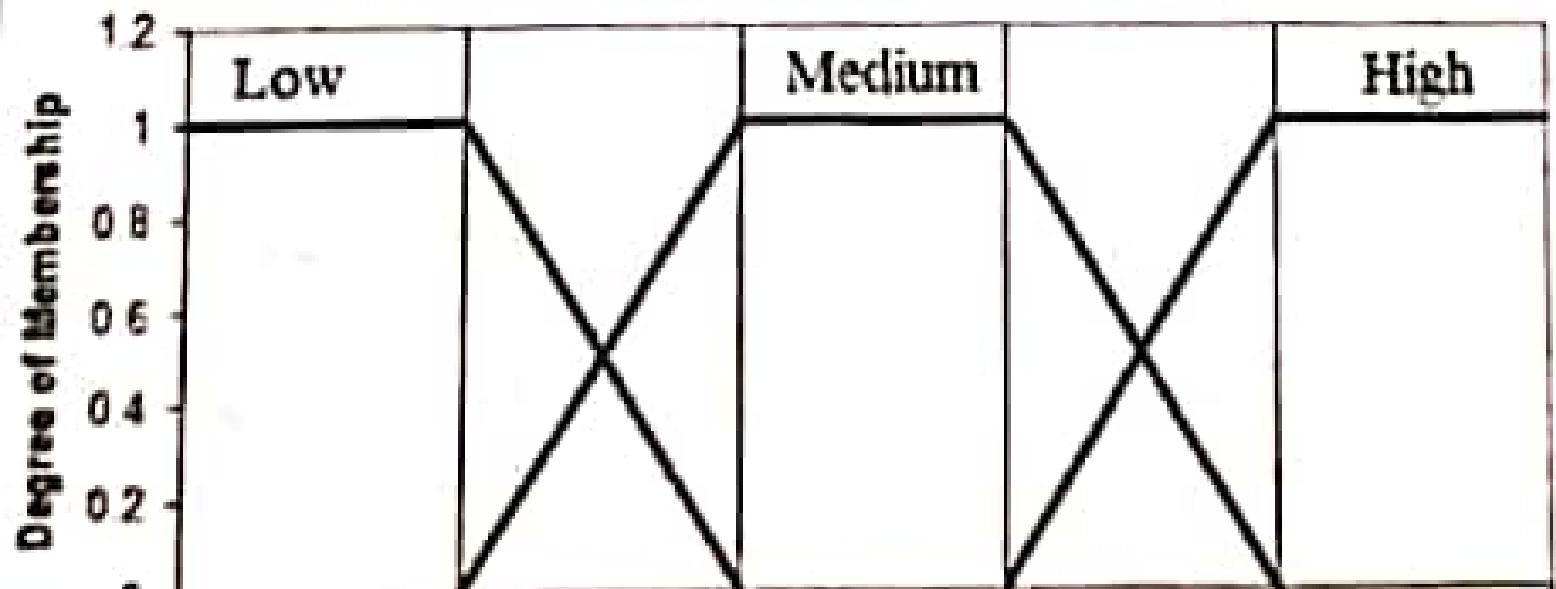


Fig. 4

Fuzzy Membership Functions for The Ambient Temperature



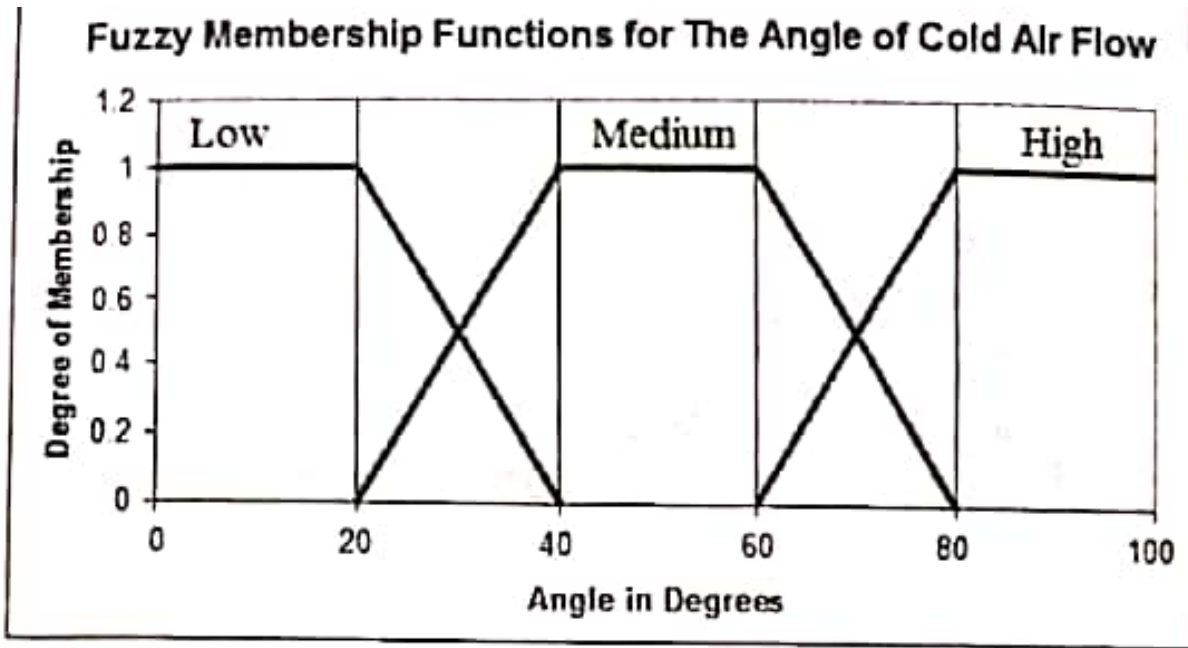


Fig. 6

With best wishes

السؤال الاول

(٧ درجة)

اشرح مميزات و عيوب قانون الخدمة المدنية الجديد الصادر اكتوبر ٢٠١٦

السؤال الثاني

(٨ درجة)

وضح مجالات التزام المهندس

السؤال الثالث

(١٠ درجة)

شركة متخصصة في انتاج مستلزمات اجهزة الحاسبات تقوم بانتاج نوعين من المكونات:
- تباع لوحة المفاتيح ب ٢٧ جنية ويستخدم ما قيمته ١٠ جنية مواد خام وكل قطعة يتم تصنيعها تزيد من تكلفة الشركة المتغيرة من العمالة وكذلك التكلفة المتغيرة غير المباشرة بمقدار ١٤ جنية.
- يباع الماوس ب ٢١ جنية ويستخدم ما قيمته ٩ جنية مواد خام وكل قطعة يتم تصنيعها تزيد من تكلفة الشركة المتغيرة من العمالة وكذلك التكلفة المتغيرة غير المباشرة بمقدار ١٠ جنية.
تمر العملية الانتاجية من خلال مراحل تتمثل في التصنيع والتغليف.
كل لوحة مفاتيح تتطلب ١ ساعة من عمالة التصنيع و ٢ ساعة من عمالة التغليف كل اسبوع.
كل ماوس يتطلب ١ ساعة من عمالة التصنيع و ١ ساعة من عمالة التغليف كل اسبوع.
-المتاح من ساعات عمالة التصنيع ٨٠ ساعة.
-المتاح من ساعات عمالة التغليف ١٠٠ ساعة.
- الطلب على الماوس لا نهائى ولكن المبيعات بالنسبة للوحات المفاتيح ٤٠ على الاكثر اسبوعيا.
باستخدام البرمجة الخطية (طرية التبسيط) حدد اعداد كل منتج و ربح الشركة.

السؤال الرابع

(١٠ درجة)

مستثمر لديه ٦,٠٠٠,٠٠٠ جنية يرغب في استثمارهم في ثلاثة مشاريع تجارية. ويلزم أن يتم الاستثمار بوحدات قدر كل وحدة ١,٠٠٠,٠٠٠ جنية ويعتمد العائد من الاستثمار في أي من المشاريع على مقدار ما يتم استثماره طبقا للجدول

المقدار المستثمر	العائد من المشروع		
	ج	ب	ا
صفر	-	-	-
١	٠,٣٨	١,٤٥	٠,٧٨
٢	١,٤٤	٢,٠	٠,٨٢
٣	٢,٢٢	٢,٢٧	١,٤٥
٤	٢,٦٥	٢,٨٣	٢,١٥
٥	٢,٧٨	٢,٨٤	٣,١٢
٦	٢,٨٧	٢,٩٥	٤,١٥

باستخدام البرمجة الديناميكية احسب المدخلات والمخرجات للمشروعات الثلاثة.

Answer the following questions:

Question No. (1): [15 Degree]

Consider a *temperature controller* with two inputs; *temperature* and *humidity* and one output; *fan speed*. The input (temperature) is divided into two fuzzy sets as COOL and HOT. The input (humidity) is divided into two fuzzy sets as LOW 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 $\mu_{COOL} = trapezoid(0,0,20,35)$ and $\mu_{HOT} = trapezoid(25,40,50,50)$. The fuzzy sets for humidity input are defined as $\mu_{LOW} = trapezoid(0,0,20,50)$ and $\mu_{HIGH} = trapezoid(30,60,80,80)$.

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:

	<i>COOL</i>	<i>HOT</i>
<i>LOW</i>	ZERO	MEDUIM
<i>HIGH</i>	MEDUIM	HIGH

Note that:

- The fuzzy reasoning is based on the fuzzy relations (*Mamdani implication method*) and compositional rule inference (*Max-Min*).
- Let, the temperature input is discretized into three points {22 °C, 30 °C, 36 °C}, the humidity input is discretized into three points {20 %, 35 %, 50 %} and the fan speed output is discretized into three points {15 %, 45 %, 70 %}.
- Use the approximated COA defuzzification method.

Find the value of the fan speed if the input temperature equals 30 °C and the input humidity equals 50 %.

Question No. (3): [15 Degree]

A) Write short notes about:

- Neuron modeling for artificial neural systems.
- Supervised and unsupervised learning in a neural network.

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

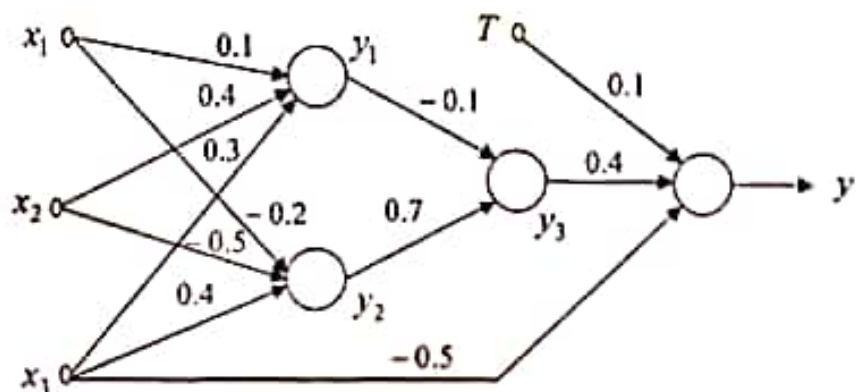
C) Two steps of *Hebbian learning rule* of a single-neuron network with four inputs have been implemented starting with $w^1 = [1 \ -1 \ 0 \ 0.5]^T$. The learning constant $c = 0.65$ and the inputs as: $x_1 = [1 \ -2 \ 1.5 \ 0]^T$ and $x_2 = [1 \ -0.5 \ -2 \ -1.5]^T$. Find the final weight vector for **unipolar continuous activation function** where $\lambda = 5$.

Question No. (4): [20 Degree]

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

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

C) 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 $x = [0.5 \ 0.2 \ 0.1]^T$, desired output $d = 0.8$, learning constant $\eta = 1$, $T = -1$ and **unipolar continuous activation function** where $\lambda = 1$.





كراسة الاجابه يجب ان تكون مرتبه ونظيفه والصفحات مرقمه. اجابه كل سوال تبدأ بصفحه جديد. مسموح استخدام
الالوان عدا اللون الاحمر. ((6 اسئله في صفتين 2 في ص 1 & 4 في ص 2))

Answering the following 6 questions:-

Q1:

1. In the following midterm exam MATLAB program lines:

- `I = imread('cell.tif');`
- `figure, imshow(I), title('original image');`
- `[junk threshold] = edge(I, 'sobel');`
- `fudgeFactor = .5;`
- `BWs = edge(I,'sobel', threshold * fudgeFactor);`
- `figure, imshow(BWs), title('binary gradient mask');`

1- In first define the following three:

2- In second line b define :

3- In third line c- what is meant by

4- In line e define:

I & = & tif

figure

| | (big brackets) before =

sobel

Q3

A) Correct the two mistakes in the following Matlab 4 lines.

B) Define and explain the following Matlab lines.

```
if(size(x,3) = 3)
```

```
    x=rgb2gray(x)
```

```
end
```

```
[M,N]=size(x)
```

Q4

A) What is the Hall Effect theory? Prove and draw to answer.

B) Draw the circuit and the symbol of the Hall sensor

In the lecture, you saw two experiments; showed position measurement:

- i. Elevated metallic weight with Hall effect. (elevate (يرفع))
- ii. Changing the voltemer reading with changing sensor distance from the experiment setup.

C) Design a circuit to measure the displacement by using Hall sensor.

Q5

A) Write the names (types) you used to add noise to an image.

B) Write Matlab command or commands to add and to remove each noise type.

C) What is the best technique in image segmentation?

Answer the following questions:

1) Consider the two fuzzy sets A_1 and A_2 defined on the following $X = \{1.5, 2.5, 3.5, 4.5, 5.5\}$ and a fuzzy set B defined on the following $Y = \{-0.5, 1, 2.5\}$. The three fuzzy sets are represented by the following:

$$\mu_{A_1}(x) = \text{trapezoid}(x; 0, 2, 4, 5), \mu_{A_2}(x) = \text{triangle}(x; 2, 5, 6) \text{ and}$$

$$\mu_B(y) = \text{triangle}(y; -1, 0, 3)$$

A) Find the following:-

- a) $A_1 \oplus A_2$ b) $B_{\overline{0.4}}$ c) Core (A_1) d) The cross-over points for fuzzy set 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 $x_0 = 2.5$ using the **Max-Min composition**.

السؤال 113: في الجدول التالي، ضع علامة (✓) أمام العبارة الصحيحة، وعلامة (X) أمام العبارة الخاطئة، مع توضيح سبب هذا الاختيار:

م.	العبارة	العلامة	توضيح سبب الاختيار
1	نمذجة النظم هي الحصول على مخرجات النظام من معلومية مدخلات النظام ومعاملات النظام	()	
2	التنبؤ هو الحصول على مدخلات النظام من معلومية مخرجات النظام ومعاملات النظام	()	
3	خطوات الحصول على نموذج النظام هي بالترتيب: - اختيار هل النموذج يكافئ النظام الحقيقي - اختيار نموذج رياضي - اختيار طريقة للنمذجة ام لا	()	
4	نقابة المهندسين هي هيئة رياضية للدولة في جميع تخصصات الهندسة	()	
5	حقوق المهندس هي حقوق اجتماعية فقط	()	

8	اتخاذ القرار في ظروف المخاطرة يعتمد على معرفة الاحتمال بدقة	()
9	اتخاذ القرار في الظروف الغير مؤكدة يعتمد على عدم معرفة الاحتمال بدقة	()
10	نظرية القرارات هي تطبيق الطريقة العلمية في تحليل مشاكل اتخاذ القرار.	()
11	شجرة القرار هي تمثيل بياني للبيانات على هيئة شجرة.	()
12	قانون الخدمة العامة الصادر في أكتوبر 2016 لا يوجد له عيوب	()
13	قانون الخدمة المدنية الصادر في أكتوبر 2016 يطبق على العاملين بالقطاع الحكومي والقطاع الخاص	()
14	قانون الخدمة المدنية الصادر في أكتوبر 2016 يطبق على جميع العاملين بالجامعات	()
15	قانون الخدمة العامة يطبق على العاملين بالحكومة	()

استاذ دكتور / محمد احمد فكيرين

مع خالص التمنيات بالتوفيق

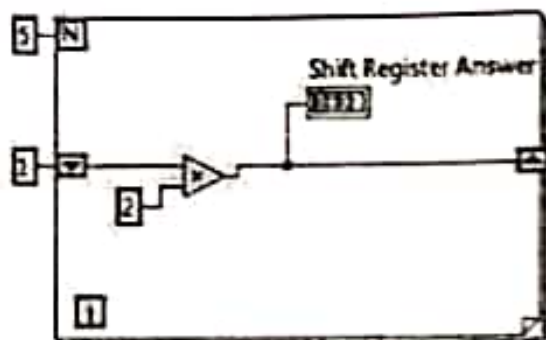
Answer the following questions:

Question (1): [9 Degree]

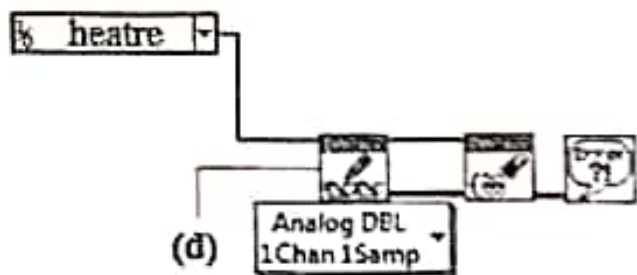
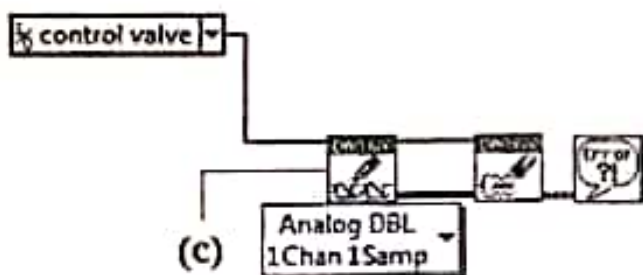
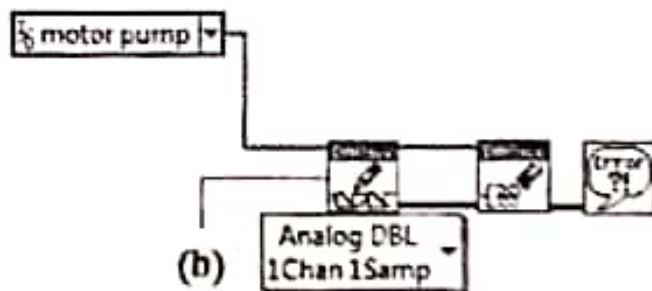
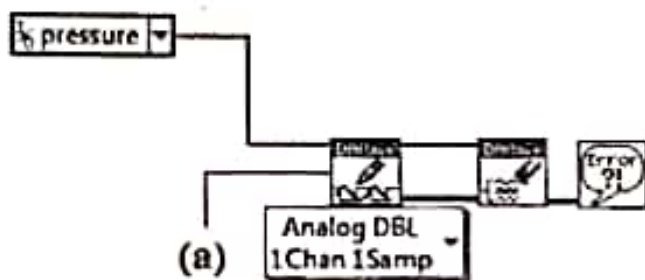
i) Choose the correct answer.

1) What is the value in Shift Register Answer after the following code has executed?

- a.16
- b.24
- c.32
- d.10



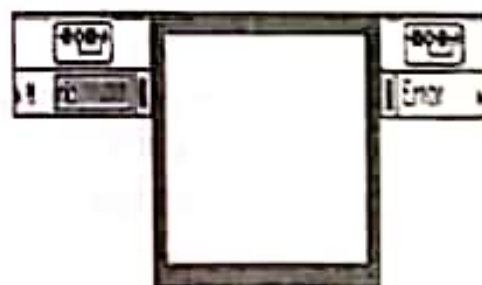
2) What is actuator in the figure for pressure control system?



3) Which of the following statements is TRUE?

- a. The speed of the simulation can be adjusted by enable the Auto Discrete Time.
- b. The simulation time and the speed of the simulation can be adjusted by enable the Auto Period
- c. To plot continuously, it must be enable the Synchronize Loop to Timing Source.
- d. Without this loop, it is impossible to place other functions in the Simulation palette in the Block Diagram.

Control & Simulation loop



- 4) Which of the following parameters is correct?
 - The result transfer function is:

$$H(s) = \frac{2s + 5}{3s^2 + 9s + 12}$$

a.

Numerator			
b0	b1	b2	b3
2	5		

Denominator			
a0	a1	a2	a3
12	9	3	

b.

Numerator			
b0	b1	b2	b3
5	2		

Denominator			
a0	a1	a2	a3
3	9	12	

c.

Numerator			
b0	b1	b2	b3
5	2		

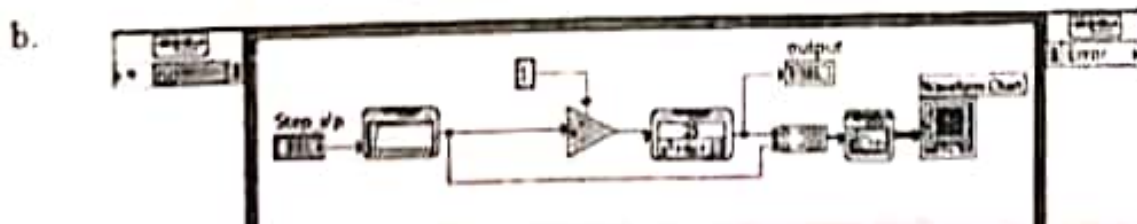
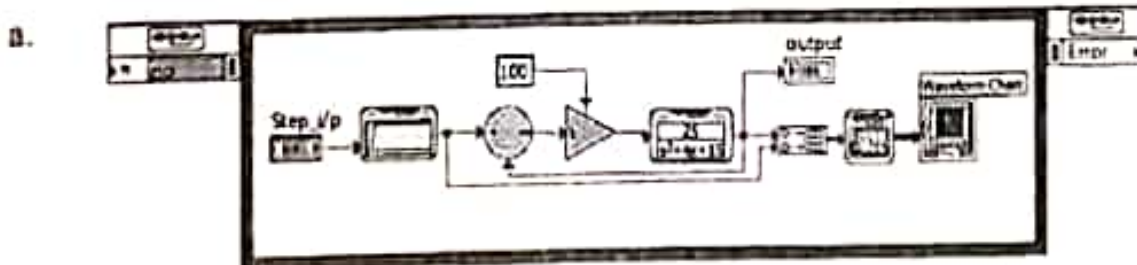
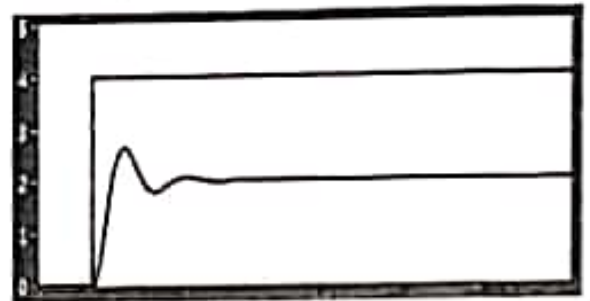
Denominator			
a0	a1	a2	a3
12	9	3	

d.

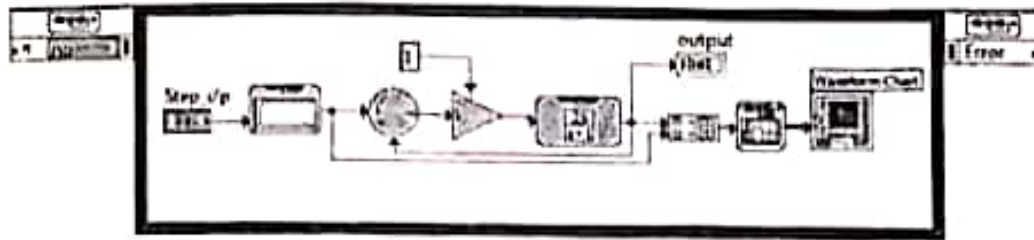
Numerator			
b0	b1	b2	b3
2	5		

Denominator			
a0	a1	a2	a3
3	9	12	

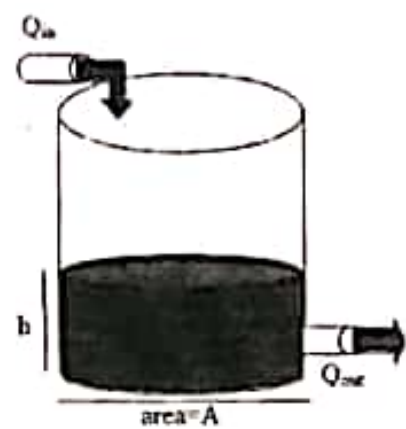
- 5) Which of the following Block Diagrams could produce this result in Waveform chart?



d.



- ii) Why do we need automatic process control?
- iii) Estimate the mathematical model of a tank shown in figure. And draw the block diagram of a tank level.

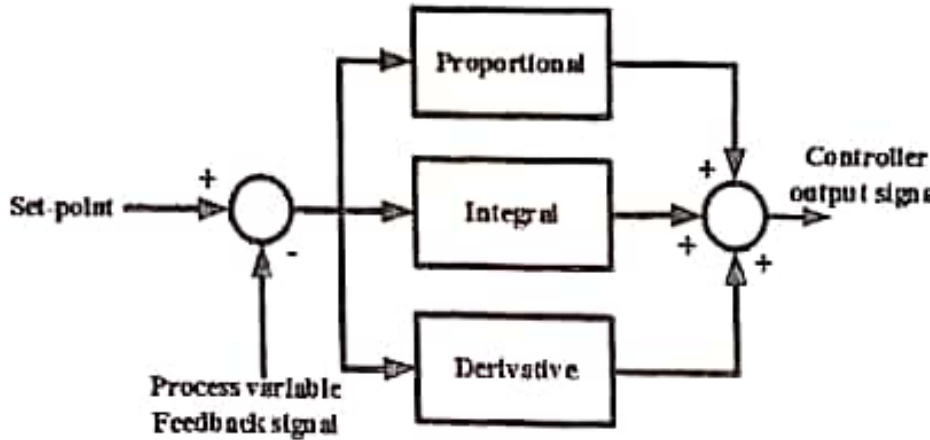


Question (2): [11 Degree]

- i) Complete the empty places in the following:
 - a- (1)..... level detectors can only detect whether the liquid is at a certain level.
 - b- The two classifications of industrial control systems are (2)..... control and (3)..... control.
 - c- (4)..... element converts pressure directly into resistance, and resistance can be converted into voltage

ii) Calculate what the pressure (head) would be at the bottom of a 12-ft deep gas oil tank and the density for gas oil is about 52 lb/ft³ and ambient pressure is 14.7 psi.

iii) Design the circuit implementation of the PID controller which shown in Figure using Op-Amp.

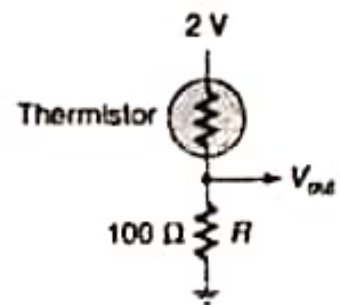
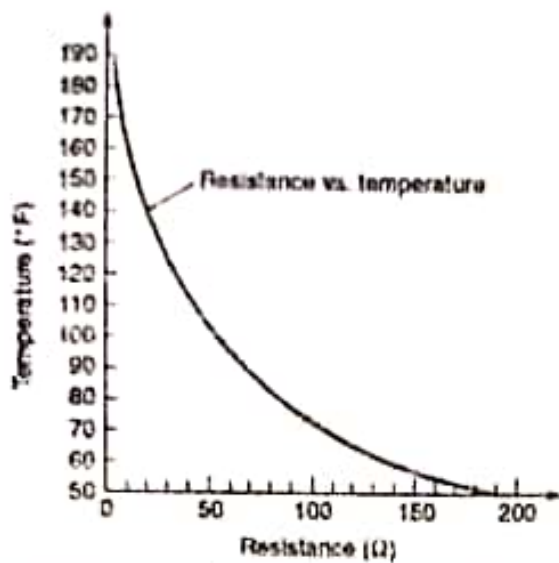


- Write the digital PID equation.
- Show the flowchart for computing the PID equation.

Question (3): [10 Degree]

- i) Identify the suitable expression for each of the following:
 - 1) When it is used in industrial closed loop systems, the input usually loses control over the output, because it is in phase with the input.
 - 2) It is a two-terminal device that changes resistance with temperature. It is made of oxide-based semiconductor materials and come in a variety of sizes and shapes.
 - 3) It is a short bent tube, closed at one end. When the tube is pressurized, it tends to straighten out.
 - 4) It is usually defined as the time it takes for the controlled variable to go from 10 to 90% of the way to its new position.

ii) If we were to operate the thermistor in the 110°F temperature, what is the output voltage?



iii) How does a bimetallic strip thermometer work? Explain how it can be used as on/off controller to control room temperature?

iv) What is the flow test elements? and state the experimental order

Best Wishes

Dr. Ebrahim A. El-hamid

السؤال الاول: أكتب نبذة مختصرة على انواع الموارد الاقتصادية وما الفرق بين الاقتصاد الكلى والاقتصاد الجزئى
 السؤال الثانى: ما هى مراحل الدراسة الفنية والهندسية لأى مشروع هندسى
 السؤال الثالث: أنتاج أى سلعة أو خدمة يتطلب وجود أربعة عناصر . اذكرها ؟
 السؤال الرابع: تكلم عن الآتى: أ) الندره ب) المرونة ج) العرض د) مفهوم الجودة
 السؤال الخامس: ما هى شروط تحقيق الجودة
 السؤال السادس :

For the following table:

x	1	2	3	4	5	6
y	1	3	4	3	4	2

Use the least squares to fit: i) Straight line ii) Parabola

السؤال السابع: حدد على الرسم منطقة الحل التى تحقق المتباينات الآتية:

$$x \geq 0.0, \quad y \geq 0.0, \quad x \leq 15.0, \quad y \leq 15.0, \quad x+y \geq 7.5, \quad x+y \leq 15.0$$

Answer the Following Questions:-

Question 1:- In a Table summarize the Classical definitions of Dimensionality.

(3 Marks)

Question 2:- What are the Specific properties of nanostructures. (3 Marks)

Note:- Look at the Questions on the paper back

Question 3:- Draw a diagram that shows the electron density of states for 3D, 2D, 1D and 0D systems. (3 Marks)

Question 4:- Write a very short notes about the techniques for Preparation of nanostructures. (3 Marks)

Best Wishes:- Prof. El-Sayed M. El-Rabaie