Tanta University

Faculty of Engineering

Computer Engineering and

Automatic Control Department

FINALEXAM

Academic Year	*2015/2016 G*					
Semester		*First*	√	*Second*		*Summer*
Course Title& No.	*Control and Instrumentation In Industrial Processes* CCE4237-3					
Level	*4th year*					
Date	*28/05/2016*					
Allowed Time	*3 hours*					
Instructor Name	*Prof. Dr./Mohamed Talaat Faheem Saidanmed*					

Answer all the following questions:

Question No.1 :(24 points divided as a=8, b=8, c-i=4, c-ii=4 points)

a—Explain with the aid of a block diagram how an automatic control of a heat exchanger process can be able to control and adjust theflow of steam to the heat exchanger to keep the temperature of the water at itspredetermined value.

b—Explain how to construct ablock diagram of elements that make up the feedback path in aprocess-control loopincluding most of well-known measuring element such as a sensor, a transducer, a transmitter, a control element, a powercontrol circuit, and its own power supply.

c— Write the right answer (yes or no) for the following two statements:

i—In process control systems, a *manipulated variable* is defined as the output response or parameter to a process that is varied by a control signal from the processor to an actuator.	(yes/no)
ii—The time delay systemsare systems that based on receiving delayed controlled or measured signals produced in most electro-mechanical systems which are essential in the operation of most process-control systems.	(yes/no)

Question No.2 :(20 points divided as a=6 , b=9, c=5 points)

a—Consider the network shown in Fig.1

i—Derive a linear time-invariant dynamical description of this network in the form

$\dot{x} = Ax + Bu, \qquad y = Cx$

Where A, B are constant matrices, C is a constant row vector, x is a state variable vector, and y is an output voltage across the capacitor v_c.

ii—Draw a Simulink diagram for the dynamical description derived in part (i) using the appropriate function blocks with a step block as an input source and show how to get v_c as an output on the diagram. Choose the initial conditions with any arbitrarily values.

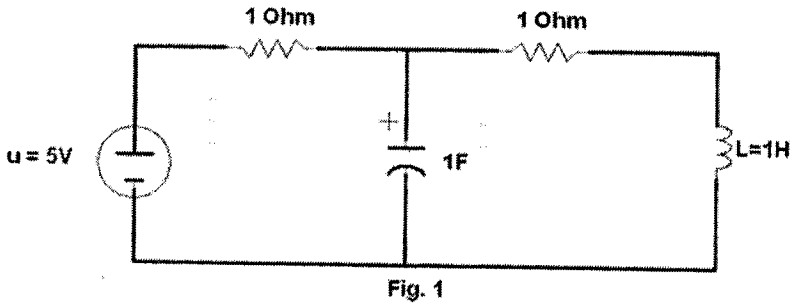


Fig. 1

b—Consider a Simulink diagram shown in Fig.2 that represents a dynamical linear system.

i-- Write a state space in the form

$$\dot{x} = Ax + Bu \quad , \qquad y = Cx$$

Where A, B are constant matrices, C is a constant row vector, x is a state variable vector, and y is an output voltage v_c.

ii- Show whether the system obtained in (i) can be controlled or not.

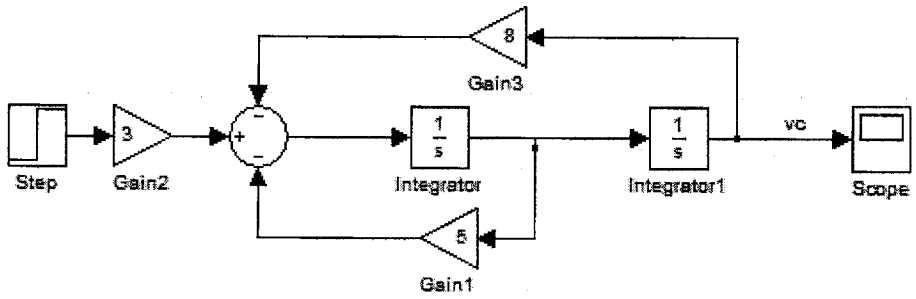


Fig.2

c—Consider the following dynamical equation

$$9\,u_1(t) = 3\ddot{z}(t) - 3\dot{z}(t) - 3\,z(t) + 6u_2(t)$$

$$y(t) = \dot{z}(t) + 3\,z + 5\,u_2(t)$$

Where *y(t)* is the output , $u_1(t)$ and $u_2(t)$ are two different inputs.

Draw a Simulink diagram using the appropriate function blocks and the scope block to simulate the system and get the output block to be shown on the diagram.

Question No.3 : (21 points divided as a=4 , b=6, c=7, d=4 points)

a— State with the aid of block diagrams the main difference between the traditional integrated sensor and the smart sensor.

b— State the types of control systems that are used in the industrial control system (ICS).

c— Write the right answer (yes or no) for the following statements in the table:

i—A smart Sensor which is called a system on chip has the ability to take decision as well as it consists of transduction element, signal conditioning electronic, and controller/processor.	(yes/no)
ii—The presence of a controller in a smart sensor has led to corrections for different undesirable sensor characteristics which include span variation, non–linearity, and cross-sensitivity.	(yes/no)
iii—The anatomy of a SCADA system consists of: Elements of SCADA and Levels of SCADA.	(yes/no)

iv—Data acquisition card (DAQ) is a PC card with analog and digital I/O interface that needs software or user-generated code for its operation.	(yes/no)
v—Transducers are devices that have no ability to change one form of energy to another.	(yes/no)
vi—Transmitters are devices used to amplify and format signals so that they are suitable for transmission over long distances with zero or minimal loss of information.	(yes/no)
vii—Resolution is the largest amount of a variable that an instrument can resolve, i.e., the largest change in a variable to which the instrument will respond	(yes/no)

d—State the *advantages of using SCADA systems in the industrial processes control.*

Question No.4 :(25 points divided as a=5 b=5, c =5, d =10 points)

a— Draw a block diagram for components of a smart sensor that contains both a network capable application processor and a transducer interface module.

b—State the advantages and disadvantages of using a smart sensor.

c—State the types of industrial networks and state their basic security elements that are needed to secure them.

d—Write the right answer (yes or no) for the following statements:

i—Network security measures used in SCADA system have authentication, authorization and accounting (AAA) as well as they have encryption of data.	(yes/no)
ii--SCADA components consist of a field instrumentation, a communication network, and a control center.	(yes/no)
iii--Functions of SCADA system include only some of the following: Information display , Supervisory control, Alarm processing & Tagging, Information storage & Reports, Data calculation, and Special RTU processing control.	(yes/no)
iv--Most Key Priorities of Control Strategy appeared with SCADA are : • Balance generation & demand (dispatching) • Monitor flows and observe system limits • Coordinate maintenance activities • Protect equipment from damage	(yes/no)
v--SCADA has two basic layers in a system: a client layer and a data server layer.	(yes/no)
vi--The preferred power supply for SCADA systems is the alternating current (AC) station system where these station systems can be inherently more reliable than direct current (DC).	(yes/no)

vii--SCADA systems are used in some processes applications such as higher education systems as well as all information technology (IT).	(yes/no)
viii--A SCADA System depends solely on remote terminal units (RTUs) collecting field.	(yes/no)
ix--Actuators are devices that are used to control an input variable in response to a signal from a controller.	(yes/no)
x—The advantages of having remote terminal units (RTUs) in the SCADA system is to transmit data and sending that data back to another RTUs via a communications system.	(yes/no)

End of all Questions
Have a good Luck
Examinar: Prof.Dr. MohamedTalaatFaheem

Tanta University

Department: Computers and Control Eng.
Total Marks: 60 Marks

Faculty of Engineering

Course Title: **Computer and Network Security** Course Code: **CCE4236** Year: 4th Computers
Date: **1 June2016 (Second term)** Allowed time: **3 hrs** No. of Pages: **(2)**

Remarks: **Please Read the question more than once to fully understand it before you start solving.**

Question 1 (14 marks):

A. **Information security is a major concern for the software industry today as the number of internal threats is nearly 80%- Define the five hacking phases.**
B. **Discuss in brief three types of port scanning?**
C. **Discuss in brief three types of password cracking?**
D. **What is a Trojan?**
E. **Define steganography?**
F. **What is the primary purpose of layer 2 port security? Which of the three violation responses available in port security does not send alerts and SNMP traps?**
G. **Will the following ACL configuration prevent 192.168.1.75 from using Telnet to reach the router at 10.1.1.1? why?**

```
access-list 1 deny 192.168.1.75 0.0.0.0

access-list 1 permit any
! line vty 0 4

ip access-group 1 in
```

Question 2 (20 marks):

Compare between the following pairs:

A. **Man in the Middle Attack and Meet in the Middle Attack**
B. **Intrusion Detection System (IDS) and Intrusion Prevention System (IPS) Solutions**
C. **DoS and DDoS attack**
D. **Virus and worm**
E. **Placing standard ACL and extended ACL**
F. **Stateless and Stateful Packet Filtering**
G. **Authentication Header (AH) and Encapsulating Security Payload (ESP) in IPsec protocol**
H. **Cryptography and cryptoanalysis**
I. **Pros (advantages) and cons (disadvantages) of symmetric and asymmetric encryption**

Question 3 (12 marks):

A. Find the 'n' and φ(n) value in RSA algorithm if p=3 and q=11
B. Perform the encryption and decryption using RSA algorithm for the following data: p=3, q=11, e=7, m=2 (given 128mod33=29 &24389mod33=2)
C. Using Diffie-Hellman (DH), users Alice & Bob who wish to swap keys. Agree on prime q=23, primitive root of q is α=5, Alice's secret number=6 and Bob's secret number=15. Prove that using DH algorithm; they will generate the same secret key for encryption. (given 15625mod23=8 &30517578125mod23=19&47045881mod23=2& 35184372088832mod23=2)
D. Encrypt the text "MEET ME AT DAWN" using caesar cipher (ROT 3)

Question 4 (14 marks):

A. State the Security services
B. With suitable sketches, explain the working of Secure Hash Algorithm (SHA-1) for message integrity
C. What are the two types of Virtual Private Networks (VPN) technologies?
D. What is DMZ? Mention its role in security architecture
E. State the three Zone-Based Policy Firewall Actions
F. Identify the five components of IPsec Protocol Framework
G. What is Digital Signatures? Write a short note on Public Key Infrastructure (PKI)

Good Luck all

Course Coordinator: *Dr. Asmaa Saafan*

Course Title: **Robotic Systems** تخصصي ٤ روبوت رابعة حاسبات Course Code: CCE4242 4th year
Date: 4.6.2016 (Second term) Allowed time: 3 hrs No. of Pages: (2)

Answer all the following questions:

Question No. 1 *(20 marks)*

1. Discuss the advantages and disadvantages of using robots in industry.
2. What is workspace? Give the functional diagram with the workspace for the following robots i-3R-robot. ii-2RP robot.
3. Draw any two Euler angle systems and show rotations and angles.
4. What are performance parameters? Define repeatability, resolution and accuracy.
5. Compare hard automation with soft automation.
6. Define the term: Robot kinematics.
7. Differentiate between robot forward kinematics and robot inverse kinematics.
8. Mention the two DH assumptions for frame assignment in forward kinematics. Explain how they reduce the parameters required to relate frame i to frame $i-1$.
9. In your own words, explain briefly how machine learning can be used to estimate robot inverse kinematics. (Explain the steps of applying machine learning).

Question No. 2 *(20 marks)*

1. The co-ordinates of a point P_{abc} in the mobile frame OABC is given by $[2,4,5]^T$. If the frame OABC is rotated 45° with respect to OY of the OXYZ frame , find the co-ordinates of P_{xyz} with respect to the base frame.

2. A mobile body reference frame OABC is rotated 30° about OZ-axis of the fixed base reference frame OXYZ. If $P_{xyz} = [-1,2,3]^T$, $Q_{xyz} = [2,-3,1]^T$ are the co-ordinates with respect to OXYZ plane, what are the corresponding co-ordinates of P and Q with respect to OABC frame?

3. For the the object shown in figure 1, find the 4x4 homogeneous transformation matrices ${}^0A_i$ for i= 1,2 and thus find the transformation of frame at point 1 with respect to the frame at point 2 (i.e. ${}^2A_1$).

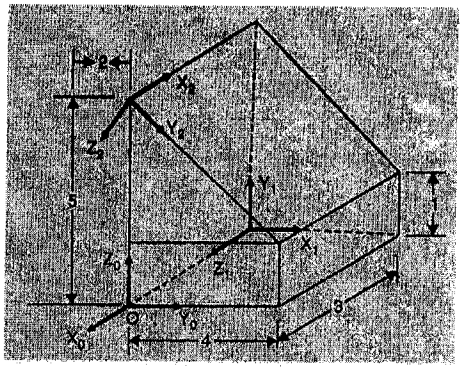


Figure 1
problem 3. of Question No.2

Question No. 3 *(22 marks)*

1. Determine the homogeneous transformation matrix to represent a rotation of 30° about OZ-axis and a translation of 20 units along the OB-axis of the mobile frame.

2. Determine the homogeneous transformation matrix to represent the following sequence of operations:

a. Rotation of 45° OZ-axis.
b. Translation of 4 units along OX-axis.
c. Translation of -4 units along OB-axis
d. Rotation of 90° about OA-axis

3. A robotic work cell has a camera with in the setup. The origin of the six joint robot fixed to a base can be seen by the camera. The homogeneous transformation matrix H_1 maps the camera with the cube centre. The origin of the base co-ordinate system as seen from the camera is represented by the homogeneous transformation matrix H_2.

$$H_1 = \begin{bmatrix} 0 & 1 & 0 & 2 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & -1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad H_2 = \begin{bmatrix} 1 & 0 & 0 & -4 \\ 0 & -1 & 0 & 2 \\ 0 & 0 & -1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

a) What is the position and orientation of the cube with respect to the base co-ordinate system?
b) After the system has been setup, someone rotates the camera 90 about the x-axis of the camera. What is the position and orientation of the camera with respect to robot's base co-ordinate system?
c) The same person rotated by 90 the object about the z-axis of the object and translated 5 units of distance along the rotated y-axis. What is the position and orientation of the object with respect to the robot's base co-ordinate system?

Question No. 4 *(23 marks)*

1. A six joint robotic manipulator equipped with a digital TV camera is capable of continuously monitoring the position and orientation of an object. The position and orientation of the object with respect to the camera is expressed by a matrix $[T_1]$, the origin of the robot's base co-ordinate with respect to the camera is given by $[T_2]$, and the position and orientation of the gripper with respect to the base co-ordinate frame is given by $[T_3]$. Where

$$T_1 = \begin{bmatrix} 0 & 1 & 0 & 3 \\ 1 & 0 & 0 & 2 \\ 0 & 0 & -1 & -1 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \; T_2 = \begin{bmatrix} 1 & 0 & 0 & -2 \\ 0 & -1 & 0 & 2 \\ 0 & 0 & -1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix} \text{ and } T_3 = \begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Determine: i-the position and orientation of the object with respect to the base co-ordinate.
ii- the position and orientation of the object with respect to gripper.

2. For the Cylindrical manipulator shown in figure 2, Find the homogeneous transformation matrix describing the forward kinematics of the whole manipulator, i.e. the position and orientation of the end effector with respect to the base. (Hint: Apply DH-convention)

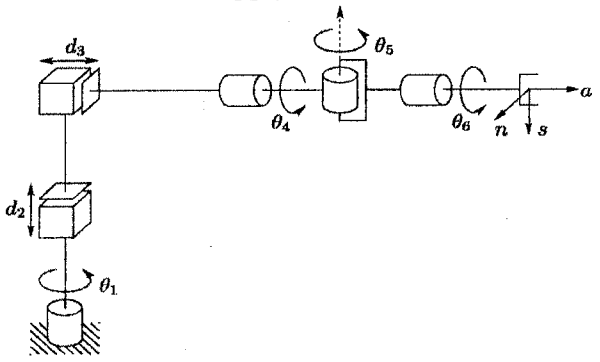


Figure 2
Problem 2. of Question No.4

Best wishes *Dr. Eng. Elsayed Sallam*

Tanta University

Department: Computers and Automatic Control Eng.
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Elective Course 3 (E-Commerce)	Course Code: CCE4340	Year: 4th
Date: June 8th 2016 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer the following questions… assume any missing data)

Problem number (1) **(20 Marks)**

(a) E-Commerce is faced with many problems, state and discuss each of them and propose a solution for each one. **(5 Marks)**

(b) What are the types of e-commerce sites? Discuss each type and give example for each. **(5 Marks)**

(c) Which display design will you use in the following situations;

1- **You need to show the object and its details in the same screen.**
2- **You need to guide the user through the installation steps**
3- **You need to give the user only the basic shapes to be drawn but he can see the additional shapes to be drawn if he wishes.**

For each design, draw the interface to be used and discuss the consideration taken when using these designs. **(10 Marks)**

Problem number (2) **(30 Marks)**

(a) Make a complete design for a dynamic webpage that will be used in a giant SHOESHOP (محل أحذية ضخم) that sells many goods such as: shoes, boots, sandals, bags, suitcases,…Before that answer the following questions: **(20 Marks)**

1- **What are the functions you must add to the storefront page?**
2- **What are the functions you must add to the administrator page? Include at least three reports for the admin.**
3- **What are the functions you must add to the user page?**
4- **Design the database needed for the system.**
5- **Draw each of the pages and add these functions in a clear manner.**

(b) What are the methods that can be done to protect the web content copyright (images, video, audio, PDF,...). Give more than three in different directions. **(10 Marks)**

Problem number (3) **(35 Marks)**

An auction site has selling customers, who want to put up an item for sale, and buying customers, who buy an item at an auction.

- **Selling customers ask the auction site to sell an item on their behalf.**
- **The auction site manger decides whether to accept or reject the selling customer request.**
- **Buying customers register with the auction site and participate in auctions.**
- **Auctions are conducted by giving buying customers information about an item, then taking bids. The auction determines a buying customer for each item put up for sale. The sale is completed when the buying customer pays for the item.**
- **The auction site sends a portion of the sale income to the selling customer who put up the item for sale in the first place. Of course, the auction house keeps track of all auctions (which are conducted every few weeks) and all sales at each auction.**

- **You may assume that the auction house records name, phone number and address information for all customers.**
- **For each item, the auction house database contains a unique identifier (call it item#), a description, its owner, and the auction during which it was sold.**
- **For each auction, the database stores the date, the items put up for sale, which their buyer was, and their sale price.**

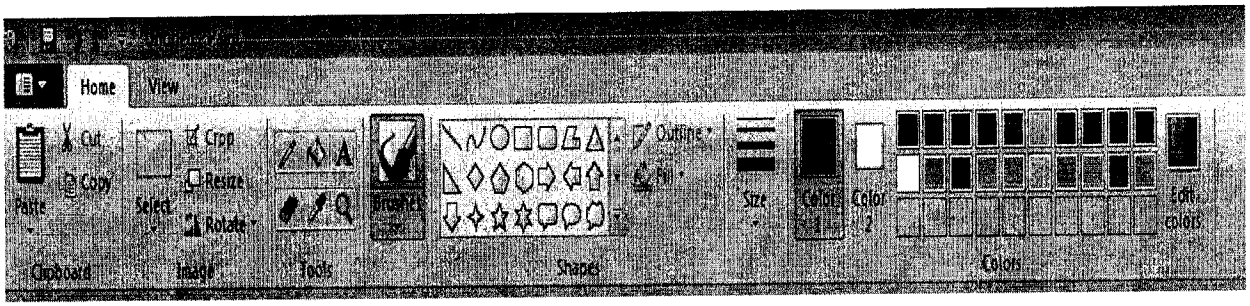
For that system, design a database, a selling customer interface, a buying customer interface and site manager interface that includes the functions mentioned in the above description. You may add any other functions for bonus degrees. **(20 Marks)**

b) What is meant by web page content adaptation? How can you adapt the content according to the current state of hardware of both the user and the server? (5 Marks)

c) In the paintbrush software interface below, show how at least 3 factors of the following are implemented:

i- Learnability **ii- robustness**

(10 Marks)



Good Luck all, ***hoping to see you as postgraduates or colleagues***

Tanta University

Department: **Computers and Control Engineering**
(60 marks)

Faculty of Engineering

Course Title: **Information Systems Design** Course Code: CCE4235 4th year
Date: 13.6.2016 (Second term) Allowed time: 3 hrs

Answer the following questions:

Question No. 1 **(15 marks)**

For each of the following, please circle the letter introducing the best answer- each one is worth one mark:

1. Which word or phrase completes the statement? A spreadsheet to a data island is as a centralized database to a _____?
   a) Data Warehouse
   b) Data Repository
   c) Analytic Sandbox
   d) Data Mart
2. You are studying the behavior of a population, and you are provided with multidimensional data at the individual level. You have identified four specific individuals who are valuable to your study, and would like to find all users who are most similar to each individual. Which algorithm is the most appropriate for this study?
   a) Linear regression
   b) Association rules
   c) K-means clustering
   d) Decision trees
3. In which lifecycle stage the analytic sandbox is prepared?
   a) Discovery
   b) Model planning
   c) Model building
   d) Data preparation
4. When would you use a Wilcoxson Rank Sum test?
   a) When the data can easily be sorted
   b) When you cannot make an assumption about the distribution of the populations
   c) When the populations represent the sums of other values
   d) When the data cannot easily be sorted
5. A data scientist wants to predict the probability of death from heart disease based on three risk factors: age, gender, and blood cholesterol level. What is the most appropriate method for this project?
   a) Linear regression
   b) Logistic regression
   c) K-means clustering
   d) Apriori algorithm
6. Consider the example of an analysis for fraud detection on credit card usage. You will need to ensure higher risk transactions that may indicate fraudulent credit card activity are retained in your data for analysis, and not dropped as outliers during pre-processing. What will be your approach for loading data into the analytical sandbox for this analysis?
   a) ETL
   b) EDW
   c) ELT
   d) OLTP
7. In which lifecycle stage are initial hypotheses formed?
   a) Discovery
   b) Model planning
   c) Model building
   d) Data preparation

8. A disk drive manufacturer has a defect rate of less than 2% with 98% confidence. A quality assurance team samples 1000 disk drives and finds 14 defective units. Which action should the team recommend?
   a) The manufacturing process should be inspected for problems.
   b) A larger sample size should be taken to determine if the plant is functioning properly
   c) A smaller sample size should be taken to determine if the plant is functioning properly
   d) The manufacturing process is functioning properly and no further action is required.
9. Which characteristic applies only to Business Intelligence as opposed to Data Science?
   a) Supports solving "what if" scenarios
   b) Uses large data sets
   c) Uses only structured data
   d) Uses predictive modeling techniques
10. Which activity might be performed in the Operationalize phase of the Data Analytics Lifecycle?
   a) Try different analytical techniques
   b) Try different variables
   c) Transform existing variables
   d) Run a pilot
11. You are asked to create a model to predict the total number of monthly subscribers for a specific magazine. You are provided with one - years' worth of subscription and payment data, user demographic data, and 10-years' worth of content of the magazine (articles and pictures). Which algorithm is the most appropriate for building a predictive model for subscribers?
   a) Linear regression
   b) Logistic regression
   c) Decision trees
   d) TF-IDF
12. Your organization has a website where visitors randomly receive one of two coupons. It is also possible that visitors to the website will not receive a coupon. You have been asked to determine if offering a coupon to visitors to your website has any impact on their purchase decision. Which analysis method should you use?
   a) K-means clustering
   b) Association rules
   c) Student T-test
   d) One-way ANOVA
13. When would you prefer a Naive Bayes model to a logistic regression model for classification?
   a) When you need to estimate the probability of an outcome not just which class it is in.
   b) When all the input variables are numerical.
   c) When you are using several categorical input variables with over 1000 possible values each.
   d) When some of the input variables might be correlated.
14. Which data asset is an example of quasi-structured data?
   a) Web clickstream data
   b) XML data file
   c) Database table
   d) D. News article
15. What is an example of a null hypothesis?
   a) that a newly created model does not provide better predictions than the currently existing model
   b) that a newly created model provides a prediction of a null sample mean
   c) that a newly created model provides a prediction of a null population mean
   d) that a newly created model provides a prediction that will be well fit to the null distribution

Question No. 2 **(25 marks)**

1. Students were given different drug treatments before revising for their exams. Some were given a memory drug, some a placebo drug and some no treatment. The exam scores (%) are given below for the three different groups. Carry out a one-way ANOVA to test the hypothesis that the treatments will have different effects. **(10 marks)**

	Memory Drug	Placebo	No Treatment
	70	37	3
	77	43	10
	83	50	17
	90	57	23
	97	63	30
Mean	83.40	50.00	16.60
Variance	112.30	109.00	112.30
Grand Mean		50.00	
Grand Variance		892.14	

2. Consider the set of items is I = {milk, bread, butter, beer} and a small database of transactions containing the items (where 1 codes presence and 0 codes absence of an item in a transaction) is shown in the table below.
   a) Apply Apriori algorithm (let the minimum support= 40%) to find all the frequent item sets in the database. **(5 marks)**
   b) Use these frequent item sets and the minimum confidence constraint (let the minimum support= 70%) to form the association rules. **(5 marks)**

Transaction ID	milk	Bread	butter	beer
1	1	1	0	0
2	0	1	1	0
3	0	0	0	1
4	1	1	1	0
5	0	1	0	0
6	1	0	0	0
7	0	1	1	1
8	1	1	1	1
9	0	1	0	1
10	1	1	0	0
11	1	0	0	0
12	0	0	0	0
13	1	1	1	0
14	1	0	1	0
15	1	1	1	1

3. Explain the difference between Business Intelligence and Data Science. **(5 marks)**

Question No. 3 **(20 marks)**

1. Consider the following Training Data Set:
   Apply the Naïve Bayesian Classifier to this data set and compute the probability score for P(y = 1|X) for X = (1, 0, 0) **(5 marks)**

X1	X2	X3	X4
1	1	1	0
1	1	0	0
0	0	0	0
0	1	0	1
1	0	1	1
0	1	1	1

Training Data Set

2. How ROC curve is used to diagnose the effectiveness of the logistic regression model? **(5 marks)**

3. Consider the following dataset....Compute the Information gain of the temperature attribute. **(5 marks)**

outlook	temperature	humidity	windy	Class
sunny	hot	high	false	no
sunny	hot	high	true	no
overcast	hot	high	false	yes
rainy	mild	high	false	yes
rainy	cool	normal	false	yes
rainy	cool	normal	true	no
overcast	cool	normal	true	yes
sunny	mild	high	false	no
sunny	cool	normal	false	yes
rainy	mild	normal	false	yes
sunny	mild	normal	true	yes
overcast	mild	high	true	yes
overcast	hot	normal	false	yes
rainy	mild	high	true	no

4. What is a confusion matrix and how it is used to evaluate the effectiveness of the model? **(5 marks)**

Wish you all the Best in your future.

Good luck
Dr. Sherin El Gokhy