

Problem number (3) (25 Marks)

- (a) State whether the following are true or false, why? [8 Marks]
- 1- Photocells are output devices ()
 - 2- Continuous-control actions may be produced by analog controllers or digital controllers ()
 - 3- The thermocouple is an active sensor ()
 - 4- All sensors produce a straight linear output ()
 - 5- Both sensors and actuators are collectively known as transducers ()
 - 6- The measurement device can have 3% accuracy and 5% error ()
 - 7- The thermometer that is used to measure the body temperature is active device ()
 - 8- Relays provide good separation of the low voltage electronic control signals () and the high power load circuits.

- (b) Write short notes about the following: [10 Marks]
- (i) Relay contact types
 - (ii) DC motor switching and control
 - (iii) Pressure sensor
 - (iv) Distributed control systems
 - (v) Centralized control

- (c) What is the meaning of robust control? Discuss the advantages and disadvantages of using one degree and two degree of freedom in designing robust controllers. [7 Marks]

Problem number (4) (25 Marks)

- (a) Write short notes about the following: [10 Marks]
- (i) Designing a simple scada system
 - (ii) Temperature sensors
 - (iii) Process facility considerations
 - (iv) Signal conditioning
 - (v) Static and dynamic characteristic of sensors

- (b) An analog controller may be written as [10 Marks]

$$G(s) = \frac{s + 2}{s^2 + 4s + 3}$$

Find a digital equivalent, $T = 0.1 \text{ sec}$, using

- (i) Bilinear mapping
 - (ii) Forward difference mapping
- (c) What are the advantages and disadvantages of forward, backward, and bilinear mapping method? [5 Marks]

GOOD LUCK

Dr. Ali Abu Tahoun

Course Title: Control and Instrumentation in Industrial Processes Course Code: CCE4237 Year: 4th
Date: June 13th 2012 (Second term) Allowed time: 3 hrs No. of Pages: (2)

Remarks: (Answer the following questions)

Problem number (1) (20 Marks)

- (a) What are the main types of optimal control problems? [5 Marks]
(b) A regulator contains a plant that is described by

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ 0 & -2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$
$$y = [1 \ 0] x$$

and has a performance index

$$J = \int_0^{\infty} \left[x^T \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix} x + 4u^2 \right] dt$$

Determine

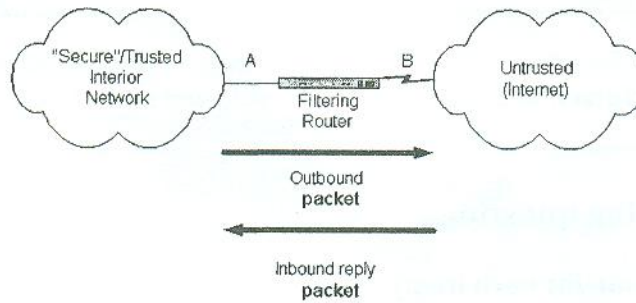
- (i) The Riccati matrix P [7 Marks]
(ii) The optimal state feedback matrix k_{opt} [5 Marks]
(iii) The closed-loop eigenvalues [3 Marks]

Problem number (2) (20 Marks)

- (a) Consider the following specification of a strain gauge pressure transducer. Explain the meaning of each term in it. Is the given transducer active or passive? [6 Marks]

| | |
|-------------------|---------------------------------|
| Ranges | 50 to 1000 kPa, 200 to 7000 kPa |
| Supply voltage | 10 to 12 V d.c. or a.c. r.m.s. |
| Supply current | 6 to 10 mA |
| Full range output | 40 mV |
| Temperature range | -54°C to +120°C when operating |
| Accuracy | 0.3% of FS |

- (b) In process control, define the following terms [6 Marks]
(i) Simple ON/OFF action
(ii) Differential-ON/OFF action
(iii) Continuous-control action
- (c) What is meant by data acquisition system. Draw a typical computer-based data acquisition Diagram. Draw signals type in each stage of the diagram. [8 Marks]

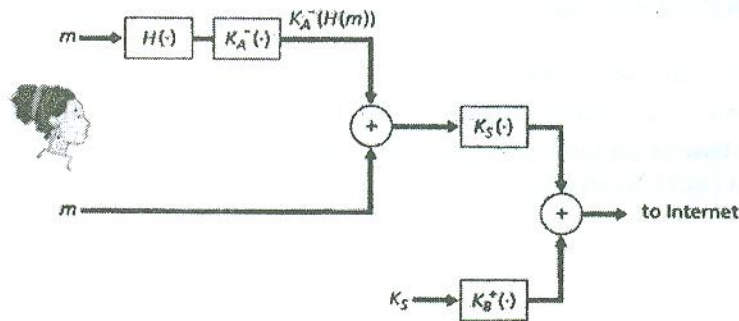


Question 3 (20 Marks: 5 for each item)

- (a) From the security point of view, which protocol is preferable to access a Cisco security appliance for management Telnet or SSH? Why?
- (b) You share an internet connection with your neighbor by using a cisco switch. For security reasons, the switch should be configured so that none of you or your neighbor is able to see the other traffic or resources. How can you enforce the required security objective?
- (c) Consider the 3-bit block cipher in the table below. Suppose the plaintext is 100100100. (a) Initially assume that Cipher Block Chaining (CBC) is not used. What is the resulting cipher text? (b) Suppose Trudy sniffs the cipher text. Assuming she knows that a 3-bit block cipher without CBC is being employed (but doesn't know the specific cipher), what can she surmise? (c) Now suppose that CBC is used with Initialization vector (IV) = 111. What is the resulting cipher text?

| Input | Output | Input | Output |
|-------|--------|-------|--------|
| 000 | 110 | 100 | 011 |
| 001 | 111 | 101 | 010 |
| 010 | 101 | 110 | 000 |
| 011 | 100 | 111 | 001 |

- (d) The following figure shows the operations that Alice must perform with Pretty Good Privacy (PGP) to provide confidentiality, authentication, and integrity. Diagram the corresponding operations that Bob must perform on the package received from Alice.

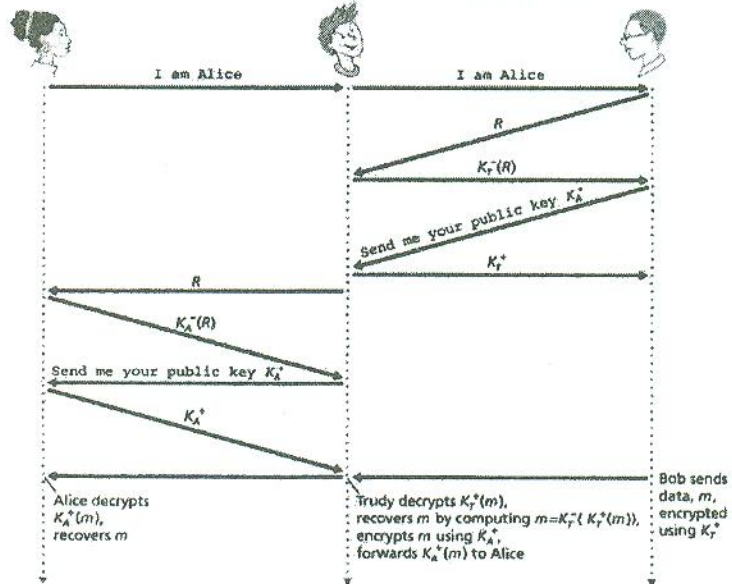


Question 4 (15 , 5 for each item)

- (a) What is the difference between block ciphers and stream ciphers?
- (b) Consider the polyalphabetic encryption system shown in Figure below. For the two cases: (a) C_1 only is used, (b) C_1 and C_2 are used in the repeating pattern: $C_1C_2C_2C_1C_2$. Will a chosen-plaintext attack that is able to get the plaintext encoding of the message "The quick brown fox jumps over the lazy dog." be sufficient to decode all messages? Why or why not?

Plaintext letter: a b c d e f g h i j k l m n o p q r s t u v w x y z
 $C_1(k = 5)$: f g h i j k l m n o p q r s t u v w x y z a b c d e
 $C_2(k = 19)$: t u v w x y z a b c d e f g h i j k l m n o p q r s

- (c) In the man-in-the-middle attack shown in in Figure below, Alice has not authenticated Bob. If Alice were to require Bob to authenticate himself using the public-key authentication protocol, would the man-in-the-middle attack be avoided? Explain your reasoning.



Good Luck

Course examination committee:

Course Coordinator: Dr. Hamed M. Hemedda



Title: Computer and Network Security
Final exam, Date: 2/6/2012, Total marks: 60

Course code: CCE4236 Year: Fourth year
Allowed time: 3 hours Number of pages: 3

Workout the following questions

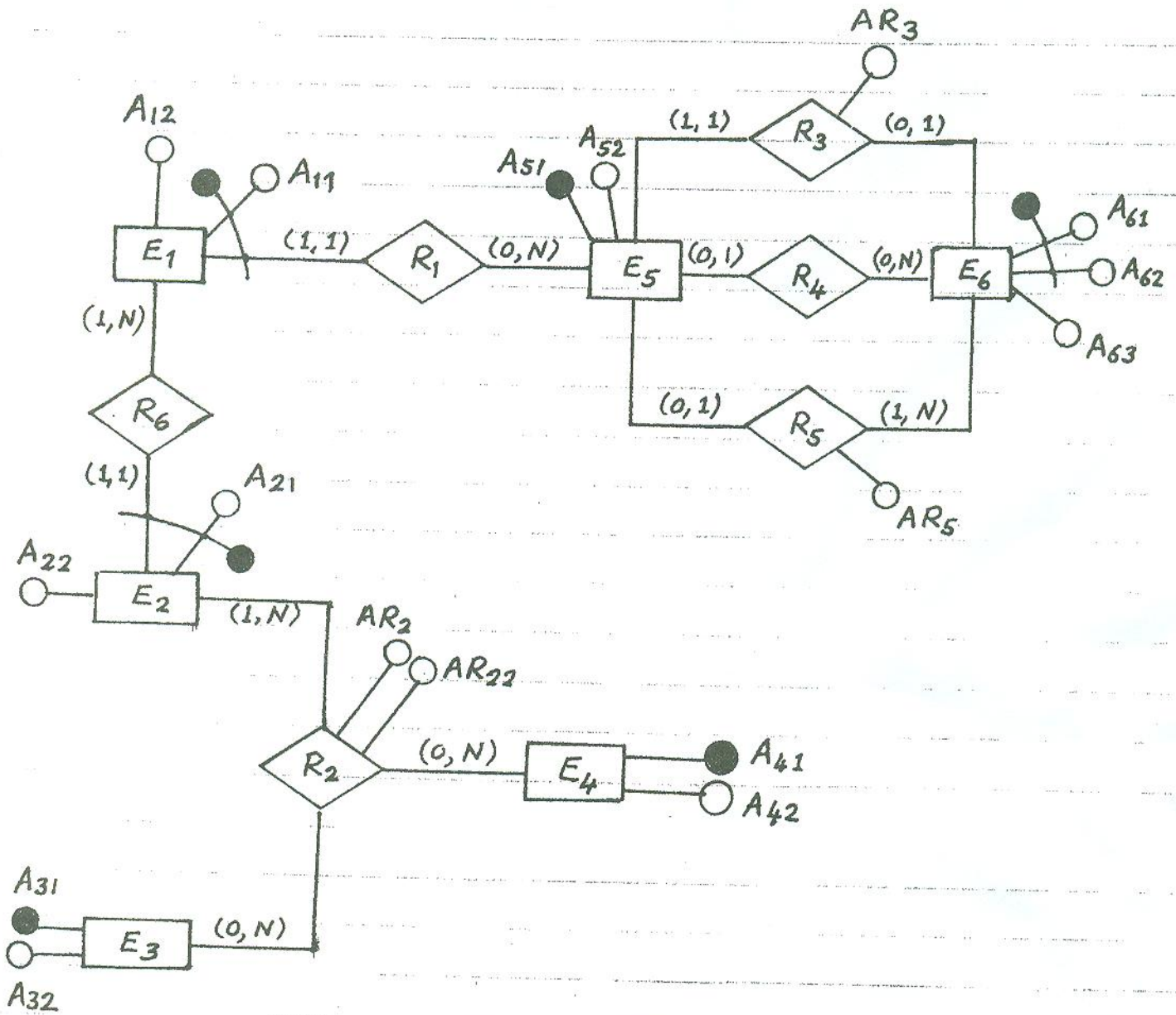
Question 1 (10 marks: one for each item)

Determine if each of the following statements is true or false, if false give the corrections.

- 1) According to OSI security architecture, data confidentiality is a security mechanism
- 2) According to the OSI reference model a compromise in a message at one layer is naturally detected in the above layers
- 3) If you wanted to deny FTP access from network 200.200.10.0 to network 200.199.11.0 but allow everything else, the following commands are used: (1) `access-list 198 deny tcp 200.200.10.0 0.0.0.255 200.199.11.0 0.0.0.255 eq ftp` (2) `access-list 198 permit ip any 0.0.0.0 255.255.255.255`
- 4) The command: `Router(config-line)# login` protects the current line interface using a password
- 5) The command: `Router(if-config)# no ip proxy-arp` disables the functionality of the router as a web proxy
- 6) Suppose *certifier.com* creates a certificate for *foo.com*. Typically, the entire certificate would be encrypted with *certifier.com*'s public key.
- 7) Suppose an SSL session employs a block cipher with Cipher Block Chaining (CBC): The server sends to the client the Initialization Vector (IV) in the clear text.
- 8) Consider sending a stream of packets from Host A to Host B using IPsec, "typically, a new Security association (SA) will be established for each packet sent in the stream.
- 9) In the SSL record, there is a field for SSL sequence numbers.
- 10) In public key encryption/authentication, when entity A sends a message to entity B, A encrypts the message using B public key

Question 2 (15 Marks: 5 for each item)

- (a) What is the difference between established and Reflexive ACL?
- (a) If the following networks (or sub-networks in an organization network) are to be filtered using an Access Control List (ACL) on an edge router. What network and inverse mask would be used for the ACL?
192.168.32.0/24
192.168.33.0/24
192.168.34.0/24
192.168.35.0/24
192.168.36.0/24
192.168.37.0/24
192.168.38.0/24
192.168.39.0/24
- (c) Referring to the following network diagram, mention what, where, and in what direction Access Control List (ACL) can be applied to allow traffic coming from the unsecured side to enter to the secured side only if it's a response to a traffic initiated on the secured side of the network.



E-R model for Question 5

INFORMATION SYSTEM DESIGN

Answer the following *five* questions. Time allowed : 3 hours.

Question 1

- (a) Discuss the 'feasibility study' and the 'operation' as the initial and last activities of the life cycle of an information system.
- (b) Why does database design play the pivotal role in information system design?
- (c) With reference to database modelling, explain how the top-down and bottom-up design strategies can be used. Is a 'mixed' strategy useful in this respect? Why?

Question 2

- (a) Dr. Peter Chen, in 1976, succeeded in developing the Entity-Relationship (E-R) model for the conceptual design of databases. Give a definition for the entity and relationship as main constructs of this model. What are the other constructs?
- (b) Construct an E-R model for a simplified, but adequate, description of the E-R model itself.

Question 3

- (a) The task of collection and analysis of data requirements is a crucial step before the actual design process. Clarify this assertion, shedding light on the static and dynamic aspects of data, the sources from which data requirements are obtained, and the methods followed to eliminate inaccurate and ambiguous terms.
- (b) Construct an E-R model for the tutors in a training centre. For each tutor, we will hold the social security number, surname, age, place of birth, and all telephone numbers. The tutor can be permanently employed by the training centre or can be a freelance.

Question 4

- (a) What do you understand from the expression 'logical design of a database'? Why do you need to restructure the E-R model in this design phase?
- (b) What do redundancies in an E-R model imply? What are their merits and drawbacks? How are they dealt with in translating the E-R model to a relational schema?

Question 5

Consider the E-R model shown on the attached sheet of paper. Translate this model to a relational schema. Comment on each step involved in the translation.

(b) What is meant by inheritance between classes? What are its benefits? Give example for the use of inheritance. (5 Marks)

(c) Two panel selector and wizard screen designs are very common. State what is meant by each, when to use them and draw a sketch for them. (8 Marks)

Problem number (4) (20 Marks)

NOTICE THAT PART (A) AND (B) OF THIS PROBLEM IS CONNECTED, SO READ BOTH OF THEM BEFORE STARTING IN THE ANSWER

(a) In the analysis and design of a library management system (نظام إدارة مكتبة)

i- Draw the use case diagram for the system propose 4 use cases.

ii- Make a High level description of 2 of them and expanded for the other two.

iii- Draw a proper interface for this application then rewrite the 2 high level use cases as real use cases.

(14 Marks)

(b) In the same Library system interface you have developed in part (a) of this question, show how could you achieve:

i- Learnability

ii- robustness

(6 Marks)

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



Course Title: Elective Course 3 (E-Commerce)
Date: June 6th 2012 (Second term)

Course Code: CCE4340
Allowed time: 3 hrs

Year: 4th
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. (10 Marks)
- (b) What are the types of e-commerce sites? Discuss each type and give example for each. (10 Marks)

Problem number (2) (20 Marks)

- (a) In the following use case description find the possible concepts (i.e. classes), attributes and the names of the relations between classes. Then draw the conceptual model for it.

| Actor Action | System response |
|--|--|
| 1- This use case begins when the customer wants to reserve a ticket | 2- The system shows a screen that requests the destination and source of the trip. |
| 3- The customer enters the destination and source of the trip. | 4- the system searches for the possible flight from/to source/destinations and show them for the customer. |
| 5- The customer chooses one of them and press enter. | 6- The system creates a new session for that customer and saves in it the flight ID. Then it requests the customer full information and number of tickets. |
| 7- The customer enter the required info (put the info. yourself in the design) | 8- The system stores the information and give a reservation ID to the customer. |

(10 Marks)

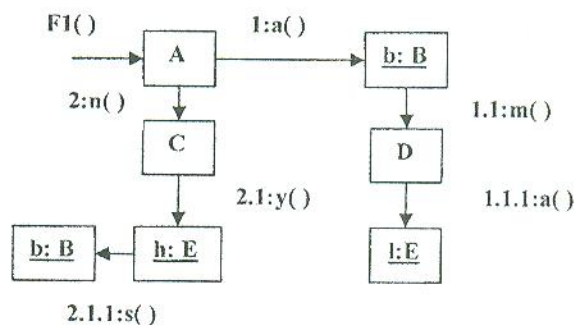
- (b) What are the differences and objective of static and dynamic UML diagrams? Mention one static UML diagram and one dynamic UML and state the objective of each one of them? Why do we need more than one UML diagram in the design (in other words, why we use many stages and different UML diagrams in the analysis and design). (10 Marks)

Problem number (3) (25 Marks)

- (a) The collaboration diagram shown describes the activities to achieve a certain operation.

Use it to answer the following questions:

- i) What is the function described here?
- ii) What are the classes collaborating in this diagram.
- iii) What are the sub functions needed to achieve the described function?
- iv) Draw the corresponding sequence diagram for this collaboration diagram.
- v) Draw the class diagram with the functions found in this diagram in it.



(12 Marks)