Tanta university
Automatic Control and Computer Depart.
Final Term Exam- January 2011

Faculty of Engineering
Third Year- Operating Systems
Time 3 hours

Answer All Questions

Question One

1- What are the difficulties with concurrences?
2- How is a counting semaphore different from a binary semaphore?
3- Consider the following snapshot of a system:
Consider the following snapshot of a system (P=Process, R=Resource) :

Available			
RA	RB	RC	RD
8	5	9	7

Maximum Demand				
	RA	RB	RC	RD
P0	3	2	1	4
P1	0	2	5	2
P2	5	1	0	5
P3	1	5	3	0
P4	3	0	3	3

Current Allocation				
	RA	RB	RC	RD
P0	1	0	1	1
P1	0	1	2	1
P2	4	0	0	3
P3	1	2	1	0
P4	1	0	3	0

Answer the following questions using banker's algorithm:

a) Calculate the *Needs* matrix:
b) Is the system in a safe state? If so, show a safe order in which the processes can run?
Show your computation step-by-step;

Question Two

1- Compare between the following: I/O programming, Interrupt driven programming and DMA?
2-What is operating system? What are its objectives and services?
3- Define the term "Processes" what does it consist? Then Draw the process image
4- Draw the two states suspend model diagram?

Question Three

1-What are the components of OS control structure?
2- What the types of registers, give an example for each type
3- The Sleeping-Barber Problem. A barbershop consists of a waiting room with n chairs and the barber room containing the barber chair. If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy but chairs are available, then the customer sits in one of the free chairs. If the barber is asleep, the customer wakes up the

barber. Write a program by any computer language to coordinate the barber and the customers.

Question Four

1-What are the major criteria for short term scheduling?

2- Explain the scenario of operation for the producer /consumer problem at the two different cases (finite and infinite buffer) , then write a pseudo code to give the correct solution to the infinite buffer.

3-

Process	Arrival Time	Service Time (T_s)
A	0	3
B	2	6
C	4	4
D	6	5
E	8	2

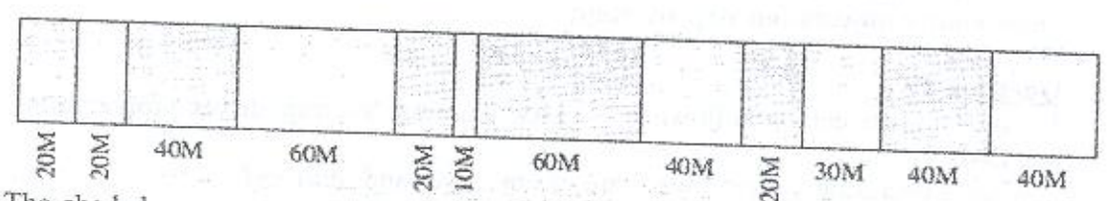
Perform three scheduling algorithm to execute the above processes

Question Five

1-What are the meaning of multi-threading and what are the benefits of it?

1- Consider an address of $(n+m)$ bits, where the leftmost n bits specifies the page number and the rightmost m bits are the offset address, Illustrate, the required steps with the necessary drawing which are needed for address translation.

3- A dynamic partitioning scheme is being used, and the following is the memory configuration at a given point in time:



The shaded areas are allocated blocks; the white areas are free blocks. The next three memory requests are for 60M, 40M, and 10M. Indicate the starting address for each of the three blocks using the following placement algorithms:

a. First-fit

b. Best-fit

c. Worst-fit

With my best wishes Dr. Hatem January 2011

ج ط سبان

Tanta University	**Third Year Students**
Faculty of Engineering	**First Term Exam**
Computers and Control Department	**January 2011**
Database Systems	***Code : CCE 3112***

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

Question 1

(a) A database management system (DBMS) is a software system able to manage collections of data that are *large*, *shared*, and *persistent*, and to ensure their *reliability* and *privacy*. It also must be *efficient* and *effective*. Explain this assertion with emphasis on the terms written in *italics*.

(b) Illustrate the three-level architecture of DBMSs and discuss its advantages from the viewpoint of data independence.

(c) What is meant by a 'key', 'superkey', and 'primary key' in relational data models? What do you understand from the expression 'key by chance'?

(d) Prove mathematically that every relation has a key.

Question 2

Consider two relations GRADUATES and MANAGERS given as:

GRADUATES

Number	Surname	Age	TownOfBirth
274	Hegazy	39	Cairo
432	Aziz	32	Cairo
824	Mostafa	40	Tanta
951	Rashad	43	Alexandria

MANAGERS

Number	Surname	Age	Salary
297	Aziz	44	2000
432	Aziz	32	1500
824	Mostafa	40	1800
971	Sallam	46	2150

Write relational-algebra expressions for the following requirements, and show the result in each case:

(a) All available information of the graduates with ages less than or equal to 40 years and whose town of birth is Cairo.

(b) The numbers and surnames of all managers.

(c) The ages and salaries of the managers with salaries greater than 1500 Egyptian pounds.

(d) The left, right, and full outer joins of the two relations. Specify any dangling tuples.

(e) The union, intersection, and difference of the two subrelations:

$\Pi_{\text{Number, Surname, Age}}$ (GRADUATES) and $\Pi_{\text{Number, Surname, Age}}$ (MANAGERS)

Both of these subrelations have the same set of attribute names. Is this a necessary condition? Why?

Question 3

(a) What does the acronym SQL stand for?

(b) Write a short account on the families of SQL elementary domains that allow representation of time instants and time intervals.

(c) Give a set of SQL commands that can construct a relation

TRAINEE (ID, FirstName, Surname, Specialization)

with the following specifications:

- The attribute ID is a primary key, with domain char (10).
- The attributes FirstName and Surname are each subject to a constraint *not null*, with domain char(20).

- The attributes FirstName and Surname, taken together, are subject to a constraint *unique*.
- The attribute Specialization, with domain char (15), refers to an attribute Career in another relation TRAINER, thus forming a foreign key.
- The foreign key specified above has a correction policy *no action* for both deletions and updates.

(d) Do the commands of part (c) belong to the data definition language (DDL) or data manipulation language (DML)? Why?

(e) Modify the commands of part (b) so that the foreign key will have correction policies *set default* for deletions and *cascade* for updates.

(f) What do the correction policies *no action* in part (b) and *set default* and *cascade* in part (e) mean?

Question 4

Consider a relation STUDENT given as:

STUDENT

FirstName	Surname	Age	Faculty	Year
Adel	Helmy	20	Commerce	1
Alaa	Raafat	21	Engineering	2
Dina	Kamal	20	Science	2
Karim	Mostafa	22	Medicine	3
Noha	Abdel-Latif	20	Engineering	2
Salem	Mostafa	23	Medicine	4
Wael	Mostafa	21	Pharmacy	1
Zohdy	Saleh	22	Engineering	3

Write SQL instructions for the following queries, showing the result in each case:

(a) Find the faculties of the students with surname Refaat. Rename the attribute Faculty as College.

(b) Find the first names and surnames of the students enrolled in year 2 of the faculty of engineering.

(c) Find the first names, surnames, and ages of the students enrolled in the faculty of engineering *or* the faculty of science.

(d) Find the first names of the students with surname Mostafa *and* enrolled in the faculty of medicine *or* the faculty of pharmacy.

(e) Find all available information of the students whose first names have an 'a' as the second letter and an 'm' as the last letter.

Course Title: Control Engineering	Course Code: CCE3115	3rd year
Date: January 23rd 2010 (First Term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (Answer the following questions... Assume any missing data)

Problem number (1) **(15 Marks)**

(a) What are the main differences between lead and lag compensators? **(4 Marks)**

(b) Consider the system shown in Figure 1, **(11 Marks)**

(i) Sketch the root-locus.

(ii) Determine the value of K such that the damped frequency, ω_d, of a pair of dominant complex conjugate closed loop poles is 2 rad/s.

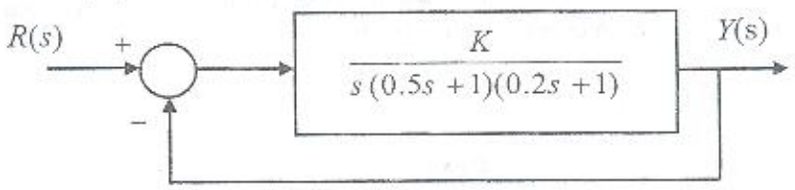


Figure 1

Problem number (2) **(15 Marks)**

(a) What is meant by gain margin and phase margin? **(3 Marks)**

(b) For the system that has the open-loop transfer function **(12 Marks)**

$$G(s)H(s) = \frac{K}{s(0.1s+1)(0.2s+1)(1+s)}$$

(i) Find the value of K for critically stable system.

(ii) Find the value of K for gain margin of 40 dB, find the corresponding phase margin.

Problem number (3) **(15 Marks)**

(a) Discuss the relationship between systems types and the corresponding polar plots. **(3 Marks)**

(b) Consider a system that has an open-loop transfer function **(12 Marks)**

$$G(s)H(s) = \frac{40K}{(s+4)(s^2+2s+2)}$$

(i) Sketch the polar plot for $K = 1$ and then find the gain margin.

(ii) Determine the range of K for which the system is stable.

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

(a) Explain the main methods that are available for tuning PID controllers. **(5 Marks)**

(b) Given an open-loop control state-space model, **(10 Marks)**

$$\dot{x} = \begin{bmatrix} 1 & 1 \\ 0 & -4 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$$

Design a state-feedback controller such that the closed-loop system poles have the values

$$s = -2, \; s = -1$$

Problem number (5) **(15 Marks)**

(a) Explain the effects of each term of PID controller on the system response. Can the derivative controller be used alone in control systems? Why? **(5 Marks)**

(b) A system is described by **(10 Marks)**

$$\frac{Y(s)}{U(s)} = \frac{1}{s^2 + 3s + 2}$$

Design a full-order state-observer that has an undamped natural frequency, ω_n, of 10 rad/s and a damping ratio of 0.7.

GOOD LUCK

Dr. Ali Abu Tahoun

Tanta University

Department: Computer and Control Engineering
Total Marks: 70 Marks

Faculty of Engineering

Course Title: Digital Signal Processing	Course Code: CCE3116	3rd year
Date: January 20th 2010 (First Term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (Answer the following questions... You may use the part of z-transform table given in page 2)

Problem number (1) **(12 Marks)**

(a) For the following discrete-time systems **(6 Marks)**

(i) $y(n) = x(n^2)$

(ii) $y(n) = \sin(x(n))$

Check whether these systems are

1. Static or dynamic
2. Linear or nonlinear
3. Causal or non-causal

(b) Consider the discrete-time sequence $x(n)$, **(6 Marks)**

$$x(n) = \left\{1, 1, 1, 1, 1, 0, -1, -1, -1, -1\right\}$$

Sketch

(i) $x(-n+4)$

(ii) $x(n+4)$

Evaluate the energy of $x(-n+4) + x(n+4)$

Problem number (2) **(15 Marks)**

(a) Find the inverse z-transform of **(4 Marks)**

(i) $X(z) = \dfrac{z}{z^2 + 4}$

(b) Find z-transform and ROC for the following sequences **(6 Marks)**

(i) $x_1(n) = n2^n u(n)$

(ii) $x_2(n) = (-1)^n e^{-n} u(n)$

(c) Compute the linear convolution, $y(n) = x(n) * h(n)$, where **(5 Marks)**

$x(n) = u(n) - u(n-4)$ $\quad$ $h(n) = 2u(n) - 2u(n-2)$

Problem number (3) **(12 Marks)**

(a) Determine 4-point DFT of the following sequence **(6 marks)**

$$x(n) = \left\{1, 2, 2, 1\right\}$$

(b) Compute the N-point DFT of the sequence **(6 marks)**

$$x(n) = \cos\left(\frac{2\pi n}{N}\right)$$

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

(a) Using radix-2 algorithm, obtain the 8-point FFT-DIT of the following sequence **(6 Marks)**

$$x(n)=\left\{\underset{\uparrow}{1},1,1,1,0,1,0,1\right\}$$

Follow exactly the corresponding signal flow graph and keep track of all the intermediate quantities by putting them on the graph.

(b) Consider the filter transfer function, **(9 Marks)**

$$H(z)=\frac{0.5(1+z^{-1}+z^{-2})}{(1-0.3z^{-1})(1+0.4z^{-1})(1+0.9z^{-1})}$$

Perform the filter realization using

(i) Direct form I
(ii) Cascade form
(iii) Parallel form

Problem number (5) **(16 Marks)**

(a) Given the following low pass filter, **(6 Marks)**

$$H(s)=\frac{10}{s+10}$$

Use bilinear transfomation to design a corresponding digital low pass filter with cutoff frequency of 20 Hz and sampling rate of 100 Hz.

(b) Design a second order digital bandpass Butterworth filter with the following specifications: **(10 Marks)**

- An upper cutoff frequency of 2.6khz
- A lower cutoff frequency of 2.4khz
- A sampling frequency of 8khz.

GOOD LUCK

Dr. Ali Abu Tabour

$x(n)$	$X(z)$
$\delta(n)$	1
$u(n)$	$\frac{z}{z-1}$
$a^n u(n)$	$\frac{z}{z-a}$
$\sin(an)$	$\frac{z\sin(a)}{z^2-2z\cos(a)+1}$
$\cos(an)$	$\frac{z[z-\cos(a)]}{z^2-2z\cos(a)+1}$

جامعة طنطا
كلية الهندسة
هندسة الحاسبات

المادة/ تنظيم صناعي
الفرقة/ الثالثة (لائحة قديمة) صباحي

بسم الله الرحمن الرحيم
التاريخ : ٢٣-١-٢٠١١
الزمن : ساعتان

أجب على خمسة من الأسئلة التالية:

١- ماهي العوامل التي تؤثر علي تكلفة الإستثمار وتكلفة الإنتاج ، وماهي نقطة التعادل وأهمية تحديدها مع التوضيح بالرسم؟

٢- ماهي الأهداف التي تسعي السلامة الصناعية إلي تحقيقها في المنشئات الصناعية، وما هي الشروط الواجب قبل تشغيل الآلة؟

٣- ماكينة تكلفة شرائها ٦٠٠٠٠ دولار ، وتكلفة تركيبها ٤٠٠٠٠ دولار وعمرها النافع مقدر بخمسة سنوات ، وقيمة النفاية (الأنقاض) لها في نهاية السنة الخامسة هو صفر ، إحسب ما يلي:
- القسط السنوي للإهلاك بإستخدام طريقة الإنحدار في حساب الإهلاك ، مع تقدير تكلفة المعدة في نهاية السنة الثانية من عمرها النافع.
- القسط السنوي للإهلاك بإستخدام طريقة الإنحار المتضاعف في حساب الإهلاك، مع تقدير تكافة المعدة في نهاية عمرها النافع.

٤- ماهو تعريفك للإنتاجية وما هي أنواعها المختلفة.
إحسب مؤشر الإنتاجية المتعدد لعدد ١٠٠٠ وحدة إنتاجية بقيمة إجمالية مقدارها ١٥٠٠٠٠ دولار ، وتبلغ تكلفة العمالة ٧٠٠٠ دولار ، والمواد الخام ٨٠٠٠ دولار.

٥- يعتمد تحليل الوضع للمنشئات الصناعية علي دراسة وتحليل البيئة الداخلية والبيئة الخارجية للمنشأة ، فما هي الطرق أو الوسائل المختلفة التي يمكن إستخدامها في تحليل الوضع مع الشرح بإيجاز لكل منها؟

٦- هناك خطوات ومراحل متتابعة يجب العمل بها عند إستخدام طريقة التسويق ، فما هي تلك الخطوات أو المراحل ، مع الشرح بإيجاز لكل مرحلة منها.

Tanta University,
Faculty of Engineering,
Computer & Control Engineering Dept.,
Date: 25/1/2011

Final Term Exam
Compiler Design
3rd year
Allowed Time: Three Hours

Answer The Following Questions:

The First Question (20 Mark)

(a) Indicate whether each of the following statements is ***true*** or ***false***, and if it is ***false*** correct it.
   a. Scanners perform syntax analysis.
   b. An interpreter is a form of compiler that runs slowly.
   c. A parser recognizes phrases structure in an input stream.
   d. All regular grammars are right linear.
   e. All right linear grammars are context-free.

(b) Why a compiler phases may be separated into front-end and back-end parts?

(c) Corresponding to the following input statement:
   x := d * (a - b) * c + (a – b) * c;
   a. Show the output of the scanner, parser, and code generator of a **compiler**.
   b. Show the output of an **interpreter**.

The Second Question (20 Mark)

(a) What is the main functionality of a symbol table? Provide two implementation techniques of such table and an advantage of each provided technique.

(b) Show a finite state machine in either state graph or table form for the following language: "Strings containing an even number of **zeros** and an odd number of **ones**" What is the input alphabet of this language?

(c) Show the balanced and not balanced binary search trees which would be constructed to store each of the following lists of identifiers:
   Hill, cat, bat, bird, tree, frog, dog, cow

The Third Question (20 Mark)

(a) What is each of the following terms means in compiler design: ***a simple language***, ***a derivation***, ***a terminal***, ***a non-terminal***, and ***a handle***?

(b) Given the following grammar:
   1. A → A * A **2. A → A / A**
   3. A → (A) **4. A → c**
   1. Show a left-most derivation and a derivation tree for (c*c)/c input string using the above grammar.
   2. Classify the above grammar according to Chomsky's definitions.
   3. Is the above grammar ambiguous one? If the answer is yes eliminate its ambiguity.

The Fourth Question (20 Mark)

(a) What is a shift/reduce parser? Outline how a shift/reduce parser may work.

(b) Explain carefully the differences between LR(k) and LL(k) parsing.

(c) Using the following grammar, show the sequence of stack and input configurations as the string **cccd** is parsed with shift reduce parsing.
   S → S c B
   S → c
   B → c d

The Fifth Question (20 Mark)

(a) Why a compiler phases may be separated into front-end and back-end parts?

(b) Write strings of atoms corresponding to the input statement: for i := a to b + c do b := b/4 and then translate them to instructions using a single-pass and a two-pass code generators.

(c) Consider the arithmetic expression: **(a + b) * (c + d) – (a + b) * (c + d)**
   1. Use the register allocation algorithm to construct a weighted syntax tree.
   2. Write strings of atoms corresponding to this expression.

With my best wishes

حاسبات

Tanta University

Department: **Computers and Control Engineering**
Total Marks: 70 Marks

Faculty of Engineering

Course Title: **Stochastic Processes** العمليات العشوائية ثالثة حاسبات Course Code: CCE3117 3rd year
Date: 27.1.2011 (First term) Allowed time: 3 hrs No. of Pages: (2)

Answer all the following questions:

Question No. 1 *(17 marks)*

(a) If A and B are independent events , prove that A^c and B^c are `independent.

(b) Let A and B be events with P(A) =1/2, P(B) = 1/3 and $P(A \cap B)=1/4$.

Find :**i-**P(A|B) , **ii-**P(B|A) , iii-$P(A \cup B)$, iv- $P(A^c|B^c)$, v- $P(B^c|A^c)$

(c) If X be a continuous random variable with the probability

$P(x) = kx \quad 0 \le x \le 2$, and zero elsewhere

Find the **cumulative** distribution function, mean, variance, and standard deviation of X.

(d) Given a and b are constants , find with prove i - E(a) = ? ii – Var(aX + b) = ?

where X is a continuous random variable.

Question No. 2 *(17 marks)*

(a) Three light bulbs are chosen at random from 20 bulbs of which 5 are defective. Find the probability that : i- exactly one is defective, ii- none is defective,

iii- at least one is defective iv- at most one is defective.

(b) Let X be a continuous random variable with distribution

$f(x) = k(2- x)$ if $0 \le x \le 2$ and f(x) equals zero elsewhere.

Sketch the graph of f(x) and thus i- Evaluate k ii- Find $P(1 \le X \le 2)$

(c) Let X be a random variable with the binomial distribution b(k;n,p).

Prove that E(X) = np.

Question No. 3 *(18 marks)*

(a) A fair die is tossed. Let X denotes twice the number appearing, and let Y denote 1 or 2 according as an odd or an even number appears. Find the probability, expectation, variance and standard deviation of:

i- X ii- Y iii- X+Y iv- XY

(b) A coin weighted so that P(H) = 1/3 and P(T) = 2/3 is tossed until a head or three tails occur. Find the expected number of tosses of the coin.

(c) Determine the expected number of boys in a family with 5 children, assuming the sex distribution to be equally probable. What is the probability that the expected number of boys does occur?

Question No. 4 *(18 marks)*

(a) Suppose 5% of the items made by a factory are defective. Find the probability P that there are 3 defective items in a sample of 100 items.

(b) Suppose the diameters of bolts manufactured by a company are normally distributed with mean 2.5 centimetres and standard deviation 0.1 centimetres . A bolt is considered defective if its diameter is ≤ 2.0 centimetres or ≥ 3.0 centimetres . Find the percentage of defective bolts manufactured by the company.

(c)) Suppose the weights of 5000 male students are normaly distributed with mean 155 pounds and standard deviation 20 pounds.

Find the number of students with wights

i- less than or equal to 100 pounds, ii- between 130 and 140 pounds,

iii- between 150 and 180 pounds iv- greater than or equal to 200 pounds.

Best wishes *Dr. Eng. Alasyed Sallam*