المستوى الرابع - الإحصاء وعلوم الحاسب

Mansoura university	2_nd term	المقرر: تحليل التباين (ر ٤٣٤)
Faculty of science	2012/2013	الزمن : ساعتان
Math. Depart	4^{th} year (stat., computer sci.)	التاريخ : ٢٠١٣/٥/٢٨
	Final exam	

Answer the following questions

Q1: (27 marks)

For the observations in the following table

treatments	observations					
A	7	6	8	5	9	7
B	8	9	10	7	8	6
C	7	8	10	5	6	3
D	8	6	5	4	9	4

(a) Test the hypothesis that $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$ at level of significance $\propto = 0.05$ where $f_{0.05}(3,20) = 3.10$

(b) Use Bartlett's test to test the homogeneity of variances at level of significance $\propto = 0.01$ where $b_4(0.01,6) = 0.5430$,

Q2: 27 marks)

(a) Construct one way analysis of variance table and test the hypothesis $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$, at level of significance $\alpha = 0.o5$, for the following observations

Treatment	Observations					
A	7	10	9	8	10	10
B	5	6	4	8	7	6
C	8	9	10	6	3	6
D	5	6	4	3	7	5

Where $f_{0.05}(3,20) = 3.10$

(b)If H_0 is rejected, use Scheffe's test to compare between four population means

(c) Compare between the two groups of treatments (A, B, C) versus (D) using the contrast $w = \mu_1 + \mu_2 + \mu_3 - 3\mu_4$, where $f_{0.05}(1,20)$ =4.35 .

Q3: (26 marks)

Suppose that we are interested in the yields of 3 varieties A, B and C of wheat using 4 different fertilizers, planted in 12 randomly selected pieces of land with the same fertility assumption, production was, as in the following table. The yields for the 3 varieties of wheat measured in 100 kg

	Fertilizers			
Wheat	I	II	III	IV
A	70	56	51	61
B	66	60	55	60
C	77	67	59	65

(a) Are there any differences between the impact of different types of fertilizers

(b) Are there any differences between the productions of different types of wheat?

[Use $\alpha = 0.05$ and $f_{0.05}(2,6) = 5.14$, $f_{0.05}(3,6) = 4.76$].

المستوى الرابع - ٤١٢

الشعبة: إحصاء وحاسب + رياضيات المادة: تحليل دالي	كلية العلوم – قسم الرياضيات	دور مايو ٢٠١٣ الزمن: ساعتـــــــان التاريخ: ٢٠١٣/٥/٢٥

Answer the following questions

First : Objective questions : **(20 marks)**

Among the following statements mark the true and false ones with (√) and (×) respectively. Justify your answer for ONLY TWO of them :

(i) In a metric space, a set $A \neq \Phi$ is closed if and only if $\overline{A}$ is closed. ....( )

(ii) For any sequences $(\alpha_n),(\beta_n) \in \ell^2$ we have

$$\sum_{n=1}^{\infty} |\alpha_n \beta_n| \leq \left(\sum_{n=1}^{\infty} |\alpha_n|^2\right)^{1/2} \cdot \left(\sum_{n=1}^{\infty} |\beta_n|^2\right)^{1/2} \quad ....( )$$

(iii) .The sequence ($(-1)^n$) belongs to the space ℓ^∞. ....( )

(iv) Any subspace of a Banach space is also a Banach space. ....( )

(v) If $A = \{x_1, x_2, x_3, x_4, x_5, x_6\} \subseteq \ell^\infty$, it follows that the linear hull H(A) is separable. ....( )

(vi) For any normed spaces E,F over K, the space L(E,F) is a Banach space. ....( )

(vii) Any set $U \neq \Phi$ can be converted to a metric space. ....( )

(viii) Any two linearly homeomorphic normed spaces are linearly isometric. ....( )

(ix) Every linear operator $T : R \to R$ is continuous on R . ...( )

(x) The space ℓ^4 is linearly homeomorphic to the space K^4 . ...( )

***Second : Subjective* questions** **(20 marks each)**

[1] a. Define : a metric space – the space ℓ^p. [4 marks]

Show that , for p > 1, and for all (α_n), $(\beta_n) \in \ell^p$, the sequence $(\alpha_n+\beta_n)$ belongs to ℓ^p , and

$$\left(\sum_{n=1}^{\infty} |\alpha_n + \beta_n|^p\right)^{1/p} \leq \left(\sum_{n=1}^{\infty} |\alpha_n|^p\right)^{1/p} + \left(\sum_{n=1}^{\infty} |\beta_n|^p\right)^{1/p}.$$ [10 marks]

b. Let X be a non-empty set. A mapping $L: X \times X \to R$ satisfies the following conditions :

(i) $L(x,y) = 0$ if and only if $x = y$, and (ii) $L(x,z) \leq L(y,x) + L(y,z) \quad \forall\, x,y,z \in X$.

Prove that L is a metric on X. [6 marks]

[2] a. Define : a separable space. [2 marks]

Show that,for p > 1, the space ℓ^p is separable . [8 marks]

b. Let E,F be normed spaces over K , $E \neq \{0\}$, and let $T : E \to F$ be a linear mapping of E onto F. Prove that T is one-to-one and T^{-1} is bounded if and only if there is a constant m > 0 such that $\|Tx\| \geq m$ for all $x \in E$ with $\|x\| = 1$. [10 marks]

[3] a. If $T : R^3 \to R^3$ is defined by $T(\alpha,\beta,\gamma)=(\alpha-\gamma, 2\alpha+\gamma, 3\beta)$; show that T is a bounded linear operator on R^3, and then find $\|T\|$. [9 marks]

b. Show that if E is a finite-dimensional normed space, then E is a Banach space, and every linear transformation $T : E \to G$ is bounded. (G; being any normed space) [11 marks]

Best Wishes

المستوى الرابع - الاحصاء وعلوم الحاسب - نظرية الأشكال ٢٠١٢

El-Mansoura- Egypt	Fourth level of B.Sc.	المنصورة – مصر
Mansoura University Faculty of Science Mathematics Department **Second Term**	Program: Math. and Statistics & Computer Science Subject: Graph Theory Course Code 412: **Date: 1 June. 2013**	جامعة المنصورة كلية العلوم قسم الرياضيات **Time: 2 hours**

Answer the following ~~five~~ four questions: **Mark**

1- a- Find the number of edges $|E(G)|$ of the graph G of each of: **(10 points each item 2 points)**

(i) G is oriented digraph with n vertices and maximal number of arcs.
(ii) Regular graph G of order 1 with $2n$ vertices .
(iii) A complete rooted 2-tree with 7 vertices,
(iv) G is a tree with $2n$ vertices ,
(v) G is a simple graph having maximum number of edges, $2n$ vertices and no triangles.

b- Give an example of each of : **(10 points each item 2 points)**

(i) A cubic graph with 6 vertices.
(ii) Two non-isomorphic digraphs with 3 vertices and 3 arcs.
(iii) A graph with n vertices and its diameter = n -1, for each +ve integer n.
(vi). A graph with (girth) $g(G) = n = c(G)$ (circumference) for each +ve integer n .
(v) Two distinct trees with 4 vertices.

2 -a Prove that a graph G is regular of order 2 $\Leftrightarrow$ each component of G is a cycle. **(8 points)**

b - Prove that In any graph the number of vertices of odd degrees is even. **(6 points)**

c - Is there a complete rooted 2-tree with even number of vertices? why? **(6 points)**

3. a- If G is a plane graph with k components , n vertices , m edges and r regions, prove that $n - m + r = 1 + k$. **(10 points)**

b- Show that the complete graph K_5 is nonplanar and then prove that K_n is a nonplanar graph for each $n \geq 5$. **(10 points)**
Also, show that the complete graph K_n is a nonbipartite graph for each $n \geq 3$.

4 – a. Let G be a simple graph with n vertices and k components, show that $n - k \leq |E(G)| \leq \binom{n-k+1}{2}$. And then give an example of a simple graph with 10 vertices and 2 components having : **(10 points)**
(i) minimal number of $|E(G)|$, and **(ii)** maximal number of $|E(G)|$.

b - Let T_1 and T_2 be two trees with the same number of vertices n. **(10 points)**
Prove or disprove that
(i) Both T_1 and T_2 have the same number of edges.
(ii) Give two non-isomorphic trees T_1 and T_2 both have 5 vertices.
(iii) If e is an edge and v is a vertex in T_1 , then $T_1 - e$ and $T_1 - v$ are trees.?

Good luck **Total (80 points)**

المستوى الرابع - الاحصاء وعلوم الحاسب - نظم الرسم بالحاسب / ٤٤٣

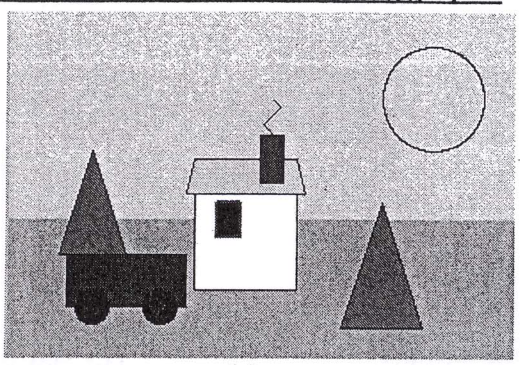
Math 443
4/6/2013

المستوى الرابع
امتحان مادة: رسم بالحاسب
الزمن: ساعتين

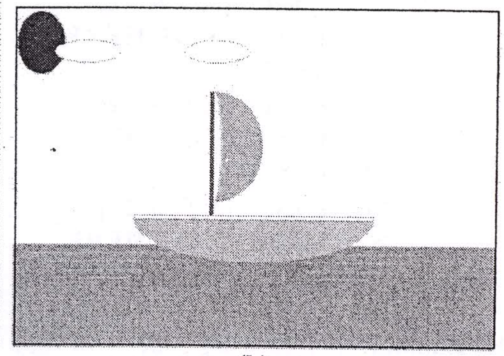
جامعة المنصورة
كلية العلوم
قسم احصاء وعلوم الحاسب

Please answer the following questions:

Q1: Write codes for the following graphs: **(20 Marks)**



(a)



(b)

Q2: For each of the following fragments of code, write what the output would be. **(10 Marks)**

```
num = 10
while num > 3:
        print num
        num = num -1
```

(a)

```
divisor = 2
for i in range(0, 10, 2):
        print i/divisor
```

(b)

```
num = 10
while True:
        if num < 7:
                break
        print num
        num -= 1
```

(c)

```
count = 0
for letter in 'Snow!':
        print 'Letter #', count, 'is', letter
        count += 1
```

(d)

Q3: For the following, write the line(s) of code that will emit the given Output. **(15 Marks)**

1. ```
   >>> a_list = [3, 5, 6, 12]
   >>> YOUR CODE HERE
   3
   ```
2. ```
   >>> a_list = [3, 5, 6, 12]
   >>> YOUR CODE HERE
   12
   ```
3. ```
   >>> a_list = [3, 5, 6, 12]
   >>> YOUR CODE HERE
   [5, 6, 12]
   ```
   ```

4. >>> a_list = [3, 5, 6, 12]
   >>> YOUR CODE HERE
   3
   5
   6
   12
5. >>> a_list = [3, 5, 6, 12]
   >>> YOUR CODE HERE
   [12, 6, 5, 3]
6. >>> a_list = [3, 5, 6, 12]
   >>> YOUR CODE HERE
   [9, 15, 18, 36]
7. >>> a_list = [3, 5, 6, 12]
   >>> YOUR CODE HERE
   [False, False, True, True]

Q4: Explain the following codes and find the outputs: **(15 Marks)**

```
def greet(friend, money):
    if friend and (money >= 20):
        print "Good Friend"
        money = money - 10
    elif friend:
        print "Friend"
    else:
        print "Not Friend"
        money = money + 10
    return money
money = 20
money = greet(True, money)
print "Money:", money
print ""
money = greet(False, money)
print "Money:", money
print ""
money = greet(True, money)
print "Money:", money
print ""
```

```
questions = ['name', 'age', 'favorite color', 'city']
answers = ['ahmed', '20', 'blue']
for q, a in zip(questions, answers):
    print 'What is your {0}? It is {1}.'.format(q, a)
```

```
for x in range(1,10):
        print '{0:2d} {1:3d} {2:4d}'.format(x, 2*x, 3*x)
```

```
f = open('/workfile.txt', 'r+')
f.write('012345012345')
f.seek(5)
f.read(1)
f.seek(-3, 2)
f.read(1)
f.close()
```

Good luck. *Dr. Abdelhameed Fawzy (6/2013)*

المستوى الرابع - رياضيات - الحاسب نمذجة ومحاكاة / ٤٢٦

Mansoura University
Faculty of Science
Mathematics Department

Final exam
Second term
May 2013

4th level students (Mathematics / Statistics and computer Science programme)

Subject: Math 426 (Modelling and Simulations)

Date: 08 /06/2013 **Time allowed: Two hours**

Answer the following questions: **Total marks: 80**

Question one:

A) Write down and find the equilibria for each of the following difference equation models: the Beverton-Holt model, the Ricker model, and the Nicholson-Bailey model. **(10 marks)**

B) Construct a mathematical model to describe the competition between two species. Explain your model, find the steady states and discuss their stability. **(10 marks)**

Question two:

A) Write down a discrete-time model for measles with vaccination. **(5 marks)**

B) Construct an SIS model for an infection spreading in a closed population with **varying** size. Explain your model, find the steady states and discuss their stability. **(15 marks)**

Question three:

A) Write down both the von Bertalanffy and Gompertz models for the tumour growth. **(5 marks)**

B) Prove that in a large **spherical** tumour there is a shell of proliferating cells, whose thickness depends on the excess nutrient concentration above a threshold $(\mathbf{c_2 - c_1})$, how fast the nutrient is consumed **k** and how fast it diffuses **D**, but not on the size of the tumour itself. **(15 marks)**

Question four: **(20 marks)**

Construct an SIRS model for an infection spreading in a closed population with constant size and study the possibility to vaccinate the susceptible individuals with rate ψ. Find the critical age above which susceptible individuals should be vaccinated to protect the population from the infection.

Best regards,
The examiner
Dr. Muntaser Safan

المستوى الرابع - الإحصاء وعلوم الحاسب - تصميم وتحليل الخوارزميات

Faculty of Science
Computer Science Department
4th - Level

Date: May-June 2013
Subject: Algorithms
Time Allowed: 2 Hours
Total Marks: 80 Marks

Answer QUESTIONS [1,2]

Question 1:[12 Marks]

A- Use the Master method to solve the following recurrences

i. $T(3n)=T(2n/9)+\Theta(n^3)$ ii. $T(n)=7T(n/2)+\Theta(n^2)$

iii. $T(n)=1.5T(2n/3)+\Theta(2^{\lg(n)})$

B- Use the substitution method to verify that the running time for the recurrence relation $T(n)=9T(n/3)+n^2$ is of order $O(n^2\lg(n))$.

Question 2:[12 Marks]

A- Write both the tilde approximations and the order of growth for the following:

I. $3N^2 - 150\lg(N^3) - 12N$ **II.** $(7N^3 - 3/N)(2^{-N} - 12)$ **III.** $7^N + \lg(N)$

IV. $2\lg N^2 + 4\lg^2 N$

B- Write the Merge sort algorithm and find its running time; then illustrate the behaviour of Merge Sort on the following array of integers {234, 344, 29, 438, 429, 37, 345, 23}.

Answer ONLY TWO from QUESTIONS [3,4,5]

Question 3:[18 Marks]

A- Use the recursion tree method to get the solution of the following recurrence.

$$T(3n)=T(5n/2)+T(3n/2)+O(n^2)$$

B- Use the recursion tree to find a good guess for the recurrence $T(n)=7T(n/2)+n^2$; then verify your guess using the substitution method.

C- Compute the running time complexity of the following algorithm

```
function Sum (array A, int n)
{
    Sum=0
    for (i=0; i<n ; i++)
        Sum=Sum+A[i]
    return Sum
}
```

Question 4:[18 Marks]

A- Write the Insertion sort algorithm and find both its best and worst running times; then illustrate the behaviour of Insertion Sort on the following array of integers {2, 44, 49, 8, 9, 57, 5, 3}.

B- Compute the running time complexity of the following algorithms:

```
function LSUM (N)
{
    int sum=0;
    for (int i=1; i < N ; i++)
        for (int j=N ; j >0 ; j=j/2)
            sum+=j;
    return Sum
}
```

See Next page ☞

C- Analyze the following algorithm to find an asymptotic upper bound of its execution

<u>*function multiply(x,y)*</u>

Input: Positive integers x and y, in binary

Output: The product of x,y

n=max(*size* of x, *size* of y)

$if(n=1)$ return $x.y$

x_L= leftmost $n/2$ bytes of x, x_R =rightmost $n/2$ bytes of x

y_L=leftmost $n/2$ bytes of y, y_R=rightmost $n/2$ bytes of y

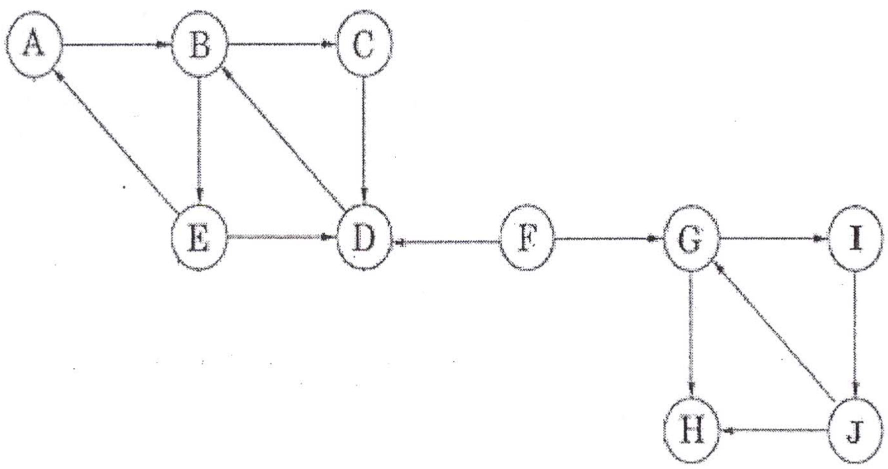
P_1=*multiply*(x_L,y_L)

P_2=*multiply*(x_R,y_R)

P_3=*multiply*(x_L+x_R, y_L+y_R)

return $P_1.2^n+(P_3-P_1-P_2).2^{n/2}+P_2$.

Question 5:[18 Marks] Study the following graph algorithm, then answer the questions following it.



A. Define the adjacency matrix for the graph.

B. Write The Depth first Search Algorithm

C. Perform Depth-First Search on the graph (starting from node A); <u>*whenever there's a choice of vertices, pick the one that is alphabetically first*</u>. Classify each edge as a tree edge, forward edge, back edge, or cross edge, and give the **first visit** and **final visit** order of each vertex., and state the complexity of its performance

D. Draw the DFS search forest results from the DFS algorithm.

E. Write an algorithm that identifies the strongly connected components within the graph.

F. Write down the strongly connected components within the graph.

....

End of Questions

المستوى الثالث - رياضيات - احصاء وحاسب - دوال خاصة ٣٢٤

الفرقة: الثالثة المادة : دوال خاصة كود المادة: 324 الدرجة الكلية:80 درجة	كلية العلوم – قسم الرياضيات برنامج: الرياضيات– الاحصاء وعلوم الحاسب	دور مايو 2013 الزمن: ساعتين التاريخ : 2013/6/13

اجب عن الاسئلة الاتية

السؤال الاول: (20 درجة)

احسب التكاملات الاتية

(ا)- $\int_0^\infty e^{-t^2}\,dt$ (6 درجات)

(ب)- $\int_0^\infty \frac{1}{1+y^4}\,dy$ (6 درجات)

(ج)- اثبت ان $\Gamma(2x) = \frac{2^{2x-1}\Gamma(x)\Gamma(x+\frac{1}{2})}{\sqrt{\pi}}$ (8 درجات)

السؤال الثانى : (20 درجة)

(ا)- اثبت ان ${}_2F_1(\frac{1}{2},1,\frac{3}{2},z^2) = \frac{1}{2z}\log\frac{1+z}{1-z}$ (7 درجات)

(ب)- اوجد $P_3(x)$ حيث $P_0(x)=1$ و $P_1(x)=x$ ($P_n(x)$ هى كثيرة حدود ليجندر) (5 درجات)

(ج)- اوجد مفكوك الدالة $f(x)=\begin{cases}1 & 0\le x<1\\ 0 & -1\le x<0\end{cases}$

فى الصورة $\sum_{m=0}^{\infty} A_m P_m(x)$ (8 درجات)

السؤال الثالث: (20 درجة)

(ا)- اثبت انة عندما n عدد صحيح فان $J_{-n}(x) = (-1)^n J_n(x)$ (7 درجات)

(ب)- اوجد قيمة $\int J_1(\sqrt[3]{x})\,dx$ (6 درجات)

(ج)- اثبت ان $4J_0''' + 3J_0'' + 3J_3 = 0$ (7 درجات)

السؤال الرابع: (20 درجة)

1. اذكر صورة ردريجيوس لكثيرات حدود لاجير $L_n(x)$ ومن ثم اوجد $L_2(x)$ (6 درجات)
2. اذكر خواص التعامد لكثيرات حدود لاجير (4 درجات)
3. اثبت ان $L_n(x) = n!\ {}_1F_1(-n,1,x)$ (10 درجات)

مع اطيب التمنيات بالتوفيق والنجاح

د. عبد المنعم لاشين

المستوى الرابع - الاحصاء وعلوم الحاسب - سلاسل زمنية وتنبؤ / ر ٤٣٥

جامعة المنصورة – كلية العلوم
قسم الرياضيات
التاريخ : ١٥ / ٦ / ٢٠١٣ م
الدرجة الكلية : ٨٠ درجة
الزمن : ساعتان

امتحان دور مايو ٢٠١٣ م
برنامج : احصاء و علوم الحاسب
المستوى: الرابع
اسم المقرر : سلاسل زمنية و تنبؤ
كود المادة : ر ٤٣٥

Answer the following questions:

[1] a- Consider the MA(q) process given by $X_t = Z_t + \theta_1 Z_{t-1} + \cdots + \theta_q Z_{t-q}$, where $\{Z_t\} \sim WN(0\ ,\ \sigma^2)$. i) When q = 1 , and $|\theta_1| < 1$, show that process can be represented as $Z_t = \sum_{j=0}^{\infty} (-\theta_1)^j X_{t-j}$ **(10 marks)**

ii) Show that $|\rho(1)| \le \cos\left(\frac{\pi}{q+2}\right)$ when q = 1 and q = 2 **(10 marks)**

b- Consider the time series model $X_t = m_t + Y_t$, where m_t is a polynomial trend of degree three and Y_t denotes the random noise component .

Find a seven point filter $\{a_j\}_{j=-3,\cdots,3}$ **(10 marks)**

---

[2] Consider the process $X_t - 0.4\, X_{t-1} - 0.45\, X_{t-2} = Z_t + Z_{t-1} + 0.25\, Z_{t-2}$

i) Classify it as an ARMA (p , q) process **(4 marks)**

ii) Determine whether it is causal and / or invertible **(6 marks)**

iii) Find the coefficients ψ_j in its linear representation $X_t = \sum_{j=0}^{\infty} \psi_j Z_{t-j}$ **(10 marks)**

iv) Use the linear process representation to drive a formula for its autocorrelation function $\rho(h)$ and evaluate it for $h = 1$ **(10 marks)**

---

[3]a- Prove that the Process $X_t = X_{t-1} + Z_t$ where $\{Z_t\} \sim WN(0\ ,\ \sigma^2)$, is not stationary process . **(10 marks)**

b- Define the following: i) The ARMA (p , q) process **ii) White noise process**

iii) Weak stationary time series **iv) The operators ∇ and ∇_d**

v) Non- negative definite function **(10 marks)**

Best wishes Dr. Faten Shiha