Assiut University **4th Mathematics** **Time:3 hours**
Faculty of Science **Complex Analysis 412M** **May : 2017**
Math. Dept. **Instructor: Professor Dr. Mohamed Abd El-Rahman Ahmed**

Answer only five of the following questions:

1- a) **State and prove** **a characterization of a complex-valued function to be analytic in any domain.** **(2 degrees)**

b) **Solve the equations:**

$\ln(z)=\frac{1}{2}\ln(2)-\frac{\pi}{4}i,\qquad \sin(z)=\cosh(4),\qquad e^{z^2+3i}=-1,\qquad \cosh(z)=-i.$ **(8 degrees)**

2- **Show that:**

$(I)\ \left|e^{z^2}+e^{\bar{z}}\right|\le e^{|z|^2}+\left|e^{z}\right|,\qquad (II)\ \left|z_2-z_1\bar{z}_1\right|\ge\left||z_2|-|z_1|^2\right|,$

$(III)\ \frac{z_1}{z_2 z_3}=\frac{|z_1|}{|z_2||z_3|}e^{i(\arg(z_1)-\arg(z_2)-\arg(z_3))};\quad z_1\neq 0,\quad z_2\neq 0,\quad z_3\neq 0,$ **(10 degrees)**

$(IV)\ |z_1+z_2|=|z_1|+|z_2|$ **if and only if** $\theta_1-\theta_2=2n\pi;\quad n=0,\pm1,\pm2,\ldots$,
where $\theta_1=\arg(z_1),\qquad \theta_2=\arg(z_2)$,

(V) **if** $\lim_{z\to z_0}\frac{f(z)-f(z_0)}{z-z_0}$ **exists, then it is unique and it equals** $f'(z_0)$.

3- a)) **Write with proof** **Residue Theorem and Cauchy integral formula.(4degrees)**

b) **Find** **Laurent series of the function** $\frac{1}{z-k}$ **for the domain** $|z|\succ k,\quad 0\prec k\prec 1$.

c) **Verify that** $u(x,y)=e^x(x\cos y-y\sin y)$ **is a harmonic function. Also,** **deduce** **the corresponding analytic function.** **(6 degrees)**

4- **Is (with details):**

$(i)\ |z_1-z_2|\ge||z_1|-|z_2||\quad\forall z_1,z_2\in C,\qquad (ii)\ e^{|z|^2}\le\left|e^{iz^2}\right|,$

$(iii)\ \arg\left(\frac{z_1}{z_2}\right)=\arg(z_1)-\arg(z_2)\quad\forall z_1\neq 0,z_2\neq 0,\qquad (iv)\ \overline{\sinh(iz)}=\sinh(-i\bar{z})$ **(10 degrees)**

(v) $f'(z_0)$ **not exist** $\Rightarrow$ **Cauchy-Riemann equations at** z_0 **are satisfied.**

To behind

5- a) **Show that** the functions $f+F,\ \ f-F,\ \ f.F,\ \ \frac{f}{F};\ F(z_0)\neq 0$ are continuous at the point z_0 where $f,\ \ F$ are continuous at z_0. **(5 degrees)**

b) Let C be a simple closed contour containing the points $z_1=0$ and $z_2=1$ taken in the positive sense and $a>0$. **Using Residue Theorem, exhibit that:**

$$\frac{1}{2\pi i}\int_C \frac{\cos^{-1}\left(\frac{az+1}{\sqrt{2}}\right)}{z\left(z^3-1\right)}\,dz=\frac{1}{18}\cos^{-1}\left(\frac{a+1}{\sqrt{2}}\right)-\frac{\pi}{\sqrt{2}}.$$ **(5 degrees)**

6- a) **Conclude that** the existence of the limit of a complex-valued function f as $z\to z_0$ leads to the limit as $z\to z_0$ of a function $\sqrt{|af|},\ \ a\prec -1$, given by

$$\sqrt{|af|}(z):=\sqrt{|a|}\ \sqrt{|f(z)|}\qquad\qquad \forall z\in C.$$ **(5 degrees)**

b) **Evaluate** $\int_{|z-2|=2}\frac{3z^2+2}{(z-1)(z^2-9)}\,dz$ **in the positive direction.** **(5 degrees)**

Finish

GOOD LUCK

Assiut University Faculty of Science Mathematics Dept.	Final Exam Spring 16-17 Course: Cryptography Course code: MC466	Date:16/5/2017 Level: Fourth Time: 2 Hour	

Answer Only five questions 10 pt. for each (if you answer all questions last one will be discarded):

Question 1:

1. Define the following terms:
   a. Cryptology
   b. Cryptography
   c. Cryptanalysis
2. Encrypt the message "we are all together" using a double transposition cipher with 4 rows and 4 columns, using the row permutation (1, 2, 3, 4) → (2, 4, 1, 3) and the column permutation (1, 2, 3, 4) → (3, 1, 2, 4).

Question 2:

1. Describe the TEA algorithm for encryption and decryption.
2. Using one-time pad, encrypt and decrypt the plaintext (11010101010101010100) with the key (10100100101010101101)

Question 3:

1. What is the cryptographic objectives?
2. Use a Hill cipher to encrypt the message "we live in an insecure world". Use the following key

$$\begin{pmatrix} 3 & 2 \\ 5 & 7 \end{pmatrix}$$

Question 4:

1. Draw the general structure of one round DES, how many rounds have DES, how big is the key and how big is the block?
2. Describe the Triple DES with two DES keys.

Question 5:

1. Describe briefly the general structure of AES algorithm.
2. Explain the substitution bytes transformation and add round key transformation of AES cipher.

Question 6:

1. Describe RSA Algorithm.
2. Perform encryption and decryption for the following data. p=11, q=3, e=3 and message="6".

Best Wishes

Dr. Rasha Mahmoud

	Assiut University Faculty of Science Mathematics Dept.	Final Exam Spring 16-17 Course: Data Mining Course code: MC464	Date:25/5/2017 Level: Fourth Time: 2 Hour	

Part1: Answer the following questions (20 pts):

1. What are data mining tasks?
2. What is the major tasks in data preprocessing?
3. Why can data be noisy/inconsistent?
4. How to handle noisy data?
5. What is data transformation?

Part2: Answer only three of the following questions (10 pts each):

1-The following dataset will be used to learn a decision tree for predicting whether a mushroom is edible or not based on its shape, color and odor.

Shape	Color	Odor	Edible
C	B	1	Yes
D	B	1	Yes
D	W	1	Yes
D	W	2	Yes
C	B	2	Yes
D	B	2	No
D	G	2	No
C	U	2	No
C	B	3	No
C	W	3	No
D	W	3	No

Draw the full decision tree that would be learned for this data

2-Given the transactions of Table 1, frequent itemset mining should be performed, using the frequent-pattern (FP) growth approach and a minimum support of 3.

(a) Construct the FP-tree corresponding to the set of transactions in Table 1.

Table 1: Transaction database

TID	List of items
T1	F, A, C, D, G, I, M, P
T2	A, B, C, F, L, M, O
T3	B, F, H, J, O, W
T4	B, C, K, S, P
T5	A, F, C, E, L, P, M, N

(b) Mine the FP-tree according to the FP-growth algorithm. The results should include the set of frequent patterns generated through the different steps in the analysis.

3-Cluster the following eight points (with (x, y) representing locations) into two clusters A1(2, 10) A2(2, 5) A3(8, 4) A4(5, 8) A5(7, 5) A6(6, 4) A7(1, 2) A8(4, 9). Initial cluster centers are: A1(2, 10) and A4(5, 8). The distance function between two points a=(x1, y1) and b=(x2, y2) is defined as: $\rho(a, b) = |x2 - x1| + |y2 - y1|$.
Use k-means algorithm to find the three cluster centers after the second iteration.

4- Suppose that the data for analysis includes the attribute age. The age values for the data tuples are (in increasing order) 13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45,46, 52, 70, answer the following.

(a) Use smoothing by bin means to smooth the above data, using a bin depth of 3.
(b) How might you determine outliers in the data?
(c) What other methods are there for data smoothing?

Best Wishes
Dr. Rasha Mahmoud

2016/2017
2nd Term
Date:May,20,2017

Final Exam for Level 4

Subject: Distributed Computation, MC452

Time: 2 Hours

50 marks

Mathematics Dept.

Faculty of Science

Assiut University

Answer the following questions (50 marks)

Q. 1. (10 marks)

Complete the following sentences:

- ……(a)…….. means solving a single problem faster using multiple CPUs if each CPU has its local memory called ……(b)…
- Parallel Computer Categories are ……(c)….. , ……(d)……
- ……..(e)…….divide a process into stages to produce several items simultaneously
- The Extend Compilers Advantages are ……(f)…… , ……(g)…..
- ……(h)…… A variable defined before the loop whose value is used inside the loop, but never assigned inside the loop
- A task is ……(i)……. if a task tries to receive a value at an input port and the value isn't available.
- The ……(j)……..of a parallel algorithm is the period of time a task is active.

Q. 2. (13 marks)

a) After running thiscode, what are the type and the value of each variable? (7 marks)

i)
```
d=0; idx=0;
parforidx=1:4
d=idx*2;
a(idx)=d;
end
```

ii)
```
spmd(4)
if labindex==1
a=rand(2,2)
else
a=rand(1,1)
end
end
```

b) Binary Tree Network interconnection network with $n = 2^d$ processor nodes, 2n-1 switches.Define and compute the diameter, bisection width, edges / node and constant edge length(6 marks)

Q. 3. (14 marks)

a) Write the purpose of each command in the following code (6 marks)

```
pmode start
if labindex == 1
        A = labBroadcast(1,magic(numlabs))
else
        A = labBroadcast(1)
End
column_sum = sum(A(:,labindex))
total_sum = gplus(column_sum)
y= codistributed(A)
c = gather(y)
```

b) How does agglomeration improve performance and scalability in Foster's algorithm(8 marks)

Q. 4. (13 marks)

a) What is the Cache-coherence Problem and how the Directory-based Protocol solves it? (4 marks)

b) What are the differences between (6 marks)

I. Shared and Switched Media Interconnection Networks

II. Data Parallelism and Functional Parallelism

c) Which code executed faster and why?(3 marks)

```
r=magic(1500)
g=zeros(1,16)
parforidx=1:16
g(idx)=rand*max(eig(r))
end
```

```
g=zeros(1,16)
parforidx=1:16
r=magic(1500)
g(idx)=rand*max(eig(r))
end
```

Best Wishes, *Dr. Hanaa A. Sayed*

Faculty of Science Operation Research 426 R June: 2017

Math. Dept Computer Science Section Time:3 hours

(Total Degree : 50 Points)

Answer 4 Questions only from the following:

1-a) Derive the necessary and sufficient conditions for the given problem

$Min\, f(\underline{x})$, $\underline{x} \varepsilon R^n$, where $f(\underline{x})$ is a continuous and differentiable function for all needed order (6.5 Points)

-b) Find the extreme points of the function

$$f(\underline{x}) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$$ (6. Points)

2-a) Given the following problem

$Min\, f(\underline{x})$ Subject to $g_j(\underline{x})$, $\underline{x} \in R^n$, $j = 1, 2, \dots, m$ (6.5 Points)

Derive the necessary condition of the constrained variation method and then derive the LaGrange multiplier method

-b) Use the Lagrange multiplier method to solve

$$Minimize\, f(\underline{x}) = x_1^2 + x_2^3 - 3x_1x_2$$

Subject to $g(\underline{x}) = x_1^2 + x_2^2 = 8$ (6. Points)

3-a) Derive the necessary and sufficient conditions for the given problem

$Min\, f(\underline{x})$, $\underline{x} \varepsilon R^n$, where $f(\underline{x})$ is a continuous and differentiable function for all needed order (6. Points)

See Next Page

-b) Find the extreme points of the function

$$f(\underline{x}) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6 \qquad \text{(6.5 Points)}$$

Use the derived conditions to evaluate the extreme points of

$$f(\underline{x}) = x_1^3 + x_2^3 + 3x_1^2 - 3x_1^2 - 8 \qquad \text{(6. Points)}$$

4-a) State the $\underline{rth}$ differentiation of the function $f(\underline{x})$, $\underline{x} \in R^n$ if all partial derivatives of this function through order $r \geq 1$ are exist and continuous at a point $\underline{x}^*$, (6. Points)

-b) Use the $\underline{rth}$ differentiation of the function $f(\underline{x})$, $\underline{x} \in R^n$ to determine the Taylor series of $f(\underline{x})$ about $\underline{x}^*$ and then find the second-order Taylor series of the function $f(\underline{x}) = x_2^2 x_3 + x_1^2\sqrt{x_3}$ about the point $[1, 3, 4]^t$

(6.5 Points)

5) Find the gradient vector ∇f and the Hessian matrix H of the function $f(\underline{x}) = x_1 + 2x_3 + x_2x_3 - x_1^2 - x_2^2 - x_3^2$ at the point (1,3,4), and then find if the Hessian matrix is positive definite matrix, negative definite matrix or non (12.5 points)

Best Wishes

Taha Elgindy *Kareem Elgindy*

Department of Mathematics	Faculty of Science		كلية العلوم	قسم الرياضيات

الإمتحان النهائي للفصل الدراسي الثاني 1438 هـ - 2016/ 2017 م

اسم المقرر: إحصاء رياضي	مستوى 4 و مستوى 3	يوم الإمتحان: 22/5/2017
رقم المقرر: 442 رأ	الدرجة: 50	الزمن : 3 ساعات

أجب عن الأسئلة الاتية: (10 درجات لكل سؤال) (الإمتحان في ورقتين)

السوال الأول: إذا أعطيت دالة الكثافة الإحتمالية المفصلية للمتغيرين X ، Y بالصورة:

$$f_{X,Y}(x,y)=\begin{cases}3x, & 0<y\le x<1,\\ 0, & o.w\end{cases}$$

(أ) أوجد: $(i)\ F_{X|Y}(x|y)$ $(ii)\ P(X\le 0.2|Y=0.4)$ $(iii)\ \rho(X,Y)$

(ب) إذا كان: $Z=X-Y$ ، فأثبت أن: $F_Z(z)=\dfrac{3z-z^3}{2},\quad 0\le z\le 1$.

السوال الثاني: (أ) إذا كان المتغير العشوائي X متصلاً وله دالة الكثافة $f_X(x)$ حيث $x\in A\subseteq R$ وكان المتغير العشوائي Z دالة في X حيث $z=g(x)$ تناظر أحادي فوقي وقابل للإشتقاق فأثبت أن:

$$f_Z(z)=f_X[g^{-1}(z)]\,|J|,\quad z\in B,\ J=\frac{dx}{dz}$$

(ب) المتغير العشوائي المتصل X يخضع للقانون الإحتمالي:

$$f_X(x)=\begin{cases}\dfrac{1}{2}e^{-x/2}, & x\ge 0\\ 0, & o.w\end{cases}$$

فإذا أعطيت المتغير العشوائي المتقطع Z بحيث:

$$Z=\begin{cases}0, & 0<x<1\\ 1, & 1\le x<2\\ 2, & 2\le x<3\\ 3, & x\ge 3\end{cases}$$

أوجد دالة الكتلة الإحتمالية $p_Z(z)$ وتحقق من كونها دالة كتلة إحتمالية فعلية.

السوال الثالث: (أ) دالة الكثافة الإحتمالية المفصلية للمتغيرين العشوائيين X ، Y هي $f_{X,Y}(x,y)$ فإذا كان: $V=XY$ فأثبت أن: $f_V(v)=\int_x \dfrac{1}{|x|}f_{X,Y}(x,\dfrac{v}{x})dx$

(ب) إذا كان المتغيران العشوائيان X ، Y مستقلان ويتبع كل منهما توزيعاً أسياً قياسياً، وكان $Z=\dfrac{X}{X+Y}$ فأثبت أن Z يتبع توزيعاً إحتمالياً منتظماً على الفترة $(0,1)$. وإحسب قيمة: $V[(X+Y)|Z=z]$

السوال الرابع: (أ) $X_1,\dots,X_n$ عينة عشوائية مسحوبة من مجتمع يتبع توزيع بواسون بالمعلمة λ أثبت أن X هو مقدر متسق - كاف - MVUE للمعلمة λ .

(ب) $X_1,\dots,X_n$ هي عينة عشوائية مسحوبة من مجتمع يتبع دالة الكثافة :

$$f_X(x)=\begin{cases}\dfrac{1}{\theta+1}e^{-x/(\theta+1)}, & x>0\quad(\theta>-1)\\ 0, & o.w\end{cases}$$

(i) هل $\bar{X}$ مقدر غير متحيز لـ θ؟ وفي حالة كونه متحيزاً، أستخدمه لإيجاد مقدر غير متحيز لـ θ.

(ii) أوجد $\hat{\theta}_M$ ، $\hat{\theta}_{ML}$.

(iii) ضع $\beta = \theta + 1$ أثبت أن $\beta > 0$ هي معلمة مقياس للتوزيع المعطى، وأوجد مقدر بتمان لـ β.

السؤال الخامس: (أ) مجتمعان معتدلان متوسطاهما هما μ_1, μ_2 ومتساويي التباين المجهول σ^2 فإذا أخذنا عينة من كل مجتمع حجومهما n_1, n_2 وكانت متوسطات وتباينات العينتين هي: $\bar{X}_1, \bar{X}_2, S_1^2, S_2^2$. أثبت أن $(1-\alpha)100\%$ فترة ثقة للفرق $\mu_1 - \mu_2$ (حيث $0 < \alpha < 1$) هي:

$$(\bar{X}_1 - \bar{X}_2) - t_{\alpha/2, n_1+n_2-2}\, S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} < \mu_1 - \mu_2 < (\bar{X}_1 - \bar{X}_2) + t_{\alpha/2, n_1+n_2-2}\, S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

(ب) مصنع يقوم بتجميع نوع من أجهزة الكمبيوتر المحمول، وجد أنه يتطلب لتوظيف فنيين جدد خضوعهم لفترة تدريب لمدة شهر للوصول إلى أقصى قدر من الكفاءة، وأقترح أسلوب جديد للتدريب. أجرى إختباراً للمقارنة بين الأسلوبين المقترح والمستخدم من قبل، فأختيرت عينتان حجم كل منهما 9 موظفين جدد، تدربت لثلاثة أسابيع لكل مجموعة أختير أسلوب تدريبها، وفي النهاية سجلت بالدقائق الفترات الزمنية التي يأخذها كل منهم في التجميع، فكان مجموع مربعات إنحرافات x_{1i} و x_{2i} عن $\bar{x}_1$ و $\bar{x}_2$ على الترتيب، حيث $i = 1,\ldots,9$ هي: $\sum_{i=1}^{9}(x_{2i} - 31.56)^2 = 160.22$ ، $\sum_{i=1}^{9}(x_{1i} - 35.22)^2 = 195.56$. أوجد 95% فترة ثقة لـ $(\mu_1 - \mu_2)$ وذلك بفرض أن أزمان التجميع في المجتمعين تتبع توزيعات معتدلة مجهولة ومتساوية التباينات. (أستخدم القيمة الجدولية: $t_{0.025,16} = 2.12$)

صيغ معاونة:

- المتغير العشوائي X يتبع توزيعاً أسياً قياسياً ⇦
$$f_X(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & o.w \end{cases}$$

- المتغير العشوائي X يتبع توزيعاً منتظماً على الفترة $(0,1)$ ⇦
$$f_X(x) = \begin{cases} 1, & 0 < x < 1 \\ 0, & o.w \end{cases}$$

- المتغير العشوائي X يتبع توزيع بواسون ⇦
$$p_X(x) = \begin{cases} \frac{\lambda^x}{x!} e^{-\lambda}, & x = 0,1,\ldots (\lambda > 0) \\ 0, & o.w \end{cases}$$

تمنياتي للجميع بالتوفيق،،،

ا.د. عبد الباسط عبدالله أحمد

جامعة سبوط

امتحان الفصل الثانى ٢٠١٦/ ٢٠١٧ الزمن: ٣ ساعات
المادة (٤٣٤ر) النمذجة الرياضية التاريخ : ٣٠-٥-٢٠١٧
كلية العلوم الشعبة: الرياضيات المستوى الرابع

أجب عن خمسة اسئلة مما يلى: الدرجة العظمى 50 درجة (10لكل سؤال)

١-أ-أكمل ما يلى:
١-المراحل الأساسية لعملية النمذجة خمس هى ١-----٢-----٣------٤----٥------
٢-تقسم النماذج الرياضية الى ثلاث مجموعات أساسية هى ١----٢----٣--
٣-الغرض من موضوع النمذجة هو ١----٢------٣-------
٤- تطوير النموذج الفيزيائى يمكن تقسيمه الى ثلاث ١------- ٢-----٣----
(٧ درجات كل نقطة نصف درجة)
ب-عرف النمذجة الرياضية وارسم خريطة توضيحية لصياغة مسألة هندسية بطريقة رياضية (٣ درجات)

٢-أ- وفق الخط المستقيم $Y+MX+C$ لقيم التجربة المعطاة بالجدول باستخدام طريقة المربعات الصغرى (٧درجات)

X	1	2	3	4	5
Y	3	5	7	9	11

ب-عندما نفكر فى حساب الأخطاء فإننا عادة نبحث عن الأخطاء الناجمة من الشخص نفسه فى اجراء العملية، على أية حال هناك أنواع أخرى من الأخطاء تحدث نتيجة تداخل العمليات الحسابية ناقش ثلاث أنواع منها (٣ درجات)

٣- من الظواهر الطبيعية المعروفة التى تقابلنا فى الحياة، الحركة الموجية ، إستنتج الصيغة الرياضية للمعادلة الموجية فى بعد واحد من خلال :
١- وتر مهتز (٥ درجات) ٢- سريان تيار كهربائى فى سلك (٥ درجات)

٤- من خلال دائرة كهربية تتكون من ملف ومقاومة ومكثف وقوة كهربية تذبذبية ، أكتب المعادلة التفاضلية المناسبة ثم أوجد حل هذه المعادلة لتحصل على التيار عند أى لحظة وبين متى تكون الدائرة فى حالة رنين (١٠ درجات)

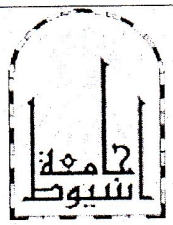
٥- اعتبر النظام الفيزيائى التذبذبى: $\ddot{\theta} + \omega^2\theta = \varepsilon\dot{\theta}$
أوجد الحل التقريبى لهذا النظام عندما يكون تردده الطبيعى معتمدا على الزمن (١٠ درجات)

٦-استنتج شرط استقرار مائع ثقيل فوق مائع خفيف تحت تأثير مجال الجاذبية الأرضية الثابت(مسألة رايلى – تايلور للاستقرار) (١٠ درجات)

انتهت الأسئلة مع تمنياتنا بالتوفيق والنجاح

(أستاذ المادة)
أ٠ د٠ محمود حامد عبيد الله

(رئيس القسم)
راجعه أ٠د٠ جمال مختار محمود

كلية العلوم قسم الرياضيات جامعة أسيوط امتحان نهائي الفصل الدراسي الثاني للعام الجامعي ٢٠١٦\٢٠١٧	المقرر:تحليل عددي (٢) المستوي الرابع(٤٢٤) التاريخ :١٩\ ٥\ ٢٠١٧ الزمن: ثلاث ساعات الدرجة :50 درجة ١٠ درجات لكل سؤال	

Answer five questions only :

1-a) Use the Modified Euler method with h=0.5 to obtain the difference equation, for the following initial-value problem, and find the actual error at t=1.0:

$$y' = te^{3t} - 2y, \qquad 0 \le t \le 1, \qquad y(0) = 0,$$

$$\left(\textbf{actual solution } \mathbf{y(t)} = \frac{1}{5}\, te^{3t} - \frac{1}{25}\, e^{3t} + \frac{1}{25} e^{-2t}\right)$$

1-b) Use Euler's method with h=0.2 to obtain the difference equation, for the initial-value problem:

$$y' = y - t^2 + 1,\ 0 \le t \le 2,\ y(0) = 0.5\,, with\ |y''| \le M = 0.5\, e^2 - 2.$$

And prove that the error bounded is given by:

$$|y_{i-} w_i| \le \frac{M}{10}\left(e^{0.2i} - 1\right), \qquad i = 0,1, \dots\dots\dots, 10.$$

2-a) Derive the three – step Adams – Bashforth method for solving the initial – value problem: $y' = f(t,y),\ a \le t \le b\,,\ y(a) = \alpha\,,$ and show that the local truncation error is $\frac{3}{8}\, y''(\mu)\, h^3.$

2-b) Find the first two iterations of the Gauss-Seidel method for the following system

$$3x_1 - x_2 + x_3 = 1, \quad 3x_1 + 3x_2 + 7x_3 = 4, \quad 3x_1 + 6x_2 + 2x_3 = 0,$$

$using\ X^{(0)} = (0,0,0)^{(t)}$

3-a) By using shooting method verify that the equation:

$$\lambda x(t) + (1-\lambda)y(t)\ \ with\ \lambda = \frac{\beta - y(b)}{x(b) - y(b)}$$

Gives the solution of the boundary value problem:

$$x'' = u(t) + v(t)x + w(t)x', \qquad x(a) = \propto, \quad x(b) = \beta$$

3-b) Use the linear shooting method to list the ways it can be solved the boundary value problem: $x'' = e^t - 3\sin t + x' - x, \quad x(1) = 1.1, \quad x(2) = 8.7$

And write the system arising from this method with component of the solution at each t.

انظر خلف الورقة.....

4) Consider the two – point boundary value problem :

$x'' = -x,\ \ x(0) = 0,\ \ x(1) = 1$

Set up and solve the tridiagonal system arising from the finite – difference method when h=0.25 . Explain any differences from the analytic solution.

$$x\left(\frac{1}{4}\right) = 0.29401, \qquad x\left(\frac{1}{2}\right) = 0.56975, \qquad x\left(\frac{3}{4}\right) = 0.81006.$$

---

5) Derive the systems arising from Forward difference method and Grank- Nicolson method at any point (x_i, t_i) *to the heat equation*:

$$\frac{\partial u(x,t)}{\partial t} = \frac{\partial^2 u(x,t)}{\partial x^2}, \qquad u(0,t) = u(1,t) = 0,\ \ u(x,0) = sin(\pi x),\ \ x_{i=ih,\ t_j=jk.}$$

---

6) Derive the scheme arising from the finite difference method to the wave equation

$$\frac{\partial^2 u(x,t)}{\partial x^2} = \frac{\partial^2 u(x,t)}{\partial t^2},\ 0 \le x \le 1,\ t \ge 0,\ u(x,0) = \sin(\pi x),\ x_i = ih, t_j = jk,$$

$$u(0,t) = u(1,t) = 0, \qquad \frac{\partial u(x,0)}{\partial t} = \frac{1}{4}\sin(2\pi x),$$

and the points (x_i, t_j) *on the interval* $[0,1]$

انتهت الاسئلة،،،،،

مع اطيب تمنياتي بالتوفيق،،،،،

د/محمد أحمد حسين

كلية العلوم	بسم الله الرحمن الرحيم	الفرقة : المستوى الرابع
قسم الرياضيات		التاريخ : 31 / 5 /2017 م

إختبار نهاية الفصل الدراسي الثانى للعام الجامعي 2016 / 2017 م

الدرجة الكلية : 50 درجة	" معادلات تفاضلية جزئية " " 414 ر "	الزمن : ثلاث ساعات

أجب عن خمسة فقط من الأسئلة التالية : (يخصص لتقدير السؤال 10 درجات . يخصص لكل جزء من السؤال 5 درجات .)

1) Find the general solution for each of the following partial differential equations :

a) $z_{yy} + y\, z_{xy} - 6\, y^2\, z_{xx} = y^{-1}\, z_y$.

b) $\dfrac{\partial^2 z}{\partial y^2} - \dfrac{\partial z}{\partial y} - \dfrac{1}{x}\left(\dfrac{1}{x} - 1\right) z = x\, y^2 - x^2\, y^2 + 2\, x^3\, y - 2\, x^3$.

2 - a) By Charpit's method find the complete integral of the nonlinear equation :

$$z^2(p^2 + q^2 + 1) = 1, \text{ where } p = \frac{\partial z}{\partial x},\ q = \frac{\partial z}{\partial y}.$$

b) Apply Jacobi's method to obtain the complete solution of the nonlinear equation :

$$x_1 + x_2 + x_3\, p_3\, (p_1 + p_2) = 0, \text{ where } p_1 = \frac{\partial z}{\partial x_1},\ p_2 = \frac{\partial z}{\partial x_2},\ p_3 = \frac{\partial z}{\partial x_3}.$$

3 - a) Use the method of Laplace to find the general solution of the linear equation :

$$x^2\, \frac{\partial^2 z}{\partial x^2} - y^2\, \frac{\partial^2 z}{\partial y^2} + x\, \frac{\partial z}{\partial x} - y\, \frac{\partial z}{\partial y} = x^2 .$$

b) By the method of Euler find the general solution of the linear equation :

$$x^2\, y^2\, \frac{\partial^2 z}{\partial x^2} + 2\, x\, y^3\, \frac{\partial^2 z}{\partial x\, \partial y} - x\, y^2\, \frac{\partial z}{\partial x} = x^3.$$

4 - a) By applying Monge's method obtain the general solution of the nonlinear equation :

$$q^2\, \frac{\partial^2 z}{\partial x^2} - 2\, p\, q\, \frac{\partial^2 z}{\partial x\, \partial y} + p^2\, \frac{\partial^2 z}{\partial y^2} = 0.$$

P.T.O. إقلب الصفحة من فضلك

b) By applying Monge's method find the general solution of the nonlinear equation :

$$3\,z_{xx} - 6\,z_{xy} + 4\,z_{yy} - \left(z_{xx}\,z_{yy} - z_{xy}^2\right) = 3\,.$$

5- a) Use the Laplace transform to give the bounded solution of the equation :

$$\frac{\partial y}{\partial x} = 2\,\frac{\partial y}{\partial t} + y\,, \quad \text{where} \quad x > 0,\ t > 0,$$

with the condition $y(x,0) = 6\,e^{-3t}$.

b -5) المطلوب إيجاد درجة الحرارة θ عند نقطة ما (x,y) داخل لوح معدنى متجانس عرضه π وحدة طول وطوله لانهائى ، إذا كانت الحالة الحرارية مستقرة وكان :

(i) $\theta(0,y,t) = 0$ (ii) $\theta(\pi,y,t) = 0$

(iii) $\lim_{y\to\infty} \theta(x,y,t) = 0$ (iv) $\theta(x,0,t) = 1\,.$

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6) قضيب متجانس طوله L سطحه الجانبى معزول . كان عند بدء قياس الزمن عند درجة حرارة 20° . لو تغيرت درجة حرارة أحد الطرفين بعد اللحظة الإبتدائية و حفظت عند القيمة 10° وتغيرت درجة حرارة الطرف الآخر فى نفس الوقت وحفظت عند القيمة 100° . أوجد درجة الحرارة θ كدالة للزمن t والموضع x مقاسا من الطرف الأول للقضيب .

مع أخلص التمنيات بالتوفيق ،،، أ.د. أحمد محمد أبو العلا ، د. رشا عثمان طايع

Faculty of Science
Mathematics Department
Term Exam
Selected topics in Computer Science (2)
Time: 2 hour
Code: MC 455
May 2017

كلية العلوم- قسم الرياضيات

امتحان الفصل الدراسي الثاني
المستوي: الرابع
المقرر: موضوعات مختارة في علوم الحاسب (2)
الرمز: 455 رك
الزمن: ساعتان
مايو 2017

Answer the following questions: (50 Marks)

I. Choose the correct answer and write it in the answer table: (20 Marks)

1. Every letter in a Java keyword is in lowercase?
(a) true (b) false

2. Which of the following is a valid identifier?
(a) 8+9 (b) class (c) 9X (d) radius

3. Which of the following is a correct way to declare variables?
(a) int length; int width; (b) int length, width; (c) int length; width; (d) int length, int width;

4. Which of the following assignment statements is incorrect?
(a) i = j = k = 1; (b) i = 1; j = 1; k = 1; (c) i = 1 = j = 1 = k = 1; (d) i == j == k == 1;

5. A block is enclosed inside .....
(a) parentheses (b) braces (c) brackets (d) quotes

6. If a program compiles fine, but it produces incorrect result, then the program suffers a ..... error
(a) syntax (b) runtime (c) logic (d) style

7. Math.pow (4, 1 / 2) returns .....
(a) 0 (b) 1 (c) 2.0 (d)1.0

8. ..... is the Java assignment operator.
(a) = = (b) := (c) = (d) +=

9. Let A=1. What are B and A after evaluating the expression int B = A++;
(a) 1. 2 (b) 2,2 (c) 2,1 (d) 1,1

10. What is the value of (double)(5/2)?
(a) 2 (b) 2.5 (c) 3 (d) 2.0

11. Which of the following is a possible output from invoking Math.random()?
(a) 3.43 (b) 0.5 (c) 1 (d) 1.0

12. Assume x = 4 and y = 5, which of the following is true?
(a) x < 5 && y < 5 (b) x < 5 || y < 5 (c) x > 5 && y > 5 (d) x > 5 || y > 5

13. If x=10 and y=10. What is the value of x after evaluating the expression (y > 10) && (x++ > 10)?
(a) 9 (b) 10 (c) 11 (d) 12

14. To improve readability and maintainability, you should declare ..... instead of using literal (e.g. 3.14159)
(a) classes (b) constants (c) methods (d) variables

15. Which of these data types requires the amount of memory?
(a) int (b) long (c) short (d) byte

16. What is the value of x after executing the following statements? int x = 2; int y = 1; x *= y + 1;
(a) x is 1. (b) x is 3. (c) x is 2. (d) x is 4.

11. Which of the following is a possible output from invoking (int)(Math.random() *10)?
(a) 3.43 (b) 8.0 (c) 7 (d) 10.0

18. 25 % 1 is.....
(a) 1 (b) 25 (c) 2 (d) 0

19. What are x, y and z after executing double x = 1.0; double y = 5.0; double z = x-- + (++y);
(a) 1.0, 6.0, 7.0 (b) 0.0, 6.0, 7.0 (c) 1.0, 5.0, 6.0 (d) 1.0, 5.0, 6.0

20. What is the value of (double) 5/2?
(a) 2 (b) 2.5 (c) 3 (d) 2.0

Answer Table

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Answer																				

II. Write the output of the following blocks of code: (10 Marks)

No	Code	Output

1.	for (int i = 1; i <= 10; i++) {
	System.out.print(i*i + " ");
	i++;
	}	

2.	double[] myList = {1, 5, 1, 5, 5, 1};
	double min = myList[0];
	int indexOfMin = 0;
	for (int i = 1; i < myList.length; i++) {
	if (myList[i] < m) {
	min = myList[i];
	indexOfMin = i;
	}
	}
	System.out.println(indexOfMin);	

3.	public class Test {
	public static void main(String[] args) {
	int i = 1;
	do {
	int num = 1;
	for (int j = 1; j <= i; j++) {
	System.out.print(num + "K");
	num += 2;
	}
	System.out.println();
	i++;
	} while (i <= 5);
	}
	}	

4.	public class Test {
	public static void main(String[] args) {
	int list[] = {1, 2, 3, 4, 5, 6};
	for (int i = 1; i < list.length; i++)
	list[i] = list[i - 1];
	for (int i = 0; i < list.length; i++)
	System.out.print(list[i] + " ");
	}
	}	

5	int i = 1;
	while (i < 10)
	if ((i++) % 2 == 0)
	System.out.println(i);	

6.	for (int i = 1; i < 4; i++) {
	for (int j = 1; j < 4; j++) {
	if (i * j > 2)
	break;
	System.out.println(i * j);
	}
	System.out.println(i);
	}	

7.	System.out.println("1" + 1 + 1);	

8.	int sum = 0;
	sum += 4.5;
	int y = (int)sum;
	sum = (int)(sum + 4.5);
	System.out.println("x is " + sum + " and y is " + y);	

9.	int number=20;
	if (number % 2 == 0)
	System.out.println(number + " is even");
	if (number % 5 == 0)
	System.out.println (number + " is multiple of 5");	

10.	int x, y;
	x = 1;
	y = 2;
	System.out.println("The output is " + x + y);
	System.out.println("The output is " + (x + y));	

III. Underline the error in each block of code below and correct it: **(10 Marks)**

No	Code	Correction
1.	int even; if (even == true) System.out.println("It is even.");	

2.	public class ShowErrors {
	public static void main(String[] args) {
	int i;
	int j = 5;
	if (j > 3) System.out.println(i + 4);
	}
	}	

3.	public class Test {
	public static void main(String[] args) {
	double[100] r;
	for (int i = 0; i < r.length(); i++);
	r(i) = Math.random * 100;
	}
	}	

4.	int i = 0;
	while (i < 10);
	{
	System.out.println("i is " + i);
	i++;
	}	

5.	if (radius >= 0)
	area = radius * radius * PI;
	System.out.println("The area "+ " is " + area);	

IV. Write Java programs for the following: **(10 Marks)**

1. Write the methods with the following headers

// Return the reversal of an integer, i.e., reverse(456) returns 654

```
public static int reverse(int number)
```

// Return true if number is a palindrome

```
public static boolean isPalindrome(int number)
```

Use the `reverse` method to implement `isPalindrome`. A number is a palindrome if its reversal is the same as itself. Write a test program that prompts the user to enter an integer and reports whether the integer is a palindrome.

2. Write a program that reads ten numbers and displays distinct numbers (i.e., if a number appears multiple times, it is displayed only once). (Hint: Read a number and store it to an array if it is new. If the number is already in the array, ignore it.) After the input, the array contains the distinct numbers.

=== With Our Best Wishes ===

Examiners Committee

Faculty of Science
Mathematics Department
Term Exam
Theory of Computation
Code: MC٤٥٧
Time: 2 hour
May 2017

كلية العلوم- قسم الرياضيات

امتحان الفصل الدراسي الثاني
المستوي: الرابع
المقرر:نظرية الحسابات
الرمز: ٤٥٧ رك
الزمن: ساعتان
مايو 2017

Answer the following questions: **(50 Marks)**

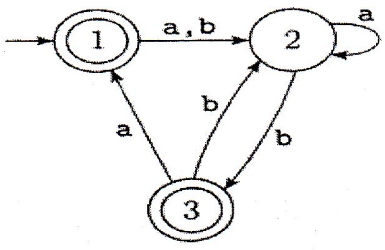
1. Give NFAs with the specified number of states recognizing each of the following languages. In all cases, the alphabet is $\Sigma = \{0,1\}$. **(10 Marks)**

a) The language $\{\omega \in \sum^* | \omega$ ends with 00 $\}$ with three states.
b) The language $\{\omega \in \sum^* | \omega$ contains the substring 0101, i. e., $\omega = x0101y$ for some $x, y \in \sum^* \}$ with five states.
c) The language $\{\omega \in \sum^* | \omega$ contains at least 0s, or exactly two 1s for some , $y \in \sum^* \}$ with six states.

2. Give regular expressions that generate each of the following languages. In all cases, the alphabet is $\Sigma = \{a, b\}$. **(10 Marks)**

a) The language $\{\omega \in \sum^* | \, |\omega|$ is odd $\}$.
b) The language $\{\omega \in \sum^* | \, \omega$ has an odd of a's $\}$.
c) The language $\{\omega | \, \omega$ contains at least two a's, or exactly two b's $\}$.
d) The language $\{\omega \in \sum^* | \, \omega$ ends in a double letter$\}$ (A string contains a double letter if it contains aa or bb as a substring.)
e) The language $\{\Lambda, a, b, ab, abb, abbb, \ldots\ldots, ab^n, \ldots\ldots\}$

3.a Give a regular expression for the language recognized by the following DFA: **(10 Marks)**



3.b Consider the following grammar G:

$$S \rightarrow SAB|\lambda$$
$$A \rightarrow aA|a$$
$$B \rightarrow bB|\lambda$$

(a) Give a leftmost derivation of $abbaab$.
(b) Build the derivation tree for the derivation in part (1).
(c) What is $L(G)$ i.e. (Give a regular expression for $L(G)$)?

٤. Prove that: **(10 Marks)**

a) $(S+T)\,R = SR + TR$. Where, $R, S,$ and T are regular expressions.
b) $L(\phi + a + b)^* = L(a^*(ba^*)^*)$
c) $a^*(b + ab^*) = b + aa^*b^*$
d) $L(a + bc^*) = \{a, b, bc, bc^2, \ldots\ldots, bc^n, \ldots\ldots\}$

5. Let $L = \{\lambda, abb, b\}$ and $M = \{bba, ab, a\}$. Evaluate each of the following language expressions. **(10 Marks)**

a) $L.M$
b) $L^*.M^*$
c) $(L^*.M^*)^*$
d) $(L \cup M)^* = (L^* \cup M^*)^*$
e) $L.(M.L)^* = (L.M)^*.L$

=== With My Best Wishes ===
Dr.Alaa F. Mohamed

Mathematics Department
Term Exam
Theory of Compilers
Code: 458 MC
Time: 2 hours
May 2017

كلية العلوم- قسم الرياضيات

امتحان الفصل الدراسي الثاني
المستوي: الرابع
المقرر: نظرية المترجمات
الرمز: 458 رك
الزمن: ساعتان
مايو ٢٠١٧

Answer the following questions: (50 Marks)

1. Write True OR correct the underline text ONLY if it is not correct in the brackets in each of the following: (10 marks)

[ ] 1. Sometimes we will discard a lexeme rather than storing it for later use.
[ ] 2. In LR(1) parsing algorithm, If action [state, t] is reduce A $\rightarrow\omega$ then shift the input and set state = goto [state, t].
[ ] 3. Any LL(1) grammar is LR (1).
[ ] 4. Two LR(1) items have the same reduction if they are identical except for lookahead.
[ ] 5. Leftmost BFS works on grammars without left recursion.
[ ] 6. All LR (1) grammars are LALR (1).
[ ] 7. Some tokens might be associated with lots of different lexemes.
[ ] 8. SLR (1) is weak because it has no contextual information.
[ ] 9. A shift/reduce conflict is an error where a shift/reduce parser cannot tell which of many reductions to perform.
[ ] 10. LR (0) only accepts languages where the handle can be found with no left context.

2. Write the scientific term: (20 marks)

Definition	Scientific term
1. An enumerated type representing what logical entity we read out of the source code.	
2. A strict superset of the regular languages.	
3. Beginning with the start symbol, try to guess the productions to apply to end up at the user's program.	
4. Move a terminal across the split.	
5. Match the longest possible prefix of the remaining text.	
6. Identify the meaning of the overall structure.	
7. A set Σ of symbols that act as letters.	
8. Guess which production should be inverted.	
9. A state where we know we have found the handle, but can't tell which reduction to apply.	
10. Design one possible structure.	
11. A family of descriptions that can be used to capture certain languages	
12. A formalism for defining languages.	
13. Pick the rule that was defined first.	
14. Marks the end of a line.	
15. An abstract representation of a program's syntax.	
16. The leftmost complete cluster of leaf nodes.	
17. The theorem that correctly computes LALR(1) lookaheads.	
18. Rule that matches any character and reports an error.	
19. Extra information derived from the text, it can be a numeric value.	
20. Recover the structure described by a series of tokens.	

3. (a) Consider the following grammar: (5 marks)

S → A

A → A + A | B + +

B → y

Write the derivation and draw a parse tree for the input y + + + y + +

(b) Give the reasons for the following: (5 Marks)

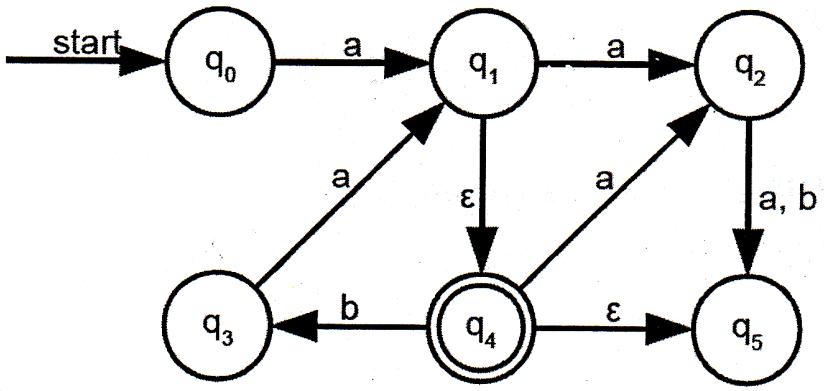
1. Merging LR(1) states cannot introduce a shift/reduce conflict.

2. LR (1) is impractical.

3. LR (0) is Weak.

4. We can't know which productions to apply in Top-Down Parsing.

4. (a) **Convert the following NFA to DFA :** **(5 Marks)**



(b) **Given the following grammer**: **(5 Marks)**

E → F
E → E + F
F → F * T
F → T
T → int
T → (E)
Use the **LL(1)** algorithm to derive **int+ int*int + int**

=== With My Best Wishes ===
Dr. Dalia Nashat