2015/2016

Final Exam for Level 3

Subject: Mathematical and Statistical Packages, MC300

Time: 2 Hours

Mathematics Dept.

Faculty of Science

Assiut University

Answer the Following Questions(50 marks)

(10 marks)

1. **For the matrix X write the output of the following MATLAB commands:**

$$X = \begin{pmatrix} 5.2 & 0.2 & 3.8 \\ 2.3 & 4.9 & 9.1 \\ 1.5 & 4 & 7 \end{pmatrix}$$

   a) Floor(X)

   b) Mod(X,2)

   c) A=X-ones(3,3)

   d) C=X(1:2,3)*2

   e) V=sum(X(:,1)

2. **(20 marks)**

a) write M-file to calculate the area of circle which have R= 9

b) write the MATLAB function to compute the roots of quadratic equation $ax^2 + bx + c = 0$

3. write the MATLAB commands used to: **(10 marks)**

a) compute $\int_0^\infty \frac{e^x}{x} dx$

b) compute $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n$

c) Generate random matrix A(5,5) from 3 to 10

d) Compute the summation of each row in A

4. **(10 marks)**

a) Write the SPSS steps used to compute the linear equation coefficients between S and R

S	5	7	9	10	12	15	17	19
R	1.2	5.7	7	8	11	13	16	20

b) Write the MATLAB commands used to compute the linear equation coefficients between S and R

c) **Write the SPSS steps used to compute the mean and sander deviation R**

d) **Write the MATLAB commands used to compute the mean and sander deviation R**

Good luck

Final Exam for Level 4

Subject: Mathematical and Statistical Packages, MC300

Time: 2 Hours

Mathematics Dept.
Faculty of Science
Assiut University

2015/2016
2ndt Term 2015/2016
Date: Jun, 2, 2016

Answer the Following Questions: (50 marks)

Q1. I. Choose the correct answer **(15 marks)**

1. median([1 3 6 9])=...............
   a)4 b) 4.5 c)3.5 d) 5

2. sin(sqrt(x^2-1))=.........................
   a) $\sin(x - 1)$ b) $sin\sqrt[2]{x^2 - 1}$ c) $sin(x^2 - 1)$ d) $\sqrt{x^2 - 1}$

3. What is the value of b, where $x = \begin{pmatrix} 1 & 3 & 4 \\ 5 & 3 & 7 \\ 1 & 3 & 6 \end{pmatrix}$; b=x(:,2:3)

   a) $b = \begin{pmatrix} 1 & 3 \\ 5 & 3 \\ 1 & 3 \end{pmatrix}$ b) $b = \begin{pmatrix} 5 & 3 & 7 \\ 1 & 3 & 6 \end{pmatrix}$ c) $b = \begin{pmatrix} 3 & 4 \\ 3 & 7 \\ 3 & 6 \end{pmatrix}$ d) $b = \begin{pmatrix} 3 & 7 \\ 3 & 6 \end{pmatrix}$

4. What is the value of c where x=[-1 2 0 4]; c=find(x)
   a) c=[1 2 4] b) c=[1 3] c) c=[1 1 0 1] d) c=[-1 2 4]

3. The command used to convert the image to binary image is ....
   a) im2bw b) rgb2ind c) bw2gray d) im2int

4. The command will give the standard deviation for each column in a 6-by-3 matrix Z is..............
   a) std(Z(:)) b) std(std(Z)) c) std(Z(6, 3)) d) std(Z)

5. The image written by color map and an array is...........image
   a) RGB b) Binary c) Intensity d) Indexed

6. To show the graphical representation of the distribution of numerical data, we can use ....
   a) syms b) hist c)dist d)median

7. abs(x) =.............
   a) e^x b) $\frac{1}{x}$ c) x^2 d) |x|

8. floor (2.6) =...............
   a)3 b) 2.6 c)2.5 d) 2

11. The Matlab command that used to repeat a set of commands an unknown number of times is.............

a)for **b)while** **c)if** **d)diff**

12. To solve Differential Equation, we using...........

a)polyfit **b)plot** **c)solve** **d)dsolve**

13. To find the root of the equation, we will use matlab command ....

a) solve **b) dsolve** **c)diff** **d) find**

14. mod(23,7)=...............

a)3 **b) 2** **c)3.2** **d) 15**

15. If function [a,b,c] = md(x,y) , the number of output is ....

a)2 **b)5** **c)No output** **d)3**

Q2. **Write the MATLAB commands used to compute:** **(15 marks)**

1. $\lim_{x \to 2} \frac{x^2-16}{x-4}$

2. Evaluate the given string **S**.

3. Differentiation $x \sin(x^2)$

4. $F(a)=\int_{-a}^{a} \sin(ax) \sin\left(\frac{x}{a}\right) dx$

5. Convert the number Z to be string.

6. Plot the relation between x and y values by red circular points .

7. Convert RGB image X to intensity image Y, then show X, Y in the same figure.

9. Calculate the linear curve fitting between the following data

X	2	3	5	6	9	12	16	20
Y	0.18	0.48	0.44	0.64	0.70	0.75	0.27	0.67

Q3.	Q3.1 Write MATLAB code to compute and print S **(using for function)**	**(10 marks)**

$$S = \frac{1}{2} + \frac{2}{4} + \frac{3}{6} + \frac{4}{8} + \frac{5}{10}$$

Q3.2 Correct the errors in the following MATLAB codes

x= 1;
a=2;
b=3;
if x<20;
r= a.b;
a=a+1;
end
	function f[s]
	s=0;
	fac=1;
	for i = 1;100
	s=s+i;
	fac=fac*b;
	end
		a = [1 3 ; 2 5]
		b = [1 ; 8]
		c = [a b]

Q4.	Q4.1 Write the <u>output</u> of the following M-file	(10 ma

a)	b)	c)

% main file
A = [1 3 5];
[q] = fnc(A)
disp(q)
% end of main file
 	
% function file
function [r1] = fnc(p1)
n = length(p1);
r1 = sum(p1)/n;
	x = 1;
	y = 2;
	while y < 4;
	z(x) = 2 * y;
	x = x + 1;
	y = y + 2;
	end
	disp(z)
		JJ=0;
		for I=1:2:5
		JJ=JJ+1;
		End
		disp(JJ)

Q4.2 Write MATLAB function takes vector X contain 20 element between[0,100], and then counts and print the values that are greater than 50 in X

Assiut University
Faculty of Science
Dept. of Mathematics

Date 31 May , 2016
Time allowad 3 hours

Second Semester Final Examination

Subject : Course No. 312 M Name of Course : Real Analysis 1
Students : Second Year Math.

Answer five question from the following:

First Question (10 Degree)

(a)(2 points).Given two real numbers x and y, x< y .Show that there is an irrational u such that x<u<y.

(b)(4 points) .Find , if they exists , the supremum and infimum of each of the following subset S of R. Also decide which of these sets have maximum and minimum:

$$(i)\ S=\left\{\frac{p}{q}\in Q, p^2<2q^2, p,q>0\right\} \qquad (ii)\ S=\{\, x : |2x+1|\le 5\,\}$$

$$(iii)\ S=\{\, x : x^2-3x-5=0\,\} \qquad (iv)\ S=\left\{\frac{n+2}{n}, n\in R\right\}$$

(c) (4 points).Suppose A and B are nonempty subsets of R . We define

$$A-B=\{z : z=x-y : \ for\ some\ x\in A\ and\ y\in B\}.$$

Prove that : (i) sup (A-B) = sup A - inf B (ii) inf (A-B) = inf (A) – inf (B).

Second Question (10)Degree)

(a) (2 points) .State and prove Archimdean property of R.

(b) (4 points) .Show that the supremum (infimum) of any nonempty set S is either a member of S or a limit point of S.

(c) (4 points).Using $(\varepsilon - N)$ prove that $\lim_{n\to\infty}\sqrt[n]{n}=1$.

Third Question (10) Degree)

(a) (3 points) . Show that the sequence (a_n) defined $a_1=1$ and $a_{n+1}=\sqrt{1+a_n}$ for $n\ge 1$ converges and find the limit.

(b)(4 points).Show that every Cauchy sequence is bounded.

(c)(3 points). Find the $\overline{\lim}\, a_n$ and $\underline{\lim}\, a_n$ for a sequence (a_n) ,where

$$(i)\ a_n=\sin\frac{n\pi}{2} \qquad (ii)\ a_n=(1+\frac{1}{n})\cos n\pi \qquad (iii)\ a_n=\frac{n-3n^2}{2n^2+1}$$

Fourth Question (10) Degree)

(a)(3 points).Discuss the convergence of the following series:

$$(i)\ \sum_{n=1}^{\infty}\frac{1}{n(n+1)(n+2)} \qquad (ii)\ \sum_{n=1}^{\infty}\frac{n^{n^2}}{(n+1)^{n^2}} \qquad (iii)\sum_{n=1}^{\infty}(-1)^{n+1}\frac{1}{n^p}\ ,\ p>0.$$

(b) (3 points).Show that the function f defined by:

$$f(x)=\begin{cases}1 & , x\ \ is\ rational\\ 0 & , x\ \ is\ irrational\end{cases}$$

is not Riemann integrable on [0,1].

(c) (4 points).State the intermediate value theorem and use this theorem to show that there is a solution of the equation: $x^5+3x+\sin x=\cos x+10$ in (0,2).

P.T.O

Fifth Question (10) Degree)

(a)(4 points). Define $f : R \to R$ by $f(x) = x^2$.

Show that f is continuous but not uniformly continuous on R .

(b) (3 points).Show that if $f \in R[a,b]$ then $|f| \in R[a,b]$ on $[a,b]$ and $\left|\int_a^b f\,dx\right| \le \int_a^b |f|\,dx$,

And give an example to show that $f \notin R[a,b]$ but $|f| \in R[a,b]$.

(c) (3 points). Give an example for discontinuous functions f , g but f+9 is continuous.

Six Question (10) Degree)

(a) (4 points). Suppose f is defined in the neighborhood of a point x and $f''(x)$ exists.

Show that : $\lim_{h\to 0} \dfrac{f(x+h)+f(x-h)-2f(x)}{h^2} = f''(x)$

(b) (4 points) Let f be defined on [a,b] ,if f has a local maximum at a point $x \in [a,b]$ and if $f'(x)$ exist then $f'(x)=0$.

(c) (2 points) .Suppose (a_n) is a Cauchy sequence. Prove that (a_n^2) is a Cauchy sequence.but the converse is not true.

Prof.R.A.Rashwan

The End

Assiut University Faculty of Science Department of Mathematics	
Final Exam in Artificial Intelligence (third-level) 2016	
Time: 2 hours	Total Mark:50

Answer each of the following questions:

Question 1: [20 Marks]

a) Write the main steps of the Single Layer Perceptron learning algorithm.

b) Consider the following classification problem

X1	X2	Y
0.5	1.5	1
− 0.5	0.5	− 1
0.5	0.5	1

where Y is the target value and $w_1 = 1$, $w_2 = 2$, and $\Theta = -2$.

Illustrate the operations of Single Layer Perceptron learning rule on this classification problem.

Question 2: [20 Marks]

a) Define the four evaluation criteria for searching strategy (e.g., space and time complexity, optimality, and completeness)?

b) What are the main differences between Breadth-first, depth-first, and Iterative Deepening searching algorithms in terms of time, space, optimality, and completeness?

Question 3: [10 Marks]

a) Demonstrate the mathematical formula of the non-linear regression model based on Radial Basis Functions.

b) Illustrate how to deal with the overfitting problem within the RBF regression model.

Good Luck — Dr. Mohammed M. Abdelsamea

جامعة اسيوط	امتحان نهاية العام الدراسي 2016-2015	لطلاب كلية العلوم- المستوى الثالث
كلية العلوم	المادة:موضوعات مختارة في الرياضيات(1)	كود المقرر: 315ر
قسم الرياضيات	التاريخ 2016-6-5 الزمن:ثلاث ساعات	الدرجة الكلية : 50 درجة

اولا اجب عن السؤال الاتي: [8 درجات]

1- اثبت قاعدة التضعيف لدالة جاما : $\Gamma(2x) = \frac{2^{2x-1}}{\sqrt{\pi}}\,\Gamma(x)\Gamma(x+1)$

ثانيا:اجب عن ثلاثة اسئلة فقط مما ياتي : [14 درجة لكل سؤال (7 درجات لكل فقرة)]

2- (i) لدوال تشيبتشيف $T_n(x)$ احسب قيم التكامل: (لقيم $n \neq m$ ولقيم $n = m$) $\int_{-1}^{1} \frac{T_n(x)T_m(x)}{\sqrt{1-x^2}}\,dx$

(ii) اثبت صيغة رودريج لكثيرات حدود لجندر : $P_n(x) = \frac{1}{2^n n!}\frac{d^n}{dx^n}(x^2-1)^n$

3- (i) اثبت ان : $(a-b)\ {}_2F_1(a,b;c;x) = a\ {}_2F_1(a+1,b;c;x) - b\ {}_2F_1(a,b+1;c;x)$

(ii)اثبت ان $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\cos x$ واكتب(بدون برهان) قيمة $J_{\frac{1}{2}}(x)$ ومن ثم اوجد $J_{-\frac{3}{2}}(x), J_{-\frac{5}{2}}(x)$

4- (i)استخدم الدلة المولدة لكثيرات حدود لجندر في اثبات ان :

$(n+1)P_{n+1}(x) - (2n+1)P_n(x) + nP_{n-1}(x) = 0$ ومن ثم احسب التكامل $\int_{-1}^{1} xP_n(x)P_{n+1}(x)\,dx$

(ii)لقيم n,m اعداد طبيعية احسب قيمة التكامل $\int_0^1 x^m(\log x)^n\,dx$

5- (i)اثبت ان:

(a) $J_{-n}(x) = (-1)^n J_n(x)$, n عدد صحيح

(b) $J_3(x) + 3J_0'(x) + 4J_0'''(x) = 0$

(ii)اثبت ان : ${}_2F_1(a,b;c;1) = \frac{\Gamma(c)\Gamma(c-a-b)}{\Gamma(c-a)\Gamma(c-b)}$ حيث $c \neq 0,-1,-2,\dots$ and $c-a-b > 0$

انتهت الاسئلة مع اطيب الامنيات لجنة الممتحنين د .مجدي كامل الجندي د.محمد عبد الله عبد الرازق حسن

Assiut University	Computer Networks
Faculty of Science	Third Level (MC354)
Mathematics Department	Time: 2 hours
Term Exam	May 2016

Answer the following questions: (50 Marks)

Question 1: Answer the following points (10 Marks)

1- Explain the internet "nuts and bolts"?

2- Explain the sources of packet delay?

Question 2: Answer the following points (10 Marks)

1- Define and explain traffic intensity?

2- Explain the Internet protocol stack?

Question 3: Answer the following points (10 Marks)

1- Explain the application client-server architecture?

2- Compare between persistent HTTP and non-persistent HTTP?

Question 4: Answer the following points (10 Marks)

1- Explain the term (web caches) and how it is useful?

2- Compare between multiplexing and demultiplexing? Support your answer with a diagram?

Question 5: Answer the following points (10 Marks)

1-Define and explain the use of ACKs and NAKs?

2- Define and explain HOL? Support your answer with a diagram?

Dr. Tarik M. A. Ibrahim

جامعة اسيوط	امتحان نهاية العام الدراسي 2015-2016	لطلاب كلية العلوم- المستوى الثالث
كلية العلوم	المادة: معادلات تفاضلية جزئية ودوال خاصة	كود المقرر: 318 ر
قسم الرياضيات	التاريخ 2016-6-8 الزمن:ثلاث ساعات	الدرجة الكلية : 50 درجة

اولا اجب عن السؤال الاتي: [8 درجات]

1- اوجد الحل العام للمعادلة $x(y^2+z)p - y(x^2+z)q = (x^2-y^2)z$

ثم اوجد الحل الخاص الذي يمر خلال المستقيم $z=1\ ,\ x+y=0$

ثانيا:اجب عن ثلاثة اسئلة فقط مما ياتي : [14 درجة لكل سؤال (7 درجات لكل فقرة)]

2- (i) احذف الثابتين الاختياريين c, d من العلاقة (a) و الدالة الاختيارية f من العلاقة (b) :

$$(a)\quad 4z = (cx + \frac{y}{c} + d)^2 \qquad , \qquad (b)\quad z = y^2 + 2f(\frac{1}{x} + logy)$$

(ii) لقيم $a , n , m > 0$ و لقيم $0 < \alpha < 1\ ,\ 0 < \beta < 1$ احسب التكاملات :

$$(a)\int_0^\infty \frac{x^{\alpha-1} - x^{\beta-1}}{1+x}\,dx \qquad (b)\int_0^\infty x^m\, e^{-a x^n}\, dx$$

3- (i) اوجد الحل العام للمعادلة $(D_1^2 + (a+b)D_1D_2 + abD_2^2)z = 24xy$

(ii)اثبت أن كثيرات حدود لجندر $P_n(x)$ تحقق : $\int_{-1}^{1} P_n(x)P_m(x)dx = \frac{2}{2n+1}\,\delta_{nm}$

4- (i) اوجد الحل العام للمعادلة $(D_1^3 - 3D_1D_2^2 - 2D_2^3)z = \cos(x+2y)$

(ii)اثبت ان دوال بسل تحقق $2J_n^{/}(x) = J_{n-1}(x) - J_{n+1}(x) \quad , \quad J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\sin(x)$

5- (i) اوجد الحل العام للمعادلة $(3D_1^2 - 2D_2^2 + D_2 - 1)z = 9e^{x+y}\sin(x+y)$

(ii)اثبت ان الدالة فوق الهندسية تحقق :

$${}_2F_1\left(\frac{1}{2},\frac{1}{2};\frac{3}{2};x^2\right) = \frac{\sin^{-1}x}{x} \quad , \quad \frac{d}{dx}\ {}_2F_1(a,b;\ c;x) = \frac{ab}{c}\ {}_2F_1(a+1, b+1; c+1; x)$$

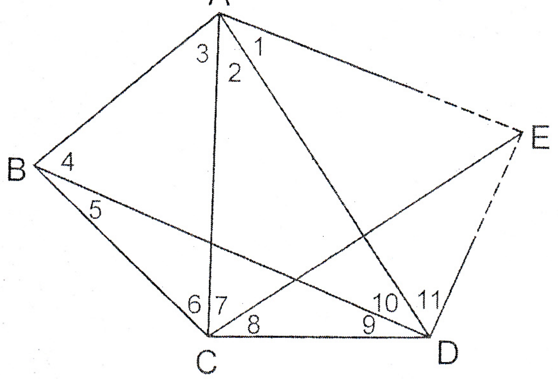
انتهت الاسئلة مع اطيب الامنيات بالنجاح   لجنة الممتحنين د. مجدي كامل الجندي   د.محمد عبد الله عبد الرازق حسن

اجب عن جميع الأسئلة الآتية:

السؤال الأول: (٥٠% من الدرجة الكلية)

أ- *اذكر باختصار الاختلافات الأساسية بين المساحة الجيوديسية والمساحة المستوية.* (٥% من الدرجة).

ب- نقطتان أ ، ب المسافة بينهم ٦٣,١ كم وارتفاع القمة (أ) هو ٩٤,٥ متر ، وارتفاع القمة (ب) هو ٦٥,٣ مترا . فإذا وجدت قمة اخرى (جـ) ارتفاعها ٢٧,٥٦ متر على نفس الخط بين (أ ، ب) وعلى مسافة ٤٩,٢ كم من القمة (أ). **ابحث وجود تبادل رؤية بين (أ ، ب) ، وفى حالة عدم وجود تبادل رؤية ابحث عن حل مناسب يسمح بتبادل الرؤية بين النقطتين.** (٢٥% من الدرجة).

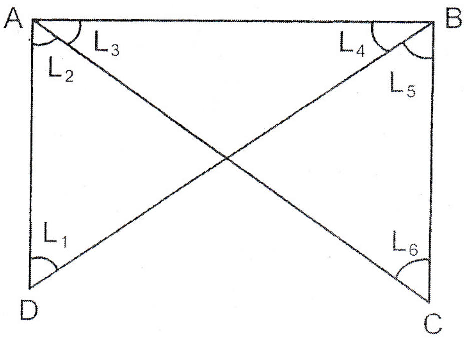


ج- الشكل التالى يوضح جزء من شبكة مثلثات مرصودة الزوايا. **المطلوب حساب عدد ونوع الاشتراطات الموجودة بالشبكة مرة حسابيا ومرة بيانيا.** (٢٠% من الدرجة).

السؤال الثاني: (٥٠% من الدرجة الكلية)

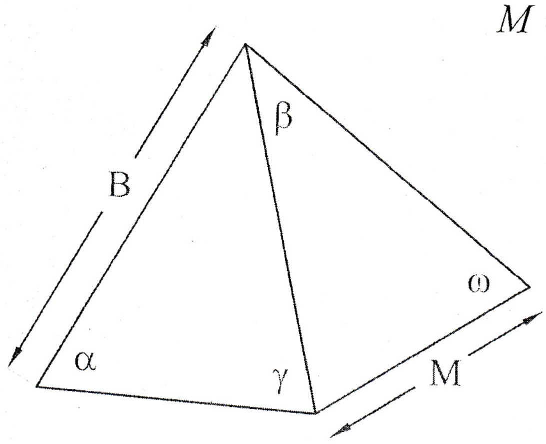
أ- الشكل التالى عبارة عن جزء من شبكة مثلثات مرصودة الزوايا، تم قياس قيم الزوايا المعطاه فى الجدول المرفق. **المطلوب هو تصحيح قيم الزوايا باستخدام الطريقة البسيطة لضبط الارصاد مع الاخذ فى الاعتبار مقدار الوزن لكل زاوية.** (٢٥% من الدرجة).

Angle	Observed Value	Weight
L_1	44" 50` 42"	2
L_2	46" 10` 29"	5
L_3	45" 55` 15"	1
L_4	43" 04` 03"	3
L_5	48" 32` 49"	4
L_6	42" 27` 38"	2



ب- الشكل التالى جزء من شبكة مثلثات. تم قياس طول الخط (B) وكذلك الزوايا الموضحة بالشكل والمعطاه بالجدول. **المطلوب حساب طول الضلع (M) والخطأ المسموح به فى طول الخط (σ_m).**(٢٥% من الدرجة).

$$M = \frac{B \times (\sin\alpha \sin\beta)}{(\sin\gamma \sin\omega)}$$



Obs.	Observed Value	σ
B	6288.56 m	0.00 m
α	52" 12` 44"	10"
β	50" 23` 33"	05"
γ	72" 51` 12"	03"
ω	80" 04` 18"	0.0"

******* انتهت الاسئلة ******************** مع أطيب التمنيات بالتوفيق...... ******

أ.د . عبد العال محمد عبد الواحد

بسم الله الرحمن الرحيم

قسم الرياضيات-كلية العلوم

Department of Mathematics
Faculty of Science

الفصل الدراسى الثانى ٢٠١٥/٢٠١٦م

المستوى الثالث شعبة الرياضيات

المقرر : عمليات عشوائيةوتطبيقاتها رقم المقرر ورمزه : ٣٤٦ر أ **الزمن : ثلاث ساعات**

أجب عن خمسة أسئلة فقط مما يأتي :- درجة جزء كل سؤال (خمس درجات)

١-(أ) عرف دالة توليد الإحتمال للمتغيرات العشوائية المنفصلة ثم اوجد $E[k(X)]$ حيث $k(X)=t^X$ هى دالة التحويل للمتغير العشوائى X بالقيم $0,1,2,....$ واثبت صحة العلاقة: $E(1)=1$.

(ب)- فى عملية برنولي العشوائية $\{X_n;n>0\}$ أوجد العزم الإرتباطي بين X ، Y موضحا العلاقة بينهما وذلك، بفرض أن: $X=X_1+X_2$ ، $Y=X_1+X_3$.

٢-(أ) فى السؤال (١-ب) أوجد دالة التوزيع الإحتمالية المناظره للمتغير العشوائى الثنائى (X,Y) ثم احسب الإحتمال: $P(X\le 3,Y\le 2)$:

(ب)- فى عملية برنولي العشوائية $\{X_n;n\ge 1\}$ إذا كان $Y_n=\sum_{i=1}^{n}X_i$ أوجد مع البرهان $V(Y_n^2)$ ثم احسب كل من :

$P(Y_1=0,Y_5=4,Y_9=6)$ ، $E(5Y_7+Y_5|Y_3)$ علما بأن $p=0.5$.

٣-(أ) عرف أزمنة النجاح T_k كعملية عشوائية فى بعد واحد ثم إثبت أن : $E(T_{n+m}|T_n)=T_n+m/p$ واوجد التوقع الرياضى والتباين للمتغير T_k

(ب)- في عملية بواسون العشوائية أو عملية الوصول المعدودة $\{N_t;t\ge 0\}$ بالمعدل λ استنتج الإحتمال $p_n(t)$ لجميع قيم $n\ge 1$ علما بأن $p_0(t)=e^{-\lambda t}$.

٤-(أ) عرف العمليات العشوائية بالزيادات المستقلة وعمليات ماركوف العشوائية .

(ب)- إذا كانت العملية العشوائية $\{X(t);t\ge 0\}$ بزيادات مستقلة إثبت أن : $\text{cov}(X(s),X(t))=V(X(\min(s,t))$

بفرض أن $X(0)=0$ ، $s\ge 0,t\ge 0$.

٥-(أ) في عملية بواسون العشوائية $\{N_t;t\ge 0\}$ إثبت أن : $\lim_{t\to\infty}\frac{N_t}{t}\to\frac{1}{\mu}$ حيث μ هو التوقع الرياضى للأزمنة بين الوصول .

(ب)- عرف عملية التجديد أو عملية رينوال العشوائية $\{R_n;n\in N\}$ موضحا ذلك بمثال وإذا كانت $F_n(t)$ هى دالة توزيع المتغير R_n ، N_t هوعدد الوصول فى عملية بواسون العشوائية إثبت أن $P(N_t=n)=F_n(t)-F_{n+1}(t)$.

٦-(أ) فى عملية التجديد أو عملية رينوال العشوائية $\{R_n;n\in N\}$ عرف دالة التجديد معبرا عنها باستخدام تحويلات لابلاس .

(ب)- في سلسلة ماركوف العشوائية المتقطعة $\{X_n;n\ge 0\}$ عرف الإحتمالات الإنتقالية p_{ij} ، $p^{(n)}_{ij}$ ثم عبر مع الإستنتاج عن الإحتمال $P(X_0=x_0,X_1=x_1,...X_n=x_n)$ من خلال الإحتمالات الإنتقالية p_{ij} .

نهاية الأسئلة

أد/ محمود ابراهيم محمود ، أد/ زينهم فكرى جاهين

ASSIUT UNIVERSITY
Faculty of Science
Mathematics Department

Second Semester Examination– June 2016– Third Year Students

Introduction to Scientific Computations

MC356

Time Limit: TWO Hours

Total Marks: 50 MARKS

Permitted Materials: Calculators

The exam consists of five questions of different weights. The first three questions are compulsory, whereas the last two questions are optional. Answer ***four questions only*** *using the answer booklet(s) provided. If you answer all five questions,* ***only the answer of the first optional question that appear in your answer booklet(s) will be considered*** *by the examiner in addition to the answers of the compulsory questions. Answers are expected to be succinct but complete. Answers that are too long and irrelevant will be penalized.*

Nomenclature

$\mathbb{Z}^+$ The set of positive integers.

Question 1 [**12 marks**]

(a) [4 marks] What is meant by the significant digits in a number? Determine the number of decimal and significant digits in the numbers 1.7320 and 0.0491.

(b) [4 marks] State and define the sources of errors in scientific computing.

(c) [4 marks] The space inside a cardboard box might be computed using the formula $V = h \times w \times l$, where h, w, and l are the height, width, and length of the cardboard box, respectively. What are the sources of error(s) in such a computation?

Question 2 [**13 marks**]

(a) [3 marks] What is meant by error propagation, computational error, and propagated data error?

(b) [3 marks] Derive the propagated data error bound for a single-variable function.

(c) [7 marks] The function $1/(1-x)$ is given by the infinite series,

$$1/(1-x) = 1 + x + x^2 + x^3 + x^4 + x^5 + \ldots,$$

for $-1 < x < 1$.

(i) [2 marks] If $x \approx 0.5$, then estimate an upper bound for the propagated data error.

(ii) [2 marks] If we approximate the function $1/(1-x)$ by using only the first two terms in the series at $x = 0.5$, then how good is the approximation in terms of forward and backward error analyses?

Question 3 [**13 marks**]

(a) [4 marks] How do we measure the sensitivity of a computational problem? Explain.

(b) [2 marks] Answer true or false: A good algorithm will produce an accurate solution regardless of the condition of the problem being solved.

(c) [7 marks] Consider the problem of evaluating the function $f(x) = \ln(x)$.

(i) [4 marks] Study the sensitivity of the problem at $x = 100$.

(ii) [3 marks] For what values of the argument x is this problem highly sensitive?

Question 4 (Optional) [**12 marks**]

(a) [4 marks] What is meant by the stability of an algorithm?

(b) [8 marks] Consider the definite integral:

$$I_n = \int_1^2 (\ln x)^n \, dx, \quad n \in \mathbb{Z}^+ \cup \{0\},$$

where $\lim_{n\to\infty} I_n = 0$. One strategy for calculating I_n starts by calculating $I_0 = 1$, then integration by parts yields,

$$I_j = 2(\ln 2)^j - j\, I_{j-1}, \quad j = 1, 2, \ldots, n.$$

An alternative strategy is to rewrite the previous recursive formula as follows:

$$I_{j-1} = \frac{1}{j}\left(2(\ln 2)^j - I_j\right).$$

To initiate this recursive formula, we can choose a large positive integer number $N > n$, such that $I_N \approx 0$. Study the stability of each algorithm.

Question 5 (Optional) [**12 marks**] Consider the polynomial root-finding problem:

$$P_n(x) = \sum_{k=0}^{n} a_k x^k = 0, \quad n \in \mathbb{Z}^+.$$

(a) [6 marks] Show how to measure the sensitivity of finding a root $x_j, j = 1, 2, \ldots, n$, due to small perturbations in the input datum $a_i, i = 0, 1, \ldots, n$.

(b) [6 marks] If $P_n(x) = (x-2)^2$, study the sensitivity of the root-finding problem.

——— *End of Examination* ———

Best Wishes

Dr. Kareem Taha Elgindy

2nd Term 2015/2016
Date: Jun, 18, 2016

Final Exam for Level 3
Subject: Image Processing
Course No. MC366
Time: 2 Hours

Mathematics Dept.
Faculty of Science
Assiut University

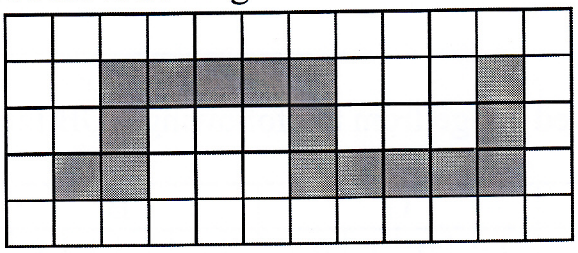
Answer the following questions (50 marks)

Q1. Complete 13 ONLY of the following: **(13 marks)**

1. Image processing applications cover a wide range of human activities, such as ...(1)......, ...(2)........, ...(3)..............
2. Prewitt edge detector operator are ....(4).........,
......(5).........
3. The image file header stores information about the image, such as ......(6).........., ...(7)......... and ......(8)..........
4. Limitations of Region Growing segmentation are ....(9)........
, ...(10)............
5. ....(11)............ uses block processing to threshold blocks of pixels, one at a time
6. Euler number can be expressed as the difference between the number of ......(12).......... and the number of ...(13)...........
7. A CCD sensor is made up of an array of light-sensitive cells called.........(14)..........
8. Digitization involves two processes ......(15)........
and......(16)..........

Q2. **(12 marks)**

a) The output of the following code



I

se = strel('square',3);
I_ero = imerode(I,se);
I_bou = imsubtract(I,I_ero);

b) Show that the LoG edge detector can be implemented using fspecial and imfilter (instead of edge) and provide a reason why this implementation may be preferred.

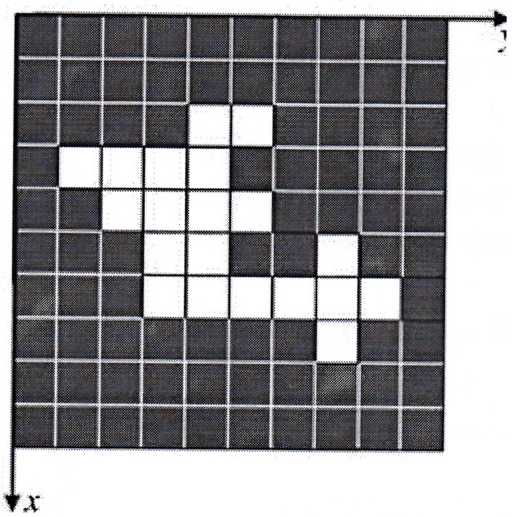
Q3.		(13 marks)

a) Write the MATLAB script used to read an image I then do the following:

(a) (b) (c)

1. Remove the noise of image (a) to be (b)
2. Segment the image (b) as shown in (c)

b) Compute The horizontal and vertical projections and Centroid features of a binary object



Q4.		(12 marks)

a) Compute the indexed image from the following RGB image

R				G				B			
1	1	0	1	0	0	1	0	1	1	1	1
0	0	0	1	1	1	1	1	0	0	0	1
2	2	0	1	2	2	0	0	0	0	0	1
1	1	0	1	1	1	0	0	0	0	0	1

b) Compute Z from the following matlab script:

```
x=[140 100 95;90 99 122;121 144 221]
y=[-1 0 1;-2 0 2;-1 0 1]
Z=imfilter(x,y,'corr')
```

Best Wishes, Dr. Hanaa A. Sayed

Department of Mathematics	بسم الله الرحمن الرحيم	قســـــــم الـــــرياضيات
Faculty of Science		كلــــــية العـــــــــلوم

امتحان نهاية الفصل الدراسي الثاني ٢٠١٥-٢٠١٦ م

للفرقة: المستوى الثالث — الدرجة الكلية: 50

اسم المقرر: تحليل عددي (١)	رقم المقرر: ٣٢٣ ر	الزمن: ثلاث ساعات

Answer five questions only:-

1- a) Derive the following Newton's Raphson formula:

$$x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)} \quad , \quad i = 0,1,2,.....$$

and discuss the convergence. (6 Marks)

b) Evaluate $\sqrt{37}$ by using Newton-Raphson method. (4 Marks)

2- a) Use Simpson's rule to approximate the integrals: $\int_0^{1.6} \frac{1}{x+1} dx \quad , \quad (n=8)$.

(5 Marks)

b) Determine the value of n and h required to approximate:

$\int_0^{1} \frac{1}{x+1} dx$ to within 10^{-9} by using Trapezoidal rule. (5 Marks)

---

3) Solve the following system:

$$x_1 + 0.2x_2 + 0.1x_3 = 1.3$$
$$0.1x_1 + x_2 + 0.3x_3 = 1.4$$
$$0.3x_1 + 0.2x_2 + x_3 = 1.5$$

by the method of iteration. Show that the process of iteration converges for the solution of the above system. What is the maximum error after applying 15 iterations? (10 Marks)

---

4) Consider the problem of finding the Fixed – Point of :

$$g(x) = \cosh\left(\frac{x}{e}\right) - 1 \quad on \quad [-1,1]$$

(i) Take $x_0 = 1$ and apply the fixed point method to find x_1 and x_2

(ii) Show that the sequence generated by $x_n = g(x_{n-1})$, $n \geq 1$ converges to the unique Fixed Point of g on [-1 ,1].

(iii) What is the maximum error after applying 16 iterations ?

(10 marks)

P.T.O

5-a) Show that the polynomial interpolating the following data has degree three

x	-2	-1	0	1	2	3
$f(x)$	1	4	11	16	13	-4

Find f(-1.5) (5Marks)

b) for a function f the forward divided differences are given by

$x_0 = 0.0$	$f[x_0] =$		
		$f[x_0, x_1] =$	
$x_1 = 0.4$	$f[x_1] =$		$f[x_0, x_1, x_2] = \frac{50}{7}$
		$f[x_1, x_2] = 10$	
$x_2 = 0.7$	$f[x_2] = 6$		

Determine the missing entries in the table. (5 Marks)

6-a)Derive the following numerical integration formula :

$$\int_{x_0}^{x_n} f(x)\,dx = \frac{h}{2}\left[f_0 + 2\sum_{i=1}^{n-1} f_i + f_n\right] - \frac{n}{12} h^3 f''(\xi) \ , \ \xi \in (x_0, x_n)$$

Discuss the convergence of the above method taking

$f(x) = e^x$, $x_0 = 0$ and $x_n = x$ (6marks)

b) To what degree of accuracy we calculate $\sqrt[3]{17}$ by means of Lagrange's interpolation polynomial for the function $y = \sqrt[3]{x}$ if we choose $x_0 = 8$, $x_1 = 27$ and $x_2 = 64$ (4 marks)

Good Luck

Dr. A. El-Safty

University: Assiut Faculty: Science Dept.: Math.	Summer Final Exam 15/16 Artificial Intelligence 352 رك	Time: 120 Min 31/8/2016 Level 3	

Part1: Answer the following questions: (4 points for each)

1. Define in your own words: (a) intelligence, (b) artificial intelligence, (c) agent.
2. There are well-known classes of problems that are intractably difficult for computers, and other classes that are provably undecidable. Does this mean that AI is impossible?
3. "Surely computers cannot be intelligent-they can do only what their programmers tell them." Is the latter statement true, and does it imply the former?
4. "Surely animals cannot be intelligent-they can do only what their genes tell them." Is the latter statement true, and does it imply the former?
5. "Surely animals, humans, and computers cannot be intelligent-they can do only what their constituent atoms are told to do by the laws of physics." Is the latter statement true, and does it imply the former?

Part2: Answer the following questions: (30 points)

1- (15 points)

Consider the 3-puzzle problem, which is a simpler version of the 8-puzzle where the board is 2 x 2 and there are three tiles, numbered 1, 2, and 3, and one blank. There are four operators, which move the blank up, down, left, and right. The start and goal states are given below. Show how the path to the goal can be found using:

Start

2	3
1	

Goal

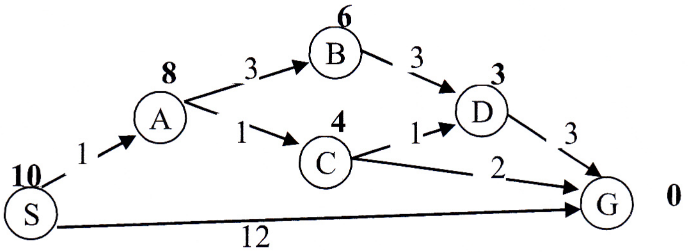
1	2
	3

a) Breadth first search
b) Depth first search
c) A* search with the heuristic being the sum of number of moves and the number of misplaced tiles.

2-(15 points)

Consider the following graph, in which the nodes are labeled with estimated cost to the goal node and edges are labeled with its actual cost.

a) Apply uniform cost search algorithm to this graph. Start node is S and goal node is G. Show expansion sequence.
b) Apply A* algorithm to search from node S to node G. Show the search sequence and result path.
c) Compare between A* and uniform cost search algorithm.



Ahmed Taloba

كلية العلوم	امتحان نهائي لطلاب	الزمن: ساعتان
قسم الرياضيات	المستوي الثالث	المادة : طرق رياضية
الفصل الدراسي الصيفي	المادة : طرق رياضية	التاريخ : ٢٠١٦/٨/٣١م

أجب عن جميع الاسئلة الاتيه

السؤال الاول:

(ا) أوجد تحويل لابلاس للدالة $f(t)$ حيث

$$f(t)=\begin{cases}\cos(t-\frac{2\pi}{3}) & , \quad t>\frac{2\pi}{3}\\ 0 & , \quad t<\frac{2\pi}{3}\end{cases}$$

(ب) برهن علي ان $L\{\frac{\cos\sqrt{t}}{\sqrt{t}}\}=\frac{\sqrt{\pi}}{\sqrt{s}}e^{\frac{-1}{4s}}$.

السؤال الثاني:

(أ) باستخدام نظرية الطي أحسب $L^{-1}\{\frac{1}{s^2(s+1)^2}\}$.

(ب) باستخدام تحويل لابلاس العكسي أوجد حل المعادلة التفاضلية

$$Y''(t)+aY(t)=F(t); \quad Y(0)=1\,,Y'(0)=0$$

السؤال الثالث:

(ا) جزئ له الكتلة $5g$ يتحرك علي محور x في اتجاه نقطة الاصل بقوة $8x$، فاذا كانت بدايته من السكون عند الموضوع $x=10$ فاوجد موضوعة عند اي زمن تالي بفرض انه لا توجد قوة اخري مؤثرة ويتاثر بقوة اخماد مقدارها 8 مرات السرعة.

(ب) باستخدام تحويلات فورير أوجد حل المعادلة التفاضلية

$$\frac{\partial u}{\partial t}=2\frac{\partial^2 u}{\partial t^2}; \quad 0<x<3, \quad t>0\,, \quad u(0,t)=u(3,t)=0 \quad ,u(x,0)=25^o c.$$

السؤال الرابع:

(أ)أوجد تحويل فورير للدالة

$f(x)=\begin{cases}1 & , \quad |x|<a\\ 0 & , \quad |x|>a\end{cases}$، وأرسم $f(t)$ وتحويلها لقيمة $a=3$ وكذلك أوجد قيمة

$$\int_{-\infty}^{\infty}\frac{\sin\alpha u\cos\alpha u}{\alpha}du$$ ثم أوجد $$\int_{-\infty}^{\infty}\frac{\sin u}{u}du$$

(ب) أوجد حل المعادلة التكاملية

$$\int_0^{\infty}f(x)\cos\alpha x dx=\begin{cases}1-\alpha\,, & 0\le\alpha\le 1\\ 0 \quad , & \alpha>1\end{cases}$$ وذلك باستخدام تحويل الجيب

مع التمنيات لكم بالتوفيق

أستاذ دكتور / احمد ماهرعبدالباسط

Numerical Analysis1 (323r) Time:3 H

Science Facuilty Summer Term 2016

Math. Depart Total degree (50)

Answer 4 questions only from the following questions:

1-a) Derive the Lagrange interpolation formula for the given $(n+1)$ Points $(x_i, y_i), i = 0, 1, \dots n$, and then put the derived formula in the general form (8 marks)

b) Use Lagrange interpolation formula to determine the second order polynomial from the following data

x	1	3	4
F(x)	0.30	1.32	5.40

and then find f(2.5) and $f'(2.5)$ (7 marks)

2-a) From the Newton-Cotes formula $\int_{x_0}^{x_n} f(x)dx \approx h\int_0^n P_n(s)ds$, derive the Simpson $\frac{1}{3}$ *rule*, where $P_n(s)$ is the well known forward interpolation formula (7 marks)

-b) Use the Simpson $\frac{1}{3}$ *rule* to calculate the following integral $\int_0^{1.2} \sqrt{x^3+x}\,dx$ approximated to 3 decimal points ,$h = 0.2$

(8 marks)

Please See the Next Page