الورقة الثالثة

Assuit university
Faculty of Science
Department of Mathematics

جامعة أسيوط
كلية العلوم
قسم الرياضيات

امتحان التيرم الصيفي (٢٠١٦ – ٢٠١٧)
كلية العلوم – المستوى الثالث
اسم المقرر ورمزه: تحليل عددي (١) (٣٢٣ ر)
الدرجة النهائية: (٥٠ درجة) – الزمن: ساعتان

Answer the following questions:

1) A – Use Lagrange's interpolation formula to find the value of y when x = 10, if the values of x and y are given as below:

x	5	6	9	11
y	12	13	14	16

B – Find a real root of the following equation by the method of false position:

$f(x) = xe^x - 3 = 0$, $a = 1$, $b = 1.5$

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2) A – Solve the equation $f(x) = \sin x - 1 - x^3$ using Newton – Raphson method.

B – Solve the following equations by using Gauss – Seidel iteration method.

$8x - 3y - 2z = 20$

$4x - 11y - z = 33$

$6x - 3y - 12z = 35$

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3) A – Find $y'(0)$ and $y''(0)$ from the following table:

x	0	1	2	3	4	5
y	8	4	15	7	6	2

B – Evaluate $\int_0^1 \frac{1}{1+x^2}\,dx$ using Simpson's 1/3 rule when h=0.25.

Hence find an approximation value of π

انظر للخلف

4) A – Find a polynomial satisfied by the following table (by using divided differences method):

x	-1	0	2	3	7	10
$f(x)$	-11	1	1	1	141	561

B – Find the area enclosed between the curve pass through the points (1, 0.2), (2, 0.7), (3, 1), (4, 1.3), (5, 1.5), (6, 1.7), (7, 1.9), (8, 2.1), (9, 2.3), (x – axis), (x = 1) and (x = 9) by using trapezoidal rule.

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5) A – Find a polynomial satisfied by the following table by using Newton's forward difference interpolation formula.

x	1	2	3	4	5	6
$f(x)$	4	26	58	112	466	922

B – Solve the following equations by using Jacobi iteration method.

$$28x + 4y - z = 32$$
$$x + 3y + 10z = 24$$
$$2x + 17y + 4z = 35$$

مع أطيب الأمنيات بالتوفيق والنجاح

لجنة الممتحنين: د/ مديحة عبد المجيد

Assiut University
Faculty of Science
Mathematics Department

Final Exam: Mathematical and Statistical Packages (MC 300) Date: 22/08/2017

Time: 2 hours Degree: 50 marks

Answer only four questions of the following questions: [12.5 marks each]

1-a) What is the output of executing each of the following MATLAB command lines

```
>> a=zeros(3)
>> a=[1,2,3,4;5,6,7,8;9,10,11,12;13,14,15,16]
>> a'
>> min(a)
>> mean(a')
>> b=a(1:2,3:4)
>> c=3*[1,2,3,6,(5:-1:1)]
>> x= 10:-1: 1
>> y= linspace(1,2,1)
```

b) Write a MATLAB code that can be used for solving the following system of linear equations

$$x + 2y + 3z = 14, \qquad 4x + 5y + 6z = 32, \qquad 7x + 8y + z = 26.$$

2-a) Write a MATLAB function code that can calculate the mean, variance and standard deviation for a given vector of sample data.

b) What is the output of executing the following MATLAB code

```
>> for K=1:3
   for L=1:3
    a(K,L)= 1/(K+L-1)
   end
   end
```

3-a) In SPSS program,

i) What are the main types of a user's files.

ii) What does it mean by: Name, Label, Data View and Variable View.

iii) In SPSS program there are three types of data. Give an example for each of these data types.

b) In MS-EXCEL program, assume that the current worksheet is blank, and only the cells A1, A2, B1 and B2 contain the values 3, 5, -1 and 1, respectively.

i) If the cell C4 contain the expression: C4= IF(AND(A1<>A2; B1<B2); 200; 300) what is then the value of C4 after execution? Explain why?

ii) If the cell D5 contain the expression: D5 =SUM(1:1)+SUM(B:B) what is then the value of D5 after execution? Explain why?

(Please turn the page for the rest of the questions) %

4-a) what does it mean by each of the following: P-value - level of significant?

4-b) In the pharmaceutical sciences the investigators are often interested in comparing three or more assay methods, specifically, suppose that **12** tablets were selected at random for the comparison of three assay methods, four tablets for each assay. The results of assays comparing the three analytical methods are:

Method	Observations			
I:	**312**	**310**	**309**	**313**
II:	**308**	**309**	**306**	**307**
III:	**309**	**310**	**308**	**309**

Assuming equal population variances, the following are the results of an ANOVA test statistics

One-way ANOVA: C1 versus C2

Source	DF	SS	MS	F	P
C2	2	24.67	12.33	6.53	0.018
Error	9	17.00	1.89		
Total	11	41.67			

i) Describe, in details, how this test statistics could be done using MINITAB or SPSS programs.

ii) By using these results, what do you conclude about the observed difference among the three sample means.

5-a) Describe what is the following MATLAB code is written for with explanation of the effect of each command line. Write a similar MATLAB code for the same proposed but using the inline function instead of the function polyval.

```
>> z=[1,3,-2,1]
>> z0 =linspace( -4,3,500) ;
>> value= polyval ( z,z0 ) ;
>> plot (z0 ,value , 'r-')
```

b) Write a MATLAB function code that can be used for calculating the roots of a given quadratic equation of the form

$$a\,x^2 + b\,x + c = 0,$$

where a, b and c are real constants.

With the best of luck,

Dr. Ayman M. Abd-Elrahman

Assiut University Faculty of Science Mathematics Dept.	Final Exam summer 16-17 Course: Artificial Intelligence Course code: MC352	Date: 24/8/2017 Level: 3 Time: 2 Hour	

Answer the following questions:

Question 1 (10 pt): Put ***True*** or ***False*** for each of the following items, and correct the false ones:

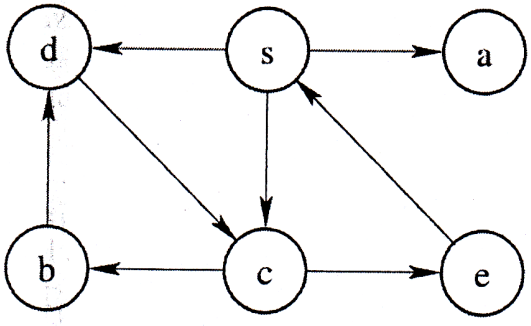
1. The environment of part parking is considered as deterministic
2. The accessibility of RHINO Robot partially
3. Simulated annealing is considered as agents
4. An agents acting upon the environment through sensor
5. Motors, files and body parts are considered as effector
6. Camera, mouse and data base are considered as effector
7. The environment of taxi- driver is statistic
8. The environment of cross puzzle is considered as Discrete
9. Crossover operator enables GAs to escape from an area in the search space
10. The Tabu search start with one solution and generate some solutions.

Question 2 (10 pt):

1. What is Artificial Intelligence?
2. What are the four views of AI systems?
3. What tasks require AI?
4. What is Agent? Discuss with examples.
5. Define the following terms:
   a. States
   b. Search space
   c. Search path
   d. Solution
   e. Strategy

Question 3 (10 pt):

1. What is the difference between Breadth-First Search and Depth-First Search?
2. Give the visited node order for each type of graph search by Breadth First Search and Depth-First Search, starting with ***s*** :



Question 4 (10 pt):

1. Name and describe the main features of Genetic Algorithms (GA).
2. Suppose a genetic algorithm uses chromosomes of the form x = abcdefgh with a fixed length of eight genes. Let the initial population consist of four individuals with the following chromosomes:

x1 = 6 5 4 1 3 5 3 2
x2 = 8 7 1 2 6 6 0 1
x3 = 2 3 9 2 1 2 8 5
x4 = 4 1 8 5 2 0 9 4

Perform the following crossover operations:

a. Cross the fittest two individuals using one–point crossover at the middle point.
b. Cross the second and third fittest individuals using a two–point crossover (points ***b*** and ***f***).

Question 5 (10 pt):

1. Maintain the tabu search algorithm .
2. Discuss the difference between Tabu search and Other Meta-heuristics.

Best Wishes
Dr. Rasha Mahmoud

قسم الرياضيات - كليـــــة العلوم	الفرقـة : المستوي الثالث	
إمتحان الفصل الدراسى الصيفي ٢٠١٦/٢٠١٧م	المادة : نظرية الأعداد (٣١٧ر)	
زمـن وتاريخ الأمتحان: ٣ ساعات ٢٩ /٨/٢٠١٧م	الدرجـــة : ٥٠ درجة	

أجب عن خمسة أسئلة فقط مما يأتي : (درجة كل سؤال من ١٠ درجات)

(١-أ) أثبت أن $g.c.d(a,b).L.c.m(a,b)=ab$ ثم أوجد $L.c.m(900,2012,1512)$ (٥ درجات)

(ب) حدد الحلول الموجبة (إن وجدت) للمعادلة $472x+531y=1121$ (٥ رجات)

(٢-أ) إذا كان $g.c.d(a,n)=1$ بين أن التطابق الخطي $ax\equiv b(\bmod n)$ له حل علي الصورة

$x=b\,a^{\phi(n)-1}(\bmod n)$ ومن ثم أوجد حل التطابق $8x\equiv 7(\bmod 165)$ (٥ درجات)

(ب)) رجل يمتلك 4000 جنيهاً ويريد أن يذهب إلي سوق للعمالة الحرفية ويأتي ب 100 عامل من ثلاثة مجموعات فإذا كانت المجموعة الأولي لها أجر يومي 70 جنيهاً والمجموعة الثانية لها أجر يومي 50 جنيهاً والمجموعة الثالثة لها أجر يومي 20 جنيهاً . أوجد عدد العمال من كل مجموعة (٥ درجات)

(٣-أ) أوجد حل لنظام التطابقات الخطية الآتية: (٥ درجات)

$$x\equiv 3\,(mod\ \ 2)\ ,\ \ x\equiv 2\,(mod\ 5),\ \ x\equiv 5\,(mod\ 3),\ \ x\equiv 11(\bmod 7)$$

(ب) إذا كان $n>2\ ,\ n\in N$ فأثبت أن $\phi(n)$ عدد زوجي ثم بين باستخدام نظرية اويلر أن

$$a^{33}\equiv a\,(mod\ 4080),a\in Z$$ (٥ درجات)

(٤-أ) (i) اكتب العدد 8124 في النظام السباعي ثم أوجد قيمة العدد $(1110001111)_2$ (٣ درجات)

(ii) بين أن العدد 61457 يقبل القسمة علي 11 . (درجتان)

(ب) أثبت أنه إذا كانت f دالة ضربية فإن الدالة $F(n)=\sum_{d|n} f(d)$ هي دالة ضربية ثم أوجد

$\mu(420)\ ,\ \sigma_2(2250)\ ,\ \sigma(2250)\ ,\ \tau(2250)$ (٥ درجات)

(٥-أ) أوجد حل التطابقة التربيعية $x^2\equiv -1(\bmod 29)$ ثم بين ما إذا كان العدد $n=1729$ هو عدد شبه أولي أم غير ذلك . (٤ درجات)

(ب) إذا كان p عدداً أولياً وأن $p\mid a$ فأثبت أن $a^{p-1}\equiv 1(\bmod p)$ ثم بين باستخدام نظريات فيرما أن العدد 119 عدداً أولياً أم غير ذلك . (٤ درجات)

(ج) تحقق من صحة $3\mid n\Leftrightarrow\phi(3n)=3\phi(n)$ (درجتان)

بقية الأسئلة خلف الورقة ←

(٦-أ) عرف عدد فيرما ثم أثبت أن $\prod_{i=0}^{n-1} F_i = F_n - 2$ وأن $F_4 = 2^{16} + 1 = 65537$ عدد أولي (٥ درجات)

(ب) إذا كان $M(n)$ عدد أولي فأثبت أن n عدد أولي ثم أعط مثال يبين أن عكس ذلك غير صحيح وأن $M(7)$ عدد أولي .
(٥ درجات)

انتهت الأسئلة مع التمنيات بالتوفيق ،،،،،،

الممتحن : أ.د/ محمد عزب عبد الله

	University: Assiut Faculty: Science Dept.: Math.	Algorithms Final Exam Summer 16/17 MC353	Time: 2 Hours 29/8/2017 Level 3	

Question 1: (10 points)

a- (3 Points) Explain the cycle of problem-solving process.

b- (7 Points) True or false? Correct the false statements.

1. MergeSort requires more space to execute than HeapSort.
2. QuickSort (using the first element as the split value) is better for nearly sorted data than HeapSort.
3. The efficiency of HeapSort is not affected by the order of the elements on entrance to the function.
4. A recursive version of QuickSort executes faster than a nonrecursive version.
5. A recursive version of QuickSort has fewer lines of code than a nonrecursive version.
6. A nonrecursive version of QuickSort takes more space on the run-time stack than a recursive version.
7. It can be programmed only as a recursive function of QuickSort.

Question 2: (10 points)

a- (4 Points) Assume you have two computers, a faster computer **A** running insertion sort against a slower computer **B** running merge sort, both must sort an array of one million numbers, suppose computer A execute one billion (10^9) instructions per second and computer B execute ten million (10^7) instructions per second, assume that c1 2 and c2 50, which of these computer is faster?

b- (6 Points) A sorting function is called to sort a list of 100 integers that have been read from a file. If all 100 values are zero, what would the execution requirements (in terms of Big-0 notation) be if the sort used was

1. Quicksort, with the first element used as the split value?
2. ShortBubble?
3. SelectionSort?
4. HeapSort?
5. InsertionSort?
6. MergeSort?

Question 3: (10 points) Show the contents of the array

43	7	10	23	18	4	19	5	66	14

After the fourth iteration of

- BubbleSort
- SelectionSort
- InsertionSort

Question 4: (10 points)

a- (6 Points) Draw the binary search tree from its preorder traversal?

15, 5, 3, 12, 10, 6, 7, 13, 16, 20, 18, 23

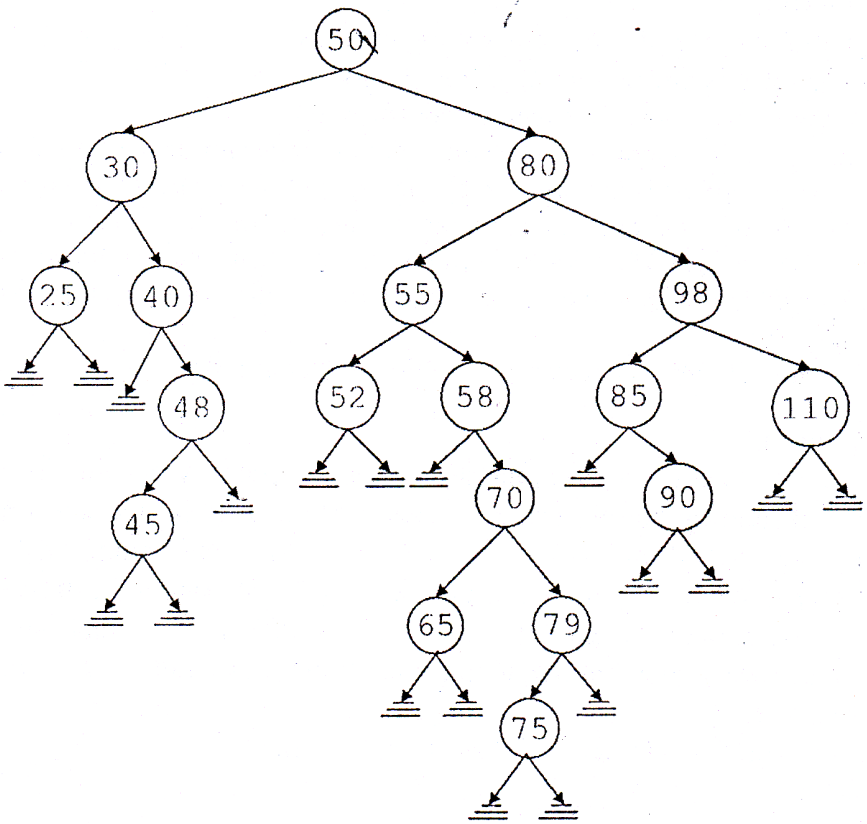
b- (4 Points)Which sorting algorithm would you *not* use under the following conditions?

a. The sort must be stable.
b. Data are in descending order by key.
c. Data are in ascending order by key.
d. Space is very limited.

Question 5: 10 points

Using the binary search tree of the following figure answer the following:

الرجاء الاخذ في الاعتبار أن تنفيذ كل جزء لا يعتمد علي الجزء الاخر



a) A node with info 35 is to be inserted in the tree. List the nodes that are visited by the function insert to insert 35. Redraw the tree after inserting 35.

b) Delete node 52 and redraw the binary tree.

c) Delete node 40 and redraw the binary tree.

d) Delete nodes 80 and 58 in that order. Redraw the binary tree after each deletion.

e) Print the tree

1. An inorder traversal of the tree.
2. A postorder traversal of the tree.
3. A preorder traversal of the tree.

Best Wishes

Dr. Rasha Mahmoud