

Assiut University	Selected topics of mathematics (2)	Date: 5/1/2019
Faculty of Sciences	Code: 427 M	Time: 3 hours
Mathematics Department	B. Sc. Students in Mathematics	Grade: 50 marks

Answer 5 (five) questions ONLY from the following (grades equally distributed):

1. (a) Show that the finite element approximation u_h defined by

$$\int_0^1 u_h' v' dx = \int_0^1 f v dx, \quad \forall v \in V_{h,0}$$

satisfies the Galerkin orthogonality

$$\int_0^1 (u - u_h)' v' dx = 0, \quad \forall v \in V_{h,0}$$

- (b) Derive the variational formulation of Poisson's equation

$$\begin{aligned} -\Delta u &= f, \quad \text{in } \Omega, \\ u &= 0, \quad \text{on } \Omega. \end{aligned}$$

2. (a) Show that the finite element solution u_h defined by

$$\int_0^1 u_h' v' dx = \int_0^1 f v dx, \quad \forall v \in V_{h,0}$$

satisfies

$$\|(u - u_h)'\|_{L^2(I)} \leq \|(u - v)'\|_{L^2(I)}, \quad \forall v \in V_{h,0}.$$

- (b) Show that the L^2 -projection $P_h f \in V_h$ of a function of two variables $f \in L^2(\Omega)$ defined by

$$\int_{\Omega} (f - P_h f) v d\Omega = 0, \quad \forall v \in V_h$$

satisfies the following best approximation estimate

$$\|f - P_h f\|_{L^2(\Omega)} \leq \|f - v\|_{L^2(\Omega)}, \quad \forall v \in V_h$$

3. Let $0 = x_0 < x_1 < x_2 < x_3 = 1$, where $x_1 = \frac{1}{6}$ and $x_2 = \frac{1}{2}$ be a partition of the interval $[0,1]$ into three subintervals. Furthermore, let $V_{h,0}$ be the space of continuous piecewise linear functions on this partition that vanish at the end-points $x = 0$ and $x = 1$.

- (a) Compute the stiffness matrix A defined by $A_{ij} = \int_0^1 \phi_i' \phi_j' dx$.

- (b) Compute the load vector with $f(x) = 1$ defined by $b_i = \int_0^1 f \phi_i dx$.

4. Let $0 = x_0 < x_1 < x_2 < x_3 = 1$, where $x_1 = \frac{1}{6}$ and $x_2 = \frac{1}{2}$ be a partition of the interval $[0,1]$ into three subintervals, and let V_h be the space of continuous piecewise linear functions on this partition.

- (a) Determine analytical expressions for the hat function ϕ_1 and draw it.

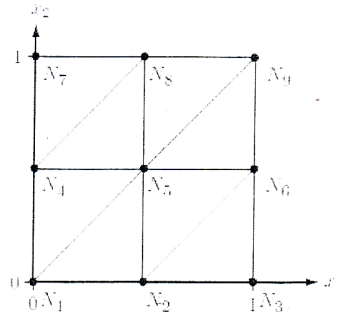
- (b) Draw the function $v(x) = -\phi_0(x) + \phi_2(x) + 2\phi_3(x)$ and its derivative $v'(x)$.

P.T.O. من فضلك اقلب الصفحة...

(c) Draw the piecewise constant mesh function $h(x) = h_i$ on subinterval I_i .

(d) What is the dimension of V_h ?

5. Given the following triangulation



(a) Write down the point matrix P and the connectivity matrix T .

(b) Determine the sparsity of the mass matrix on this mesh.

6. Consider the problem

$$\begin{aligned} -u'' + u &= f, & x \in (0,1) \\ u(0) &= u(1) = 0 \end{aligned}$$

(a) Choose a suitable finite element space V_h .

(b) Formulate a finite element method.

(c) Derive the discrete system of equations.

Good luck,
Dr. Shaaban Bakr



أجب فقط عن خمسة أسئلة مما يأتي :

- (١) بفرض أن τ توبولوجي على $X = \{a, b, c, d, e\}$ حيث
 $\tau = \{X, \phi, \{a\}, \{d, e\}, \{a, d, e\}, \{a, c, d, e\}\}$
(أ) حدد أساسا للتوبولوجي τ ثم أوجد Na, Nb (٥ درجات)
(ب) أوجد أكبر مجموعة جزئية $A \subseteq X$ بحيث $A^\circ = \{d, e\}, A' = \{b, d, e\}$ (٥ درجات)

- ٢- (أ) أثبت أن $\tau = \{\phi, E_n = \{n, n+1, n+2, \dots\} \subseteq N, n \in N\}$ توبولوجي على N ثم
أوجد $\bar{A}, A', b(A), \text{ext}(A), A^\circ$ حيث $A = \{5, 6, 7, \dots, 14\}$ (٥ درجات)
(ب) لفضاء المجموعة المختارة (X, θ) حيث $\theta = \{U \subseteq X : \{a, b\} \subseteq U\}$ أوجد $A^\circ, \bar{A}$
حيث $A \subseteq X$ (٥ درجات)

- ٣- (أ) لفضاء النقطة المستبعدة (X, ξ) أوجد $b(A), A^\circ, \bar{A}$ حيث $A \subseteq X$ (٥ درجات)
(ب) بفرض أن (X, τ) فضاء توبولوجي أثبت أن $\bar{A} = A \cup A'$ لأي $A \subseteq X$ (٥ درجات)

بقية الأسئلة خلف الورقة

4- a) Find the relation between torsions of a regular space curve c and its Evolute. (5 Marks)

b) Find the equation of the involute of the circle:

$$x = a \cos \theta \underline{e}_1 + a \sin \theta \underline{e}_2, \quad a > 0 \quad (5 \text{ Marks})$$

5- a) Determine the curvature $K(u)$ of the curve given by:

$$\underline{r} = \{a(u - \sin u), \quad a(1 - \cos u), \quad bu\}$$

then: Calculate $K(0) \cdot K\left(\frac{\pi}{2}\right)$ (5 Marks)

b) If a curve lies on the surface of a sphere, show that $\frac{d}{ds} \left(\frac{K'}{K^2 \tau} \right) + \frac{\tau}{K} = 0$. (5 Marks)

6- a) Prove that any regular space curve is completely determined up to its position by its curvature function

$K = K(s) > 0$ and its torsion $\tau = \tau(s)$ (s- arc length parameter) (5 Marks)

b) Find the torsion for the curve: $\underline{r} = \{2ae^u \cos u, 2ae^u \sin u, ae^u\}$ (5 Marks)

بالتوفيق ،،،،،،،، لجنة الممتحنين: أ.د/ أحمد عبد المنصف علام & د/ راوية عبد الرحمن حسين

راوية عبد الرحمن حسين

أحمد عبد المنصف علام

	Assiut University Faculty of Science Mathematics Dept.	Final Exam Theory of Computation Code : MC457	Date :31/12/2018 Level: fourth Time : 2 Hours	
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Answer the following questions:

(50 Marks)

Question 1:

(10 Marks)

Read and Put (✓) or (X) in the answer table:

- 1) $L = \{(11)^*0\}$ is the set of all strings consisting of some number of concatenations of 11 with itself, followed by 0.
- 2) $1(0|1)^*$ is matched by any string that starts with a '1'.
- 3) The language L over $\{a, b\}$ that contains the ab or ba as substring is regular.
- 4) The language $\{\omega | \omega \text{ ends with } 11\}$ is described by the expression $\Sigma^*11\Sigma^*$.
- 5) $L(G) = \{a, ab, abb, abbb\}$ is produced by the grammar $S \rightarrow a|ab|abb|abbb$.
- 6) The language $0\Sigma \cup \Sigma 1$ consists of all string that either with a 0 or end with a 1.
- 7) The language $\{\omega | \omega \text{ is a string of even length}\}$ is described by the expression $\Sigma\Sigma$.
- 8) The language $\{\omega | \omega \text{ has at least one } 1\}$ is described by the expression $\Sigma^*1\Sigma^*$.
- 9) The language $0\Sigma^*00$ consists of all string ending in 00.
- 10) The language $1^*0(01^*0 \cup 1)^*$ has an odd number of 0's.

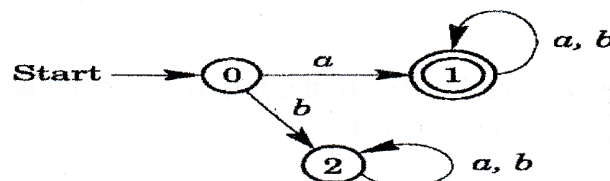
Answer Table

Question	1	2	3	4	5	6	7	8	9	10
Answer										

Question 2:

(10 Marks)

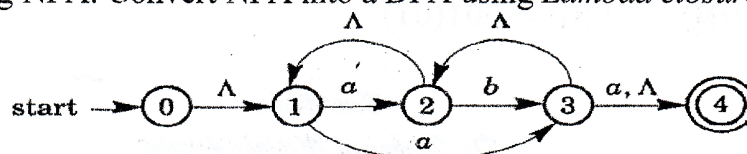
1. Create a DFA over $\{a, b\}$ that recognize all string contain the substring $baab$. Write the regular expression and the transition table.
2. Using Arden's Theorem, derive the regular expression for the following DFA:



Question 3:

(10 Marks)

Given the following NFA. Convert NFA into a DFA using *Lambda closures*



Question 4:**(10 Marks)****Choose the correct answer and write it in the answer table: $\Sigma = \{0,1\}$** 1. The language $\{w : w \text{ contains exactly two } 0s\}$ is described by the expression

a) $1^+0^*1^*01^+$	b) $1^*01^*01^*$	c) $\Sigma^*00\Sigma^*$	d) $\Sigma^+00\Sigma^+$
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2. The language $\{w : w \text{ contains at least two } 0s\}$ is described by the expression

a) $\Sigma^*00\Sigma^*$	b) $\Sigma^*0\Sigma^*0\Sigma^*$	c) $0\Sigma^*00\Sigma^*$	d) $\Sigma^*00\Sigma^*0$
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3. The language $\{w : \text{the length of } w \text{ is even}\}$ is described by the expression

a) $(\Sigma\Sigma)^*$	b) $\Sigma\Sigma$	c) $(\Sigma\Sigma)^+$	d) $\Sigma^*\Sigma^*$
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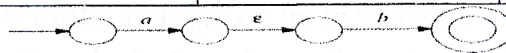
4. The language $\{1011, 0\}$ is described by the expression

a) $1011 + 0$	b) 10110	c) $1011^* + 0$	e) 1011
---------------	------------	-----------------	-----------

5. The regular expression $(0 \cup \epsilon)(1 \cup \epsilon)$ describes the language

a) $\{0,1,10,\epsilon\}$	b) $\{01,0,1\}$	c) $\{0,1,10\}$	d) $\{01,0,1,\epsilon\}$
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6. The regular expression of



a) ba	b) $b + a$	c) ab	d) $a + b$
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7. The regular expression of $\{0, 00, 000, \dots, 1, 01, 001, 0001, \dots\}$ is

a) $(0 + 1) \cdot 0^*$	b) $0^* \cdot (0 + 1)$	c) $(0 + 1)^*$	d) $0^*(01)^*$
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8. the set of strings consisting of b followed by zero or more as

a) $\{b^n a n \geq 0\}$	b) $\{ba^n n \geq 0\}$	c) $\{ba^n n \geq 1\}$	d) $\{ba^n\}$
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9. $(ba)^*$, denotes

a) $\{ba^n n \geq 0\}$	b) $\{(ba)^n n \geq 0\}$	c) $\{(ab)^n n \geq 0\}$	d) $\{(ba)^n n \geq 1\}$
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10. The whole language of strings over the alphabet $\{a, b\}$

a) $a^* + b^*$	b) $a + b$	c) $(a + b)^*$	d) $(a \cdot b)^*$
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Answer Table

Question	1	2	3	4	5	6	7	8	9	10
Answer										

Question 5:**(10 Marks)**

Prove the language that derived by each of the following grammar G:

a. $S \rightarrow 01S$, $L(G) = (01)^*0$

$S \rightarrow 0$

b. $S \rightarrow K01$

$K \rightarrow K01|N$, $L(G) = 001(01)^*$

$N \rightarrow 0$

*Best Wishes**Dr. Mohamed Mostafa darwish*



Important remarks • No. of pages: 3 - No. of questions: 4

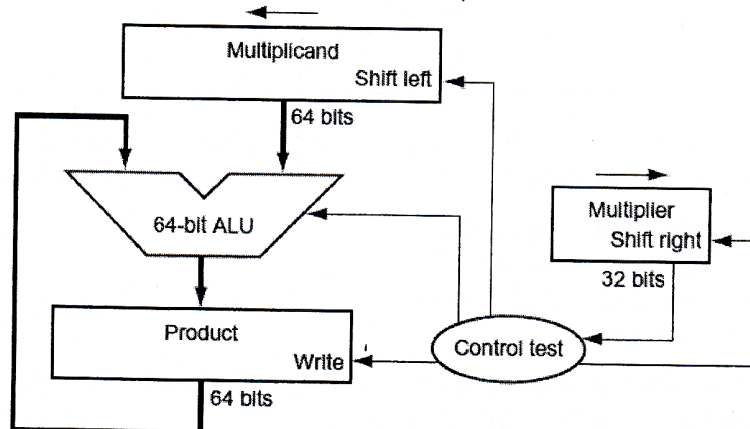
ATTEMPT ALL QUESTIONS.

QUESTION I (12 POINTS)

- (a) (3 pts) What is the power wall? How did it affect Moore's law?
- (b) (3 pts) Write down the binary representation of the decimal number 20.125 assuming the IEEE 754 single precision format.
- (c) (6 pts) Translate the following C code to MIPS assembly code. Use a minimum number of instructions. Assume that the values of a, sum, and i are in registers \$s0, \$s1, and \$t0, respectively. Also, assume that register \$s2 holds the base address of the array D.
- ```
for (i=0; i<a; i++)
 sum= 2*sum + D[i];
```

**QUESTION II (12 POINTS)**

- (a) (3 pts) Provide the type, assembly language instruction, and binary representation of instruction described by the following MIPS fields:  
op=0, rs=3, rt=2, rd=3, shamt=0, funct=34
- (b) Assume that the following multiplication circuit is used but with multiplying only 4-bit numbers (both multiplicand and multiplier are 4-bits).



- (i) (2 pts) What will the size of the Product register be?
- (ii) (7 pts) Create a table showing the contents of the two registers in the figure as we start the operation and after each edition and shift operations until obtaining the final answer. Assume we are multiplying 9 by 7.

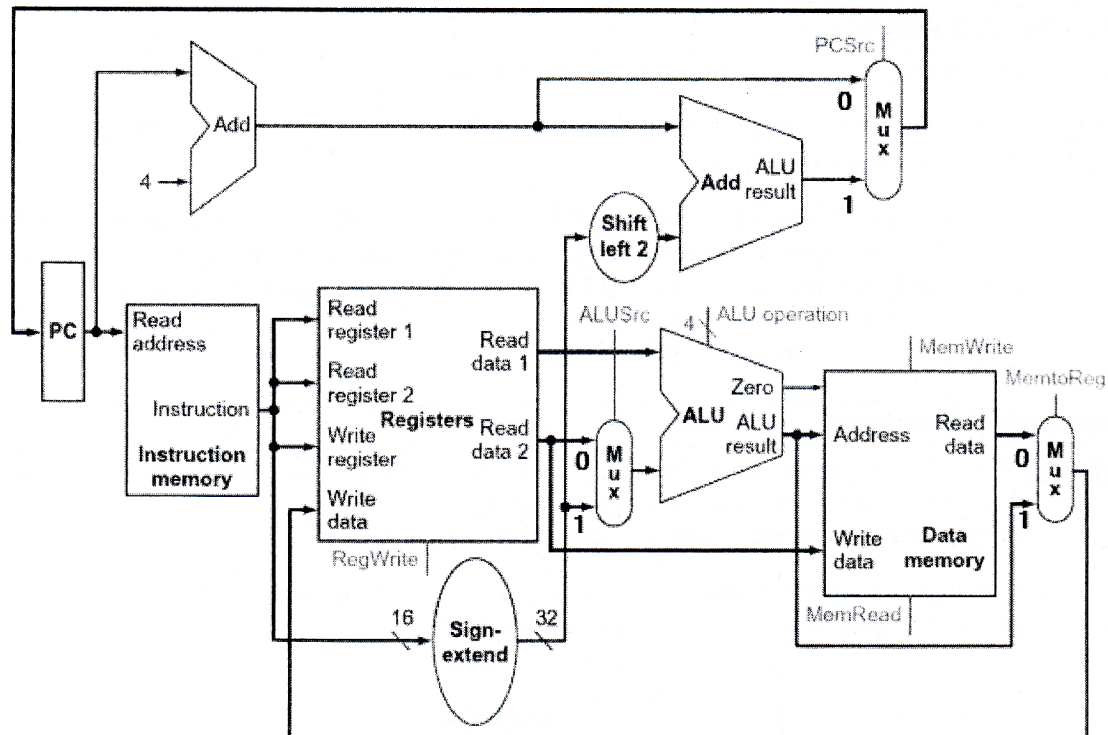
**QUESTION III (10 POINTS)**

- (a) (3 pts) State the role of each of the following MIPS registers in procedure calling: \$a0, \$v0, \$s0, \$t0, \$sp, and \$ra.

- (b) (7 pts) Implement the C function `strlen(char* str)` in MIPS Assembly. The function accepts a NULL-terminated string `str` of ASCII characters, and returns the length (number of characters) of the string `str`. For example, `strlen("hello")` returns 5.

#### QUESTION IV (16 points)

Answer the following questions using the given simplified single-clock MIPS processor design:



- (i) (12 pts) What are the values of the control signals: RegWrite, MemRead, ALUSrc, MemWrite, ALUoperation, MemtoReg, and PCSrc in each of the following instructions:
- 1) `add $t2, $t2, $t3`
  - 2) `sw $t1, 8($s2)`
  - 3) `bne $t1, $s2, label`
  - 4) `jal label`
- (ii) (2 pts) If the offset in a jump instruction is `0xEF47`, what are the outputs of the sign-extend and the jump "Shift left 2" units?
- (iii) (2 pts) What is the ALU's Zero output needed for?

GOOD LUCK!

Dr. Moumen El-Melegy

# MIPS Reference Cheat Sheet

## INSTRUCTION SET (SUBSET)

| Name (format, op, funct)                   | Syntax          | Operation                                                              |
|--------------------------------------------|-----------------|------------------------------------------------------------------------|
| add (R,0,32)                               | add rd,rs,rt    | reg(rd) := reg(rs) + reg(rt);                                          |
| add immediate (I,8,na)                     | addi rt,rs,imm  | reg(rt) := reg(rs) + signext(imm);                                     |
| add immediate unsigned (I,9,na)            | addiu rt,rs,imm | reg(rt) := reg(rs) + signext(imm);                                     |
| add unsigned (R,0,33)                      | addu rd,rs,rt   | reg(rd) := reg(rs) + reg(rt);                                          |
| and (R,0,36)                               | and rd,rs,rt    | reg(rd) := reg(rs) & reg(rt);                                          |
| and immediate (I,12,na)                    | andi rt,rs,imm  | reg(rt) := reg(rs) & zeroext(imm);                                     |
| branch on equal (I,4,na)                   | beq rs,rt,label | if reg(rs) == reg(rt) then PC = BTA else NOP;                          |
| branch on not equal (I,5,na)               | bne rs,rt,label | if reg(rs) != reg(rt) then PC = BTA else NOP;                          |
| jump and link register (R,0,9)             | jalc rs         | \$ra := PC + 4; PC := reg(rs);                                         |
| jump register (R,0,8)                      | jr rs           | PC := reg(rs);                                                         |
| jump (J,2,na)                              | j label         | PC := JTA;                                                             |
| jump and link (J,3,na)                     | jal label       | \$ra := PC + 4; PC := JTA;                                             |
| load byte (I,32,na)                        | lb rt,imm(rs)   | reg(rt) := signext(mem[reg(rs) + signext(imm)] <sub>7:0</sub> );       |
| load byte unsigned (I,36,na)               | lbu rt,imm(rs)  | reg(rt) := zeroext(mem[reg(rs) + signext(imm)] <sub>7:0</sub> );       |
| load upper immediate (I,14,na)             | lui rt,imm      | reg(rt) := concat(imm, 16 bits of 0);                                  |
| load word (I,35,na)                        | lw rt,imm(rs)   | reg(rt) := mem[reg(rs) + signext(imm)];                                |
| multiply, 32-bit result (R,28,2)           | mul rd,rs,rt    | reg(rd) := reg(rs) * reg(rt);                                          |
| nor (R,0,39)                               | nor rd,rs,rt    | reg(rd) := not(reg(rs)   reg(rt));                                     |
| or (R,0,37)                                | or rd,rs,rt     | reg(rd) := reg(rs)   reg(rt);                                          |
| or immediate (I,13,na)                     | ori rt,rs,imm   | reg(rt) := reg(rs)   zeroext(imm);                                     |
| set less than (R,0,42)                     | slt rd,rs,rt    | reg(rd) := if reg(rs) < reg(rt) then 1 else 0;                         |
| set less than unsigned (R,0,43)            | sltu rd,rs,rt   | reg(rd) := if reg(rs) < reg(rt) then 1 else 0;                         |
| set less than immediate (I,10,na)          | slti rt,rs,imm  | reg(rt) := if reg(rs) < signext(imm) then 1 else 0;                    |
| set less than immediate unsigned (I,11,na) | sltiu rt,rs,imm | reg(rt) := if reg(rs) < signext(imm) then 1 else 0;                    |
| shift left logical (R,0,0)                 | sll rd,rt,shamt | reg(rd) := reg(rt) << shamt;                                           |
| shift left logical variable (R,0,4)        | sllv rd,rt,rs   | reg(rd) := reg(rt) << reg(rs <sub>4:0</sub> );                         |
| shift right arithmetic (R,0,3)             | sra rd,rt,shamt | reg(rd) := reg(rt) >>> shamt;                                          |
| shift right logical (R,0,2)                | srl rd,rt,shamt | reg(rd) := reg(rt) >> shamt;                                           |
| shift right logical variable (R,0,6)       | srlv rd,rt,rs   | reg(rd) := reg(rt) >>> reg(rs <sub>4:0</sub> );                        |
| store byte (I,40,na)                       | sb rt,imm(rs)   | mem[reg(rs) + signext(imm)] <sub>7:0</sub> := reg(rt) <sub>7:0</sub> ; |
| store word (I,43,na)                       | sw rt,imm(rs)   | mem[reg(rs) + signext(imm)] := reg(rt);                                |
| subtract (R,0,34)                          | sub rd,rs,rt    | reg(rd) := reg(rs) - reg(rt);                                          |
| subtract unsigned (R,0,35)                 | subu rd,rs,rt   | reg(rd) := reg(rs) - reg(rt);                                          |
| xor (R,0,38)                               | xor rd,rs,rt    | reg(rd) := reg(rs) ^ reg(rt);                                          |
| xor immediate (I,14,na)                    | xori rt,rs,imm  | reg(rt) := reg(rs) ^ zeroext(imm);                                     |

### Definitions

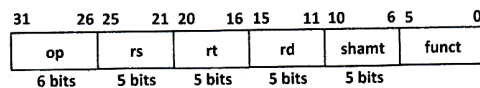
- Jump to target address: JTA = concat((PC + 4)<sub>31:28</sub>, address(label), 00<sub>2</sub>)
- Branch target address: BTA = PC + 4 + imm \* 4

### Clarifications

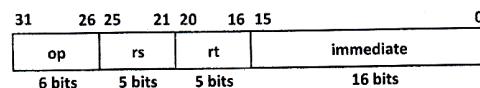
- All numbers are given in decimal form (base 10).
- Function signext(x) returns a 32-bit sign extended value of x in two's complement form.
- Function zeroext(x) returns a 32-bit value, where zero are added to the most significant side of x.
- Function concat(x, y, ..., z) concatenates the bits of expressions x, y, ..., z.
- Subscripts, for instance X<sub>8:2</sub>, means that bits with index 8 to 2 are spliced out of the integer X.
- Function address(x) means the address of label x.
- NOP and na means "no operation" and "not applicable", respectively.
- shamt is an abbreviation for "shift amount", i.e. how much bit shifting that should be done.

## INSTRUCTION FORMAT

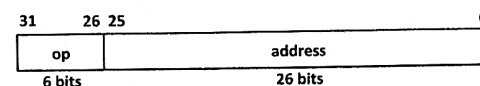
### R-Type



### I-Type



### J-Type



## REGISTERS

| Name   | Number | Description      |
|--------|--------|------------------|
| \$zero | 0      | constant value 0 |
| \$at   | 1      | assembler temp   |
| \$v0   | 2      | function return  |
| \$v1   | 3      | function return  |
| \$a0   | 4      | argument         |
| \$a1   | 5      | argument         |
| \$a2   | 6      | argument         |
| \$a3   | 7      | argument         |
| \$t0   | 8      | temporary value  |
| \$t1   | 9      | temporary value  |
| \$t2   | 10     | temporary value  |
| \$t3   | 11     | temporary value  |
| \$t4   | 12     | temporary value  |
| \$t5   | 13     | temporary value  |
| \$t6   | 14     | temporary value  |
| \$t7   | 15     | temporary value  |
| \$s0   | 16     | saved temporary  |
| \$s1   | 17     | saved temporary  |
| \$s2   | 18     | saved temporary  |
| \$s3   | 19     | saved temporary  |
| \$s4   | 20     | saved temporary  |
| \$s5   | 21     | saved temporary  |
| \$s6   | 22     | saved temporary  |
| \$s7   | 23     | saved temporary  |
| \$t8   | 24     | temporary value  |
| \$t9   | 25     | temporary value  |
| \$k0   | 26     | reserved for OS  |
| \$k1   | 27     | reserved for OS  |
| \$gp   | 28     | global pointer   |
| \$sp   | 29     | stack pointer    |
| \$fp   | 30     | frame pointer    |
| \$ra   | 31     | return address   |

## IEEE 754 Float-Point Formats

### Floating Point Components

|                  | Sign   | Exponent   | Fraction   |
|------------------|--------|------------|------------|
| Single Precision | 1 [31] | 8 [30-23]  | 23 [22-00] |
| Double Precision | 1 [63] | 11 [62-52] | 52 [51-00] |

Version 1.0, December 19, 2014



Assiut University  
Faculty of Science  
Mathematics Department  
Term Exam

Computer Security  
Fourth Level (MC453)  
Time: 2 hours  
January 2019

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

**Question 1: Answer the following questions: (10 Marks)**

- 1-What is NIST definition for Computer Security?
- 2-Explain the term CIA Triad?
- 3- Mention some of the computer security challenges?

**Question 2: Answer the following questions: (10 Marks)**

- 1- Based on RFC 2828, mention the four kinds of threat consequences and list the kinds of attacks that result in each consequence?
- 2- Compare between passive and active attacks?
- 3- Write the X.800 and RFC 2828 definitions for security service?

**Question 3: Answer the following questions: (10 Marks)**

- 1-Explain the symmetric encryption ingredients?
- 2-Explain the methods used to attack symmetric encryption?
- 3-Explain DES?

**Question 4: Answer the following questions: (10 Marks)**

- 1- What are the general means of authenticating a user's identity?
- 2-What is NIST definition to the term malware?
- 3-Malware are mainly classified into two broadly categories. What are these categories? Discuss another method for malware classification?

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**Question 5: Answer the following questions: (10 Marks)**

- 1-What is NIST definition for DoS attack?
  - 2- Explain poison packet?
  - 3- Explain cyberslam attack?
- 

Dr. Tarik M. A. Ibrahim





**Answer four questions only from the following questions:**

**First Question(12 Degree)**

- (a) Show that  $d : R \times R \rightarrow R$  is not a metric, where  $R$  is the set of real number and defined by:

$$d(x, y) = (x - y)^2, \quad x, y \in R$$

- (b) The distance  $D(x, B)$  from a point  $x$  to a nonempty subset  $B$  of a metric space  $(X, d)$  is defined by:  $D(x, B) = \inf_{b \in B} d(x, b)$ . Show that for every  $x \in X$

$$|D(x, B) - D(y, B)| \leq d(x, y)$$

- (c) Give an example of a metric space  $(X, d)$  and a Cauchy sequence  $\{x_n\} \subseteq X$  such that  $\{x_n\}$  does not converge in  $X$ .

**Second Question(12 Degree)**

- (a) Show that every convergent sequence in a metric space  $(X, d)$  is a Cauchy.  
(b) State and prove Banach fixed point theorem in a complete metric space.  
(c) Let  $X$  be an inner product space. Prove that,

$$|\langle x, y \rangle| \leq \|x\| \|y\|, \quad x, y \in X.$$

**Third Question (13 Degree)**

- (a) Prove that every finite dimensional subspace  $Y$  of a normed space  $X$  is complete.

- (b) Let  $X = R^n$  with the norm:  $\|x\|_p = \left( \sum_{i=1}^n |x_i|^p \right)^{1/p}$ ,  $0 < p < 1, n > 2, x \in R^n$ .

Show that  $(X, \|\cdot\|_p)$  is not a normed space.

- (c) Show that the space  $C[a, b]$  of all continuous functions on  $[a, b]$  is a Banach space under the norm:

$$\|f\| = \max_{a \leq x \leq b} |f(x)|, \quad f \in C[a, b].$$

**Fourth Question (13 Degree)**

- (a) Consider two norms  $\|\cdot\|_1$  and  $\|\cdot\|_\infty$  on  $R^n$ . Prove that  $\|x\| = \frac{1}{3} \|x\|_1 + \|x\|_\infty$  defines a norm on  $R^n$ .  
(b) Define equivalent norms on a vector space  $X$  and give examples with proof for two equivalent norms and for two non-equivalent norms.  
(c) Let  $B(X, Y)$  be the space of all linear bounded operator  $T$  on a normed space  $X$  into normed space  $Y$  with the norm:

$$\|T\| = \sup_{x \neq 0} \left\{ \|Tx\|, \|x\| = 1 \right\}$$

Prove that  $B(X, Y)$  is a Banach space if  $Y$  is a Banach space.

**Fifth Question (13 Degree)**

- (a) Let  $T : C[0, 1] \rightarrow C[0, 1]$  be defined by:  $(Tf)(t) = e^t f(t)$ ,  $f \in C[0, 1]$ ,  $0 \leq t \leq 1$ .  
Prove that  $T$  is linear bounded operator and find  $\|T\|$ .  
(b) Give an example of non-bounded operator on a normed space  $(X, \|\cdot\|)$ .  
(c) Prove that the canonical mapping  $C : X \rightarrow X^{**}$  is isometric isomorphism of a normed Space  $X$  into its second dual  $X^{**}$ .



**Answer the following questions:**

1) Use the central limit theorem to generate a single observation from the binomial distribution with parameters  $n$  and  $p$ , and write the corresponding algorithm. (7 Marks)

2) Explain how to use the Monte Carlo integration method to compute the integrals: (i)  $\int_{-5}^5 \frac{e^x}{x} dx$ , (ii)  $\int_0^\infty x^5 e^{-x} dx$  (7 Marks)

3) Explain the LSP to approximate a function by a linear approximation and use it to approximate the following function:

$$y(t) = \cos t, [0, \frac{\pi}{2}] \quad (7 \text{ Marks})$$

4) Explain the Box-Muller transformation method to generate random sample of size 20 from the Normal distribution  $N(5,16)$  with mean 5 and standard deviation 4, and write the corresponding algorithm. (8 Marks)

5) Use the importance sampling method to compute the integrals: (7 Marks)

$$(i) \int_{-\infty}^2 e^{-\frac{z^2}{2}} dz, \quad (ii) \int_4^\infty \frac{1}{1+x^2} dx$$

6) Use an appropriate method to generate random sample of size  $n$  from the Beta distribution with probability density function  $f(x) = \frac{1}{B(\alpha, \beta)} x^{\alpha-1} (1-x)^{\beta-1}$ ,  $0 < x < 1$ , and write the corresponding algorithm. (7 Marks)

7) Solve the following non linear equations by Newton method and write the corresponding algorithm :

$$e^x - e^y = 0, \ln(1+x+y) = 0, x_0 = y_0 = 0.5 \quad (7 \text{ Marks})$$

=====



1st Term 2018/2019

**Final Exam for Level 4**  
**Subject: Software Design and Engineering**  
**Course No. MC467**  
**Time: 2 Hours**

**Mathematics Dept.**  
**Faculty of Science**  
**Assiut University**

**Answer the following questions (50 marks)**

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Q1</b> | <p>a) What are the <b>umbrella activities</b>?</p> <p>b) Describe the <b>Rapid Prototyping</b> for software development and list three advantages and weaknesses for this software development.</p> <p>c) What are the main differences between <b>equivalence testing</b> and <b>boundary testing</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>15 marks</b> |
| <b>Q2</b> | <p>a) State the requirements and use cases for the following user story” the learning system must have three subjects math, Arabic, and English. Each user has an account. For each subject there are material and tests “</p> <p>b) Define the concepts and extract the responsibilities for each concept in (a).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>15 marks</b> |
| <b>Q3</b> | <p>Show <b>system sequence diagram</b> and <b>domain model</b> for <b>Unlock Use case</b>.</p> <hr/> <p><b>Use Case UC-1:                      Unlock</b></p> <p>Related Requirements:      REQ1, REQ3, REQ4, and REQ5 stated in Table 2-1</p> <p>Initiating Actor:              Any of: Tenant, Landlord</p> <p>Actor’s Goal:                      To disarm the lock and enter, and get space lighted up automatically.</p> <p>Participating Actors:        LockDevice, LightSwitch, Timer</p> <p>Preconditions:                      • The set of valid keys stored in the system database is non-empty.</p> <p>                                             • The system displays the menu of available functions; at the door keypad the menu choices are “Lock” and “Unlock.”</p> <p>Postconditions:                      The auto-lock timer has started countdown from autoLockInterval.</p> <p>Flow of Events for Main Success Scenario:</p> <p>→        1.      Tenant/Landlord arrives at the door and selects the menu item “Unlock”</p> <p>             2.      <u>include::AuthenticateUser (UC-7)</u></p> <p>             System (a) signals to the Tenant/Landlord the lock status, e.g.,</p> <p>←        3.      “disarmed,” (b) signals to LockDevice to disarm the lock, and (c) signals to LightSwitch to turn the light on</p> <p>←        4.      System signals to the Timer to start the auto-lock timer countdown</p> <p>             Tenant/Landlord opens the door, enters the home [and shuts the door</p> <p>→        5.      and locks]</p> | <b>10 marks</b> |



|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Q4 | <p><b>Complete the following:</b></p> <p>a) ____ (1) ____ is a description of the sequence of activities carried out in an SE project,.</p> <p>b) ____ (2) ____ simulates the components that are called by the tested component.</p> <p>c) ____ (3) ____ test verifies non-functional requirements</p> <p>d) ____ (4) ____ who needs to work together, not how they work together</p> <p>e) Code coverage criteria include: ____ (5) ____ and ____ (6) ____</p> <p>f) System Sequence Diagrams considered interactions between the ____ (7) ____</p> <p>g) ____ (8) ____ requirements define factors, such as I/O formats, storage structure, computational capabilities, timing, and synchronization.</p> | <p><b>10 marks</b></p> |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|

Best Wishes, Dr. Hanaa A. Sayed



2018/2019  
Date: 20.01.2019

1st Term  
Fourth Year  
Subject: Neural Network  
Time: 2 Hours



Mathematics Dept.  
Faculty of Science  
Assiut University

**Answer the following questions**

**Questions are in two pages**

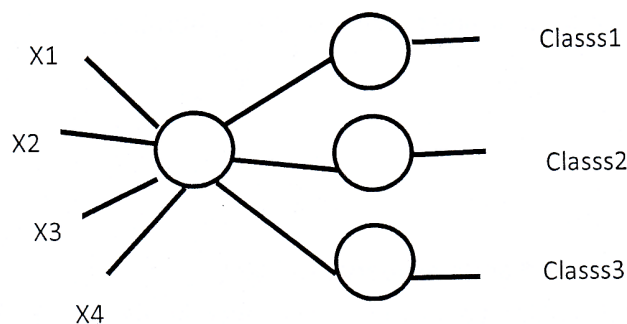
**Q1. Solve only Four points (12 marks)**

- Explain the neural network to your friend who is studying physics or biology.
- Explain the training of neural network using the linear regression problem ( $y=ax+b$ ).
- What is the computational graph? What are the advantages of using the computational graph to represent the neural network?
- What is the main limitation in AdaGrad method? How can the newest method overcome this limitation?
- Write the formal algorithm that describes the adam method.

**Q2. (16 marks)**

For the next network, do these requirements:

- Build this network using KERAS and computational graph.



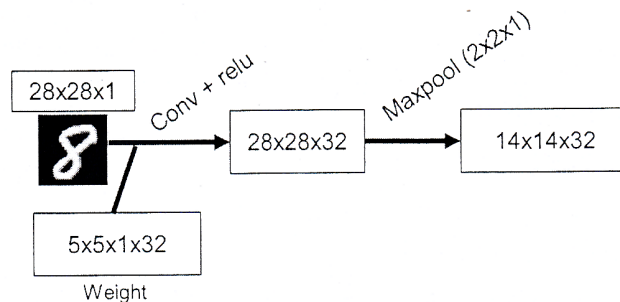
b) Solve only **three** points

- Use KERAS to update the weights using adam.
- Write a Tensorflow code to update the weights in this network using SGD method.
- Train this network using KERAS.
- Extract the weights from the KERAS model. Use these weights to classify new examples

.....  
**Please, the other questions are in the next page.**

**Q3. (12 marks)**

a) Convert the next flowchart to a Tensorflow code.



b) Solve only **three** points

1. What is the main advantage of using Deep Learning?
2. Explain the main Deep Learning operations: Convolution and maxpool to the next matrix and kernel (compute only one row for the convolution operation)

$$\text{matrix} = \begin{bmatrix} 1 & 2 & 3 & 4 & 3 \\ 1 & 0 & 1 & 1 & 2 \\ 3 & 3 & 2 & 1 & 1 \\ 3 & 3 & 1 & 2 & 1 \\ 0 & 0 & 1 & 1 & 1 \end{bmatrix}, \text{kernel} = \begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & -1 \\ 1 & -1 & -1 \end{bmatrix}$$

3. Explain the complexity of learning process of Deep Learning. Give some examples for money and time cost for learning process of Deep Learning.
4. Draw AlexNet

**Q4. Solve only Five points (10 marks)**

- a) Compare between the supervised and unsupervised learning.
- b) What is the Encoding and Decoding operations in autoencoder network?
- c) Give some applications for the autoencoder network.
- d) What are the application of Recurrent Neural Network.
- e) Draw the computation graph that represents many-to-many Recurrent Neural Network.
- f) Draw a figure that illustrates how Deep Learning with Recurrent Neural Network are used to predict the image-captioning problem.

---

All of the best wishes,  
Dr. Ibrahim Elsemman





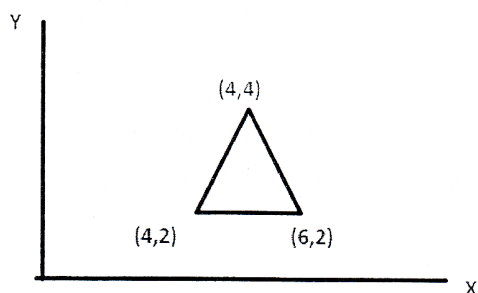
1st Term 2018/2019

Final Exam for Level 4 Faculty of Science  
Subject: Computer Graphics MC461  
Time: 2 Hours

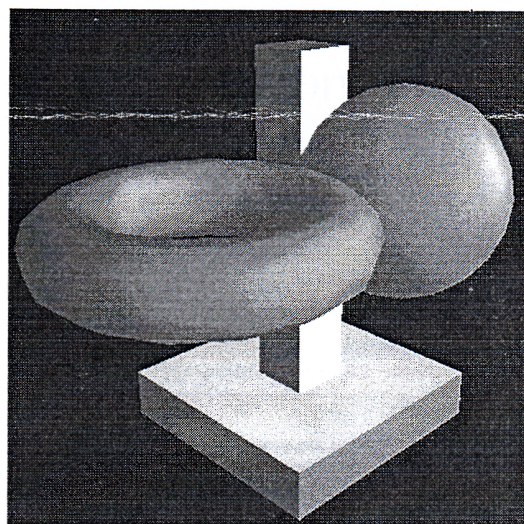
Mathematics Dept.  
Faculty of Science  
Assiut University

**Answer the following questions (50 marks)**

- Q. 1** Write the display function that draws the following triangle then rotate it by  $90^\circ$  around Y axis 10 marks



- Q. 2** Write the display function that draws the scene shown in the image below: 10 marks



- Q. 3** What are the differences between: 10 marks
- a) the function **glOrtho()** and the function **gluPerspective()**
  - b) **Double-buffering** and **depth buffer**
  - c) **Diffuse term** and **specular term** in the material

**Q. 4 Complete the following:**

**10 marks**

- To rotate about any arbitrary point **P** in space, so .....(1).....that P coincides with the origin, then .....(2)....., then .....(3).....
- .....(4).... space where the scene and viewing specification is made
- The .....(5)..... is a region of memory sufficiently large to hold all pixels of the display.
- In this course we use three libraries for writing OpenGL programs: GL, GLU and .....(6).....
- .....(7).....shading: single color per polygon
- .....(8)..... pops the current matrix stack, moving each matrix in the stack one position towards the top of the stack,

**Q. 5 Explain clearly what each function call does:**

**10 marks**

- a) glutDisplayFunc (display);
- b) glutMainLoop ();
- c) glFlush ( void );
- d) glMatrixMode (GL\_PROJECTION);
- e) glLineStipple ( );

**Best Wishes, Dr. Hanaa A. Sayed**

|                                               |                                                                                   |                                                                  |
|-----------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------|
| Department of Mathematics                     |  | قسم الرياضيات                                                    |
| Faculty of Science                            |                                                                                   | كلية العلوم                                                      |
| امتحان نهائي الفصل الدراسي الثاني ٢٠١٨/٢٠١٩ م |                                                                                   |                                                                  |
| التاريخ : ١٢ يناير ٢٠١٩<br>الزمن : ساعتان     | شعبة : رياضيات<br>رقم المقرر ورمزه : ٤٣١ ر                                        | اسم المقرر : هيدروديناميكا ومرونة (١)<br>الدرجة الكلية : ٥٠ درجة |

أجب عن أربعة فقط مما يأتي :

١- أ) استنتج العلاقات التي تعطي قيم القوي الخارجية بدلالة مركبات الاجهادات الداخلية .

(6.5 درجة)

ب) في جسم مرن كانت حالة الاجهاد تعطي من

$$\sigma_x = 2xy, \quad \tau_{xy} = 5y^2, \quad \tau_{yz} = 2z, \quad \sigma_y = \sigma_z = \tau_{zx} = 0$$

اوجد الاجهاد عند النقطة  $(2, 1, \sqrt{3})$  التي تقع علي المستوي المماس للاسطوانة

(6 درجات)

$$y^2 + z^2 = 4$$

(6 درجات)

٢- أ) كيف يمكنك تعيين الانفعال الطولي لعنصر مرن ،

ب) استنتج مركبات الانفعال بدلالة مركبات الاجهاد ، ومن ثم استنتج قانون هوك الحجمي .

(6.5 درجة)

(6 درجات)

٣- أ) كيف يمكنك اشتقاق المعادلة الاتجاهية الديناميكية المرنة

ب) اكتب الطرق المستخدمة في وصف حركة الموائع ، ثم استنتج دالة الجهد المركب لمزدوج .

(6.5 درجات)

٤- أ) اكتب نص نظرية بلازيوس ، انسياب منتظم له السرعة U عند اللانهاية ينساب في الاتجاه

الموجب لمحور x يمر علي اسطوانة دائرية ثابتة نصف قطرها a مع وجود لف حولها شدته k

احسب الضغط المؤثر علي الاسطوانة والعزم حول مركزها .

ب) استخدم التحويل  $\zeta = z^3$  لنقل المنطقة في المستوي z المحددة بالاقواس الدائرية

(6 درجات)  $r = 9 \text{ cm}, r = 5 \text{ cm}$  وانصاف الاقطار  $\theta = 0, \theta = \pi/3$

٥ - أ) استنتج معادلات حركة مائع لزج غير قابل للتضاغط، ثم ادرس حركة مستوي لانهاية

الطول تحرك فجأة في مستواه بسرعة ثابتة في مائع لزج غير قابل للتضاغط . (6.5 درجة)

ب) اكتب نظرية باي للتحليل البعدي ، ثم استخدمها في ايجاد قانون قوة المقاومة المؤثرة علي

وحدة السطوح من جدار انبوبة مع فرض انها دالة في معامل اللزوجة  $\mu$  والكثافة  $\rho$  والقطر d

والسرعة v . (6 درجات)

د/فكري محمد حادي ، د/حسين السيد حسن حماد

انتهت الأسئلة مع تمنياتي بالنجاح







الامتحان النهائي للفصل الصيفي ٢٠١٧ / ٢٠١٨ م

الفرقة : الرابعة علوم رياضيات

التاريخ: ٢٠١٨ / ٩ / ٦ م  
الزمن: ٣ ساعات

الدرجة الكلية: ٥٠ درجة

اسم المقرر: نمذجة رياضية

أجب عن خمسة اسئلة فقط مما يلي: (كل سؤال ١٠ درجات)

١- (أ) عرف النمذجة الرياضية واذكر المراحل الاساسية لها وناقش احداها بالتفصيل.  
(ب) ارسم خريطة توضيحية لوصف عملية النمذجة الرياضية لمسألة هندسية لاستطالة زنبرك اذا كانت قوة الاستطالة = ٣ سم.

٢- (أ) ناقش الاخطاء التي قد تتعرض لها في النمذجة الرياضية من خلال ايجاد المتوسط الحسابي والانحراف المعياري للحسابات المبينة في الجدول الاتي وذلك لا قرب رقمين عشريين:

|   |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|
| x | 1.1 | 1.3 | 1.5 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 |
|---|-----|-----|-----|-----|-----|-----|-----|-----|

(ب) لديك الدالة  $f(x) = 2 - \sqrt{x}$  اوجد النقطة على منحنى هذه الدالة والتي تجعل مربع المسافة بينها وبين النقطة (1, 2) أصغر ما يمكن.

٣- وفق القانون:  $i = ae^{bt}$  لقيم الجدول الاتي الذي يبين فئة من النتائج تقيس التيار المناسب عبر دائرة كهربية خاصة وذلك باستخدام طريقة المربعات الصغرى. من ثم اوجد القيمة المتوقعة للتيار المناسب عند الزمن 8.2.

|        |       |      |      |      |      |      |      |
|--------|-------|------|------|------|------|------|------|
| $t(s)$ | 1     | 2    | 3    | 4    | 5    | 6    | 7    |
| $i(A)$ | 12.32 | 6.12 | 3.04 | 1.51 | 0.75 | 0.37 | 0.18 |

٤- باستخدام طريقة المربعات الصغرى اوجد معاملات كثيرة حدود من الدرجة الاولى مرة ومن الدرجة الثانية مرة اخرى بحيث يمثلان قيم التجربة المعطاة الآتية:

|   |      |      |       |       |      |
|---|------|------|-------|-------|------|
| x | 0    | 1    | 2     | 3     | 4    |
| y | 0.99 | 0.03 | -1.02 | -1.94 | -3.4 |

٥- (أ) من مفهوم النمذجة الرياضية استنتج العلاقة الرياضية لمعادلة لابلاس.

(ب) استخدم طريقة لاجرانج في حل المشكلة الآتية:

$$\text{minimize: } f(x, y) = k x^{-1} y^{-2}, \quad \text{Subject to: } g(x, y) = x^2 + y^2 - a^2 = 0$$

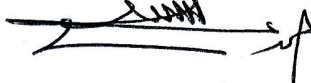
حيث  $a, K$  كميات ثابتة.

٦- (أ) عرف الشد السطحي ثم استنتج العلاقة الرياضية له ومن ثم اوجدها لفقاعة الصابون.

(ب) استخدم طريقة K-B لاجاد الحل التقريبي للنظام الفيزيائي التذبذبي  $\ddot{\theta} + \omega^2 \theta = \varepsilon \theta$  عندما يكون التردد الطبيعي للنظام ثابت.

إنتهت الأسئلة .... مع دعواتنا لكم بالتوفيق والنجاح

أ. د/ حمدي نور الدين أ. د/ محمود حامد عبيد الله





**Assiut University**  
**Faculty of Science**  
**Mathematics Dept.**

**Final Exam**  
**Course: Computer Security**  
**Course code: MC453**

**Date: 6-9-2018**  
**Level: Fourth**  
**Time: 2 Hour**



**Part 1- Put True or False for each of the following items (10 marks):**

1. An encryption algorithm transforms plaintext into simple text.
2. Integrity prevent unauthorized reading of information.
3. Confidentiality keep data and resources hidden.
4. Modification is an attack on integrity.
5. Original message, before being transformed, is plaintext.
6. A substitution cipher replaces one symbol with two symbols for each.
7. The resulting ciphertext depends only on the original plaintext message.
8. When the encryption and decryption keys are the same this form is called asymmetric encryption.
9. Asymmetric encryption, often called "public key" encryption.
10. In Asymmetric encryption, public key and private key are not related.

**Part 2- Answer the following questions (40 marks):**

1. What is the purpose of computer security?
2. What is the meaning of CIA in computer security?
3. Define the following terms
  - a. Plaintext
  - b. Ciphertext
  - c. Encryption
  - d. Decryption
4. Encrypt the message "this is an exam" using Atbash Cipher
5. What is a hash function?
6. What is the difference between Symmetric algorithms and Asymmetric algorithms
7. What is the difference between Block Ciphers and Stream Ciphers
8. Encrypt the message "War Lost" using Affine Cipher (key=10 and m=7)

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

*Best Wishes*  
*D/Rasha Mahmoud*

|                                  |                                                                                   |                                      |
|----------------------------------|-----------------------------------------------------------------------------------|--------------------------------------|
| Department of Mathematics        |                                                                                   | قسم الرياضيات                        |
| Faculty of Science               |  | كلية العلوم                          |
| امتحان نهائي الفصل الصيفي ٢٠١٨ م |                                                                                   |                                      |
| التاريخ: ٢٠١٨/٩/٣                | شعبة: رياضيات                                                                     | للفرقه: الرابعة                      |
| الزمن: ساعتان                    | رقم المقرر ورمزه: ٤٣١ ر                                                           | اسم المقرر: هيدروديناميكا ومرونة (١) |

أجب عن أربعة فقط مما يأتي:

١- أ) أثبت أن  $\phi = (x-t)(y-t)$  تمهل جهد السرعة لمائع غير قابل للانضغاط في بعدين. وأثبت أن خطوط الانسياب

$$\phi = (x-t)^2 + (y-t)^2 = C^2 \quad \text{عند الزمن } t \text{ تمثل بالمنحنيات}$$

$$\ln(x-y) = \frac{x+y}{2} - \frac{A}{2(x+y)} + B \quad \text{وأن مسار الجزيئات يعطى بالمعادلة}$$

حيث  $A, B, C$  ثوابت (6.5 درجة)

(ب) اكتب مع البرهان نظرية بلازيوس. (6 درجات)

٢- أ) منبعان شدة كل منهما  $m$  وضعا عند النقطتين  $(\pm a, 0)$  في مائع غير محدود. أثبت أنه عند أي نقطة على الدائرة

$x^2 + y^2 = a^2$  فإن سرعة المائع تكون موازية لمحور  $y$  وتتناسب عكسياً مع الاحداثي الصادي لها. أوجد أيضاً النقطة على المحور الصادي التي تكون عندها السرعة أكبر ما يمكن. (6.5 درجة)

(ب) في حالة حركة مائع لزج غير قابل للانضغاط والذي يوصف بالمعادلة  $\frac{\partial u}{\partial t} = \nu \frac{\partial^2 u}{\partial y^2}$  والتي تحقق الشروط

$$u(0, t) = U_0, u(y, 0) = 0 \text{ and } u(\infty, t) = 0, t > 0, y > 0.$$

استخدم التحويلات  $\eta = \frac{2y}{\sqrt{\nu t}}, u = U_0 f(\eta)$  لتحويلها إلى معادلة تفاضلية عادية. ثم أوجد حلها. (6 درجات)

٣- أ) إذا كانت مركبات السرعة في مائع متحرك في اتجاهات المحاور هي  $u = x + t, v = -y + t, w = 0$  فأوجد:

(i) معادلة الخطوط الانسيابية ثم معادلة الخط الانسيابي المار بالنقطة  $A(-1, -1)$  عند  $t = 0$ .

(ii) مسار النقطة  $M$  التي كانت تشغل في اللحظة  $t = 0$  الموضع  $A(-1, -1)$ . (6.5 درجة)

(ب) إذا علم أن مركبات الانفعال عند نقطة ما في جسم مرن مجهد هي:

$$\epsilon_x = \epsilon_y = \epsilon_z = \epsilon_{xy} = 0, \epsilon_{yz} = ax, \epsilon_{xz} = -ay$$

احسب مركبات متجه الإزاحة. (6 درجات)

٤- أ) كيف يمكنك إيجاد القيمة العظمى لإجهاد القص. (6 درجات)

(ب) إذا كان  $G$  معامل المرونة على القص،  $E$  معامل ينج،  $\nu$  معامل بواسون فأثبت أن:

$$G = \frac{E}{2(1+\nu)} \quad (6.5 \text{ درجة})$$

٥- أ) كيف يمكنك تعيين الانفعال الطولي لعنصر مرن. (6 درجات)

(ب) عنصر مستو تؤثر على وجهيه المتعامدين والأساسيين الإجهادات التالية:

$$\sigma_1 = 80 \text{ kp/Cm}^2, \sigma_2 = -20 \text{ kp/Cm}^2$$

أوجد الإجهادات المؤثرة على الوجه الذي اتجاهه يصنع زاوية  $30^\circ$  مع الاتجاه الأساسي الأول  $\sigma_1$ . (6.5 درجة)

حظ موفق ان شاء الله ----- أ.د. فؤاد سيد إبراهيم & د. حسين حماد





## Operation Research (414 R)

Math.Dep.

Summer Exam: 2018 Time: 3 Hours

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### Answer 4 Questions Only From the Following

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

given problem  $\text{Min } f(\underline{x})$ ,  $\underline{x} \in R^n$

, where  $f(\underline{x})$  is a continuous and differentiable function for all needed order

-b) Find the extreme points of the function

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

2-a) Derive the constraint variation method and then the

Lagrange Multiplier method for the following problem

$$\text{Mini } f(x_1, x_2) \quad \text{Subject to } g(x_1, x_2) = 0$$

-b) Use the LaGrange multiplier method to solve

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

$$\text{S.t } c(\underline{x}) = x_1^2 + x_2^2 = 8$$

3-a) The well known Newton-Raphson method used to solve the non-linear equation  $f(x) = 0$ . can be easily adopted to find the extreme values of the single variable optimization.

*See Next Page*

Derive the adopted formula and find the convergence necessary condition

b) Use the derived formula for two iterations only to solve the problem  $\text{Min } f(\underline{x}) = x^2 - 5x - 6 = 0$ .

$$x_0 = 0.5, \varepsilon = 10^{-4}$$

4-a) Derive the necessary and sufficient conditions for  $x^*$  to be a local minimum point for the problem

$$\text{Min } f(x)$$

-b) Find the extreme points of the following function

$$f(x) = 12x^5 - 45x^4 + 40x^3 + 7$$

5-a) If  $\underline{c}^k$  and  $\underline{d}^k$  are the gradient vector and the descent direction of the continuous and differentiable function

$$f(\underline{x}), \underline{x} \in R^n \text{ at the point } \underline{x}^k, \text{ then prove that } \underline{c}^k \cdot \underline{d}^k < 0$$

-b) Use the gradient method to solve the problem

$$\text{Min } f(\underline{x}) = 2x_1^2 + x_2^2 + 2x_1x_2 + x_1 - x_2, \underline{x}_0 = (0, 0), \varepsilon = 10^{-2}$$

b) Use the derived formula for two iterations only to solve the problem  $\text{Min } f(\underline{x}) = x_1^2 + 2x_2^2 - 4x_1 - 2x_1x_2,$

$$\underline{x}^0 = (0.1), \varepsilon = 10^{-4}$$

Best Wishes

Taha Elgindy Alaa Faheem





**Assiut University**  
**Faculty of Science**  
**Mathematics Dept.**

**Final Exam Summer 17-18**  
**Course: Data Communication**  
**Course code: 463** رك

**Date: 27-8-2018**  
**Level: Fourth**  
**Time: 2 Hour**



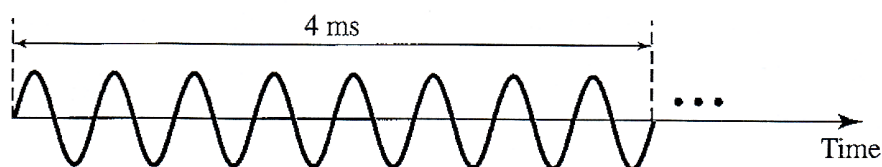
**Answer the following Questions**

**Question (1) True (T) or False (F). (10 points)**

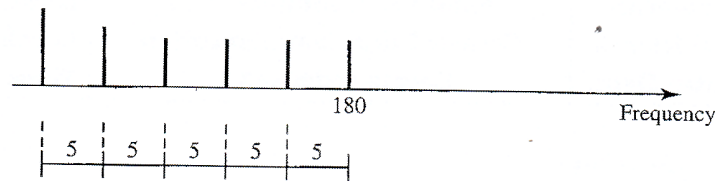
|     |                                                                                                                                           |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | The Physical layer Covers the physical interface between a data transmission and a transmission medium or network                         |
| 2.  | A TCP Segment contains some control info. Such as Destination port, Sequence number and Checksum                                          |
| 3.  | TCP header size is larger than UDP header                                                                                                 |
| 4.  | IPv6 space is wider than IPv4                                                                                                             |
| 5.  | Attenuation means that signal strength falls off with distance                                                                            |
| 6.  | Delay Distortion only occurs in guided media                                                                                              |
| 7.  | Twisted pair (with loading) frequency range is from 0 to 3.5 kHz                                                                          |
| 8.  | twisted pair is subject to external electromagnetic interference                                                                          |
| 9.  | An increase in data rate increases bit error rate (BER)                                                                                   |
| 10. | Increasing the number of quantization levels increases the data rate                                                                      |
| 11. | The main Characteristics of a crosstalk noise is that it has a short duration and high amplitude                                          |
| 12. | Intermodulation noise is introduced due to thermal agitation of electrons                                                                 |
| 13. | Shanon Bandwidth consider noise free channels                                                                                             |
| 14. | Greater capacity is the main benefit beyond using twisted pair cables                                                                     |
| 15. | Twisted pair quality greater than Optical Fiber                                                                                           |
| 16. | An increase in bandwidth allows an decrease in data rate                                                                                  |
| 17. | OSI model is 6 layers whether TCP/IP Model is only five                                                                                   |
| 18. | The main benefit of Optical fiber is Greater bandwidth and greater repeater spacing                                                       |
| 19. | Free space loss in wireless communication is proportional to the square of distance whether in wired media is few decibels per kilometer. |
| 20. | Microwaves is directional and radio waves is omnidirectional                                                                              |

**Question (2) Solve the following problems. (10 points)**

A. What is the frequency of the signal in the following Figure?



B. What is the bandwidth of the composite signal shown in the following Figure?



**Question (3) Answer the following . (10 Points)**

A. Sound may be modeled as sinusoidal functions. Compare the relative frequency and wavelength of musical notes. Use 330 m/s as the speed of sound and the following frequencies for the musical scale.

| Note | C   | D   | E   | F   | G   | A   | B   | C   |
|------|-----|-----|-----|-----|-----|-----|-----|-----|
| Freq | 264 | 287 | 330 | 352 | 396 | 440 | 495 | 528 |
|      |     |     |     |     |     |     |     |     |

B. Decompose the signal  $(1 + 0.1\cos 5t)\cos 100t$  into a linear combination of sinusoidal functions, find the signal bandwidth and draw its spectrum.

**Question (4) Answer the following . (10) Point**

A-Given an amplifier with an effective noise temperature of 10,000 K and a 10-MHz bandwidth, what thermal noise level, in dBW, may we expect at its output?

B-A digital signaling system is required to operate at 9600 bps.If a signal element encodes a 4-bit word, what is the minimum required bandwidth of the channel?

**Question (5) Answer the following. (10 Points)**

A. Draw the OSI Model and state only two functions for every layer

B. What is the main advantages of the layered model adopted in OSI.

Assiut University  
Faculty of Science  
Math. Dep.

4th Mathematics  
Complex Analysis 412M  
Instructor: Professor Dr. Mohamed Abd El-Rahman Ahmed

Time: 3 hours  
Summer : 2018

**Answer only five of the following questions:**

1- a) State and prove Cauchy Integral Formula. (4 degrees)

b) Verify that:

$$\frac{z_1 \cdot z_3}{z_2 \cdot z_4} = \frac{z_1}{z_2} \cdot \frac{z_3}{z_4}; \quad z_2 \neq 0, \quad z_4 \neq 0, \quad \ln(z) = \ln|z| + i(\arg(z) + 2n\pi); \quad n = 0, \pm 1, \quad (6 \text{ degrees})$$

$$\sinh(z) = \sinh(\operatorname{Re}(z)) \cdot \cos(\operatorname{Im}(z)) + i \cosh(\operatorname{Re}(z)) \cdot \sin(\operatorname{Im}(z))$$

2- a) Mention with details four properties that are satisfied for real functions  
And not satisfied for corresponding complex functions. (5 degrees)

b) Show that  $z\bar{z} = |z|^2 \quad \forall z \in \mathbb{C}$  and deduce that

$$||z_1| - |z_2|| \leq |z_1 - z_2| \quad \forall z_1, z_2 \in \mathbb{C}. \quad (5 \text{ degrees})$$

3- a) Give and prove the characterization of the limit of complex-valued functions. (4 degrees)

b) Solve the equations  $e^{2z-1} = 1, \quad \cos(z) = 2, \quad \ln(z) = \frac{\pi}{2}i, \quad \sinh(z) = i.$  (6 degrees)

4- a) State and prove Residue Theorem. (4 degrees)

b) Write Cauchy-Riemann equations at a point. Use these equations to exhibit that the function  $f(z) = |z|^2$  hasn't derivative at any point  $z \neq 0$ . (6 degrees)

5- a) Give and prove the characterization of the continuity of complex-valued functions. (4 degrees)

b) (I) Using Residue Theorem, evaluate  $\int_C \frac{3z^2 + 2}{(z-1)(z^2 + 9)} dz$  taken counterclockwise around the circle  $|z-2| = 2$ .

(II) Write Laurent series of the function  $\frac{z-1}{z^2}$  for the domain  $|z-1| > 1$ . (6 degrees)

6- a) State and deduce the characterization of the convergence of complex series. (4 degrees)

b) Using Cauchy Integral Formula for Derivatives of Analytic Functions, find:

$\int_C \frac{5z-2}{z^3(z-3)} dz$  where  $C$  is the circle  $|z| = 2$ , described counterclockwise. (6 degrees)

**The End**

**GOOD LUCK**



جامعة أسيوط  
كلية الحقوق

الخميس : ٢٠١٨/٩/٦ م  
الزمن : ٩ - ١١ صباحاً  
( ساعتان )

امتحان مقرر " حقوق الإنسان "

لطلاب كلية العلوم - الفصل الصيفي ٢٠١٨ م

ملحوظة : على الطالب الإجابة عن الأسئلة المطلوبة فقط ، ولايُلتفت إلى الإجابة الزائدة .

أجب عن سؤالين فقط من الأسئلة الآتية : ( خمس وعشرون درجة لكل سؤال )

السؤال الأول :

ما المقصود بحقوق الإنسان ؟ مع شرح خصائصها ؟ مبيناً أنواعها ؟

السؤال الثاني :

تكلم عن الإعلان العالمي لحقوق الإنسان من حيث :

أ- القيمة القانونية للإعلان العالمي لحقوق الإنسان .

ب- حقوق الإنسان التي تضمنها الإعلان .

السؤال الثالث :

من الأمور التي ساوى الإسلام فيها بين الرجل والمرأة :

(١) في الحقوق السياسية .

(٢) في حق التعلم .

وضح ذلك ؟

السؤال الرابع :

من الأمور التي فرق الإسلام فيها بين الرجل والمرأة :

(١) الميراث .

(٢) شهادة الشهود .

وضح ذلك ؟

( انتهت الأسئلة )

مع تمنياتنا بالنجاح والتوفيق ،،،

د. بدر أحمد محمد عبد السلام