

Answer the following questions: (50 Marks)

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

1. An assault on system security that derives from an intelligent threat
 - A. Attack.
 - B. Threat.
 - C. Vulnerability.
 - D. Risk.
2. An expectation of loss expressed as the probability that a particular threat will exploit a particular vulnerability with a particular harmful result
 - A. Attack.
 - B. Threat.
 - C. Vulnerability.
 - D. Risk.
3. Possible danger that might exploit a vulnerability
 - A. Attack.
 - B. Threat.
 - C. Vulnerability.
 - D. Risk.
4. Flaw or weakness in a system's design, implementation, or operation and management that could be exploited to violate the system's security policy.
 - A. Attack.
 - B. Threat.
 - C. Vulnerability.
 - D. Risk.
5. An action, device, procedure, or technique that reduces a threat, a vulnerability
 - A. System resource.
 - B. Countermeasure.
 - C. Security policy.
 - D. Adversary.
6. An entity that attacks, or is a threat to, a system.
 - A. System resource.
 - B. Countermeasure.
 - C. Security policy.
 - D. Adversary.
7. Attack that does not affect system resources
 - A. Passive.
 - B. Active.
 - C. Insider.
 - D. Outsider.
8. Attack that initiated from outside the perimeter
 - A. Passive.
 - B. Active.
 - C. Insider.
 - D. Outsider.

9. Attack that initiated by an entity inside the security perimeter
- A. Passive.
 - B. Active.
 - C. Insider.
 - D. Outsider.
10. means used to deal with security attacks
- A. Prevent.
 - B. Detect.
 - C. Recover.
 - D. All previous choices.

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

- 1-Explain the term CIA Triad?
- 2-Mention some of the computer security challenges?

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

- 1-Define the term nonrepudiation and its types?
- 2-Mention the top five security technologies used in practice?

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

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

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

- 1-Explain each of DES and 3DES?
- 2-Explain AES?

Dr. Tarik Ibrahim



2015/2016

Summer Course

Date: 24-8- 2016

Final Exam for Level 4
Subject: Neural Network
Time: 2 Hours

Mathematics Dept.
Faculty of Science
Assiut University

Answer the Following Questions: (50 marks)

Q1.	a. Explain a simple mathematical neuron model with a simple diagram. b. Give a simple definition about Artificial neural networks	(15 marks)
Q2.	Explain three different types of Neuron signal functions	(15 marks)
Q3	a. Write the Backpropagation Algorithm b. Optimize the weights using backpropagation algorithm to correctly map arbitrary inputs to outputs. <pre> graph LR i1((i1)) --- ".15 w1" h1((h1)) i1 --- ".20 w2" h2((h2)) i2((i2)) --- ".25 w3" h1 i2 --- ".30 w4" h2 h1 --- ".40 w5" o1((o1)) h1 --- ".45 w6" o2((o2)) h2 --- ".50 w7" o1 h2 --- ".55 w8" o2 b1((1)) --- ".35 b1" h1 b2((1)) --- ".60 b2" h2 </pre>	(20 marks)

Best Wishes, Dr. Alaa F. Mohamed

Answer only five of the following questions:

1- a) State and prove a characterization of the continuity of a complex-valued function at a point. (10 degrees)

b) Show that

$$\sqrt{2} |z| \geq |\operatorname{Re}(z) - \operatorname{Im}(z)|, \quad |z_1 - z_2| = |z_1| - |z_2| \Leftrightarrow \theta_1 - \theta_2 = 2n\pi, \quad n = 0, \pm 1, \pm 2, \dots$$

(10 degrees)

2- Let $z_1 \neq 0, z_2 \neq 0, z_3 \neq 0$. Is:

$$(I) \frac{z_3 z_4}{z_1 z_2} = \left(\frac{z_3}{z_1} \right) \left(\frac{z_4}{z_2} \right), \quad (II) \overline{\sinh(iz)} = \sinh(-i\bar{z}), \quad (III) ||z_1| - |z_2|| \leq |z_1 - z_2| \leq |z_1| + |z_2|,$$

$$(IV) \operatorname{Arg}\left(\frac{z_1}{z_2}\right) = \operatorname{Arg}(z_1) - \operatorname{Arg}(z_2), \quad (V) \frac{z_1}{z_2 z_3} = \frac{|z_1|}{|z_2| |z_3|} e^{i(\arg(z_1) - \arg(z_2) - \arg(z_3))},$$

(20 degrees)

3- a) State and prove Residue Theorem. (6 degrees)

b) Write Laurent series of the function $\frac{5}{(z+2)(z^2+1)}, \quad 1 < |z| < 2$. (6 degrees)

c) With details, what do you think about the following implication:

not satisfactory of Cauchy-Riemann equations at $z_0 \Rightarrow f'(z_0)$ not exist. (8 degrees)

4- a) State and prove Cauchy Integral Formula. (10 degrees)

b) Solve the equations:

$$e^{i-2z} = 1 - \sqrt{3}i, \quad \sin z = \cosh 4, \quad \cosh z = -2, \quad \ln z = \frac{1}{2} \ln(2) - \frac{\pi}{4}i.$$

(10 degrees)

To behind

5- a) Conclude that the existence of the limit of a complex-valued function f leads to the existence of the limit of a function $|af|$, $a < -1$, given by

$$|af|(z) := |a| |f(z)| \quad \forall z \in C.$$

(5 degrees)

b) Verify that

$$(i) |\cosh(z)|^2 = \sinh^2(\operatorname{Re}(z)) + \cosh^2(\operatorname{Im}(z)),$$

$$(ii) |e^{z^2} + e^{\bar{z}}| \leq e^{|z|^2} + |e^{\bar{z}}|,$$

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

(15 degrees)

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

(6 degrees)

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

(12 degrees)

Finish

GOOD LUCK

Department of Mathematics		قسم الرياضيات
Faculty of Science		كلية العلوم
امتحان نهائي الفصل الصيفي ٢٠١٦ م		
التاريخ: ٢٠١٦/٩/٤ م	شعبة: رياضيات	الفرقة: المستوى الرابع
الزمن: ساعتان	رقم المقرر ورمزه: ٤٣١ ر ر	اسم المقرر: هيدروديناميكا ومرونة (١)

(الدرجة الكلية: ٥٠ درجة)

أجب عن أربعة فقط مما يأتي:

- ١- (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) ادرس حركة مائع لزج بين مستويين نهائيين أحدهما ثابت والآخر يتحرك بسرعة ثابتة U . (6 درجات)

٢- (أ) 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

$$\eta = \frac{2y}{\sqrt{\nu t}}, u = U_0 f(\eta), u(0, t) = U_0, u(y, 0) = 0 \text{ and } u(\infty, t) = 0, t > 0, y > 0.$$

(6.5 درجة)

لتحويلها الى معادلة تفاضلية. ثم أوجد حلها. (U_0, ν ثابتان).

- (ب) أكتب نص نظرية للتحليل البعدي. ثم استخدمها في إيجاد قانون قوة المقاومة τ على وحدة السطوح من جدار أنبوبة على فرض أنها دالة في كل من معامل اللزوجة μ والكثافة ρ والقطر d وسرعة التدفق v . (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 $t = 0$.

(6.5 درجة)

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

(6 درجات)

(ب) استنتج مركبات الانفعال بدلالة مركبات الاجهاد. ومن ثم اوجد قانون هوك للانفعال الحجمي.

٤- (أ) إذا كانت S_x, S_y, S_z هي مركبات القوى الخارجية S المؤثرة على سطح مستوي وكان l, m, n هي جيوب تمام اتجاهه مع محاور الإحداثيات x, y, z على الترتيب. اوجد قيم هذه المركبات بدلالة الاجهادات الداخلية، ومن ثم اوجد مركبة الاجهاد العمودي والمماسي على هذا السطح. (6.5 درجة)

(ب) عند نقطة في جسم مرن مجهود وجد أن حالة الإجهاد هي $\sigma_x = \sigma_y = \sigma_z = \sigma, \tau_{xy} = \tau_{xz} = \tau_{yz} = 0$ عین سطح كوشي للإجهاد في هذه الحالة. (6 درجات)

(6 درجات)

٥- (أ) اثبت أن مجسم الانفعالات هو عبارة عن معادلة سطح من الدرجة الثانية.

(ب) عنصر حجمي تؤثر على وجوهه الاجهادات الآتية:

$$\sigma_x = 120 \text{ dN / Cm}^2, \sigma_y = 45 \text{ dN / Cm}^2, \sigma_z = 20 \text{ dN / Cm}^2, \tau_{xy} = \tau_{yz} = 30 \text{ dN / Cm}^2$$

(6.5 درجة)

احسب: (i) الاجهادات الأساسية. (ii) القيمة العظمى للإجهاد القاص.

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

Answer five questions only: (10 marks for any question)

1-a) For the joint probability mass function $f(x, y) = \frac{1}{32}(x + y)$, $x = 1, 2$, $y = 1, 2, 3, 4$, compute $f_X(x)$, $f_Y(y)$, $\rho(x, y)$, are X and Y dependent or independent.

b) Let $X_1, X_2, \dots, X_n$ be a random sample of size n from the Poisson distribution with parameter λ :
 (i) compute the moments estimator of λ .
 (ii) prove that $\bar{x}$ is a minimum variance unbiased estimator for λ .

2-a) Let $f_X(x) = 24x^2$, $0 < x < 0.5$ and $f(y|x) = \frac{y}{2x^2}$, $0 < y < 2x$, compute $f_{X,Y}(x|y)$.

b) If the two random variables $Z \sim N(0, 1)$ and $U \sim \chi^2(k)$ are independent, find the PDF of $X = Z / \sqrt{U/k}$.

3-a) Let $X_1, X_2, \dots, X_n$ be a random sample of size n from the exponential distribution with parameter θ , compute the Bayes estimator of the parameter θ by assuming a conjugate prior distribution for θ under the squared error loss function.

b) Compute the Fisher information matrix based on a single observation from the $N(\mu, \sigma^2)$ distribution

4) Let $X_1, X_2, \dots, X_n$ be a random sample of size n from a normal distribution $N(\mu, \sigma^2)$:

(i) compute the maximum likelihood estimator of σ^2

(ii) show that $\frac{(n-1)s^2}{\sigma^2} \sim \chi^2(n-1)$, $s^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$

(iii) show that s^2 is consistent estimator of σ^2

(iv) for a random sample of size 25 and $\bar{x} = 80$ from the $N(\mu, 36)$, test $H_0: \mu = 90$ against the test $H_1: \mu \neq 90$ at a significant level $\alpha = 0.05$.

5-a) Let $X_{(1)} < X_{(2)} < \dots < X_{(n)}$ be the order statistics of a random sample of size n from the uniform distribution $U(0, \theta)$:

(i) Compute the maximum likelihood estimator of θ .

(ii) Compute $E(X_n)$ and find the value of c so that cX_n is an unbiased estimator of θ .

b) Construct a $100(1-\alpha)\%$ CI for the variance σ^2 of a normal distribution and for a random sample of size 8 and $\bar{x} = 85$ from the $N(\mu, 72)$ compute a 95% CI for μ .

6-a) Let $X_1, X_2, \dots, X_n$ be a random sample of size n from a population with Pareto density function: $f(x; \theta, \beta) = \theta\beta^\theta x^{-(\theta+1)}$, $\beta \leq x < \infty$, construct a $100(1-\alpha)\%$ CI for the parameter θ when β is known.

b) Let $X_1, X_2, \dots, X_n$ be a random sample of size n from a normal distribution $N(\theta, \sigma^2)$, compute the Bayes estimator of the parameter θ by assuming $\theta \sim N(a, b^2)$ is a conjugate prior distribution for θ when σ^2 is known under the squared error loss function.

Answer the following questions:

(50 Marks)

I. Complete the following statements from the given table.

(20 Marks)

Note: each answer may be used several times.

1	DFA	6	Regular expressions	11	ambiguity	16	LL(1)
2	Shift/reduce conflict	7	four	12	NFA	17	three
3	reduce/reduce conflict	8	parse tree	13	action	18	DFS
4	Optimization	9	LR(1)	14	LALR(1)	19	go to
5	IR Optimization	10	BFS	15	tokens	20	LR(0)

- an error where a shift/reduce parser cannot tell which of many reductions to perform. ()
- Any LR(0) grammar is ()
- are a family of descriptions that can be used to capture certain languages. ()
- Lexical analysis splits input text into ()
- Every SLR(1) grammar is ()
- Encoding the steps in a derivation. ()
- Low-memory has higher scan time. ()
- Leftmost works on all grammars. ()
- Formally, a CFG is a collection of objects. ()
- is impractical because its contextual information makes the automaton too big. ()
- a property of grammars, not languages. ()
- improve the resulting structure. ()
- The worst-case memory usage of is linear. ()
- The table maps state/symbol pairs to a next state. ()
- High-memory has lower scan time. ()

II. Write the scientific term of the following definitions:

(10 Marks)

Definition	Scientific term
1. The piece of the original program from which we made the token	(.....)
2. The leftmost complete cluster of leaf nodes.	(.....)
3. state where the handle might occur, but we might actually need to keep searching.	(.....)
4. Theorem that correctly computes LALR(1) lookaheads.	(.....)
5. Pick the rule that was defined first.	(.....)
6. Identify the meaning of the overall structure.	(.....)
7. Store extra information about the token.	(.....)
8. Match the longest possible prefix of the remaining text.	(.....)
9. The set of terminals that might come after a given nonterminal.	(.....)
10. Recover the structure described by that series of tokens.	(.....)

III. (a) Consider the following grammar:

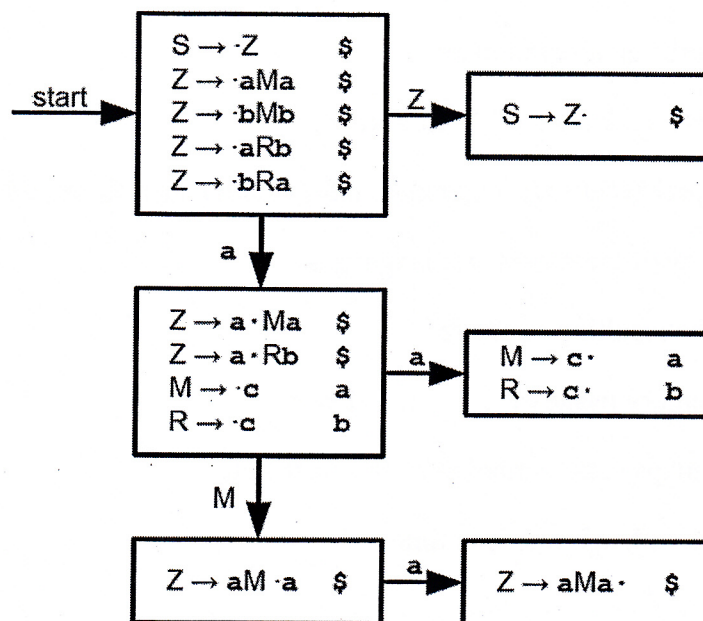
$S \rightarrow Z$

$Z \rightarrow aMa \mid bMb \mid aRb \mid bRa$

$M \rightarrow c$

$R \rightarrow c$

which is known to be LR(1) with the following automaton during a parse of the input **aca**:



Is this grammar is SLR(1)? If you can decide whether the grammar is SLR(1), do so and explain your reasoning. If you cannot decide, explain why not.

III. (b) Consider the following ambiguous grammar:

$E \rightarrow E + E$

$E \rightarrow E * E$

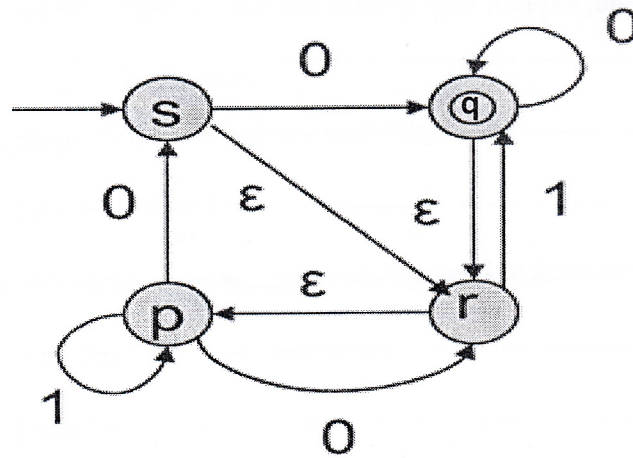
$E \rightarrow \text{int}$

$E \rightarrow (E)$

Explain why this grammar cannot be parsed with an LL(1) parser, even if the parser knew the relative precedence and associativity of addition and multiplication.

IV. (a) Convert the following NFA to DFA:

(5 Marks)



IV. (b) Given the following grammar:

(5 Marks)

$E \rightarrow F$

$E \rightarrow E + F$

$F \rightarrow F * T$

$F \rightarrow T$

$T \rightarrow \text{int}$

$T \rightarrow (E)$

Use the Shift/Reduce Parsing algorithm to derive $\text{int} + \text{int} * \text{int} + \text{int}$

=== With My Best Wishes ===

Dr. Dalía Nashat



امتحان الفصل الثاني ٢٠١٥ / ٢٠١٦ الزمن: ٣ ساعات
المادة (٣٤ ر) النمذجة الرياضية التاريخ: ٢٠١٦-٦-١٨
كلية العلوم - قسم الرياضيات المستوى الرابع

أجب عن خمسة أسئلة فقط مما يلي (الدرجة العظمى خمسون والسؤال عليه عشر درجات يصحح من عشرين وتقسم درجته على ٢) :

١- أذكر الخمس مراحل الأساسية لعملية النمذجة الرياضية وناقش واحدة منها بالتفصيل (١٠ درجات)
ب) كمركبة لوصف عملية النمذجة ناقش كيفية إيجاد القوة اللازمة لاستطالة زنبرك مسافة معينة معطاة ووضح ذلك برسم تخطيطي (١٠ درجات)

٢- باستخدام طريقة المربعات الصغرى أوجد المعاملات لأحسن كثيرة حدود من الدرجة الثانية ممثلة للنتائج الآتية:

٤	٣	٢	١	٠	x
١٥,٦	٩,٢	٤,٢	٠,٨	٠,١	y

٣- من مفهوم عملية النمذجة استنتج الصياغة الرياضية لما يلي:
أ- وتر مهتز (المعادلة الموجية في بعد واحد) (١٠ درجات)
ب- الشد السطحي (١٠ درجات)

٤- ناقش ظاهرة الرنين في الأنظمة الكهربائية والميكانيكية على الترتيب من خلال:
أ- دائرة تتكون من ملف حثي ومقاومة ومكثف وقوة دافعة دورية (١٠ درجات)
ب- نظام ميكانيكي يشابه النظام الكهربائي السابق (١٠ درجات)

٥- أذكر فقط الخطوات اللازمة لنمذجة وتمثيل الأنظمة الديناميكية (٤ درجات)
ب) استنتج شرط استقرار مائع ثقيل فوق مائع خفيف تحت تأثير مجال الجاذبية الأرضية الثابت (مسألة رايلي - تايلور للاستقرار) (١٦ درجة)

٦- أوجد الحل التقريبي للنظام الفيزيائي التذبذبي

$$\ddot{\phi} + \omega^2 \phi = \epsilon \phi$$

أ- عندما يكون التردد الطبيعي للنظام ثابتا (١٠ درجات)
ب- عندما يكون التردد الطبيعي للنظام دالة في الزمن تتغير ببطي (١٠ درجات)

أ. د. جمال مختار محمود راجعه

أ. د. محمود حامد عبيد الله

Department of Mathematics		قسم الرياضيات
Faculty of Science		كلية العلوم
امتحان نهائي الفصل الدراسي الثاني ٢٠١٥/٢٠١٦ م الدرجة الكلية: ٥٠ درجة		
المقرر: (٤١٤ ر) معادلات تفاضلية جزئية	التاريخ: ٢٠ / ٦ / ٢٠١٦	الزمن: ثلاث ساعات

أجب عن خمسة فقط مما يأتي: (١٠ درجات عن كل سؤال - بواقع ٥ درجات عن كل فقرة)

١- أ) باستخدام طريقة لابلاس - أوجد الحل العام للمعادلة التفاضلية

$$x(x-1)r - (x^2-1)s + (x-1)t - p + q = 2x(1-x)^3 e^{2y}.$$

ب) بوضع $x^2 = X, y^2 = Y$ في المعادلة التفاضلية $4xyz = pq + 2x^2yp + 2xy^2q$ ، عين كلا من الحل الكامل والحل المفرد لهذه المعادلة.

٢- أ) باستخدام طريقة أويلر - أوجد الحل العام للمعادلة التفاضلية

$$y^2t - 2xys - 3x^2r - 3xp + yq = xy^2 \cos(\ln y^2).$$

ب) أوجد حلا للمعادلة التفاضلية $(r^2\phi_r)_r + \frac{1}{\sin\theta}(\phi_\theta \sin\theta)_\theta = 0$ على الصورة $\phi = f(r) \cos\theta$ والذي يحقق الشروط

$$\phi_r \rightarrow 0 \text{ عندما } r \rightarrow \infty, \phi_r = -\cos\theta \text{ عند } r = a.$$

٣- أ) عين الشرط اللازم لكي يكون النظام $p_1x_1 + p_2x_2 = p_3^2$ ، $p_1 + p_3 = p_2 + 1$ متوافق ، ثم أوجد الحل الكامل لهذا النظام.

ب) أوجد الحل العام للمعادلة التفاضلية $t - 2xq + x^2z = (x-2)e^{3x+2y}$.

٤- أ) باستخدام طريقة جاكوبي - أوجد الحل الكامل للمعادلة التفاضلية $p_1p_2p_3 = x_1x_2x_3z^3$.

ب) أوجد حل المعادلة التفاضلية $u_{xx} + y u_y + y^2 u_{yy} = 0$ على الصورة $u = XY$ بحيث تحتوي X على دوال مثلثية فقط ، والدالة u تحقق الشروط $u_y = -\cos(2x)$ when $y = a$ ، $u \rightarrow 0$ as $y \rightarrow \infty$.

٥- أ) باستخدام طريقة شاربت - عين كلا من الحل الكامل والحل المفرد (إن وجد) للمعادلة التفاضلية

$$2yz - y^2q - 2xyp + pq = 0.$$

ب) أوجد حل دالمبير لمسألة كوشي لوتر غير منتهي للمعادلة الموجية $t \geq 0, -\infty < x < \infty, u_{tt} = c^2 u_{xx}$ والتي تحقق

الشروط $u(x,0) = f(x), u_t(x,0) = g(x)$ ، ثم أوجد حل هذه المعادلة عندما $f(x) = \sin x, g(x) = \cos x$.

٦- أ) باستخدام طريقة مونج - عين الحل الكامل للمعادلة التفاضلية $(e^x - 1)(qr - ps) = p q e^x$.

ب) أوجد الحل العام للمعادلة التفاضلية $z_{xy} = xy^2$ ثم أوجد الحل الخاص الذي يحقق الشروط

$$z(0,y) = y^2, z(x,1) = \cos x$$

د. محمد عبدالله الرازي

انتهت الأسئلة ،،،



Answer the following questions:

(50 Marks)

I. Choose the correct answer and write it in the answer table:

(20 Marks)

1. The Java compiler produces

- (a) Java bytecode (b) machine language (c) assembly language (d) an iterated list

2. Java can run from a Web browser.

- (a) applications (b) Micro Edition programs (c) servlets (d) applets

3. The extension name of a Java bytecode file is

- (a) .java (b) .obj (c) .class (d) .exe

4. Which of the following is not reserved word?

- (a) public (b) static (c) (d) class

5. A block is enclosed inside

- (a) parentheses (b) braces (c) brackets (d) quotes

6. If a program compiles fine, but it produces incorrect result, then the program suffers a error

- (a) syntax (b) runtime (c) logic (d) style

7. Math.pow (4, 1.0 / 2) returns

- (a) 2 (b) 2.0 (c) 0 (d) 1.0

8. is a template or blueprint for objects.

- (a) Class (b) Identifier (c) Method (d) JVM

9. The expression $4 + 20 / (3 - 1) * 2$ is evaluated to

- (a) 4 (b) 20 (c) 24 (d) 9

10. What is the value of $(\text{double})(5/2)$?

- (a) 2 (b) 2.5 (c) 3 (d) 2.5

11. Which of the following is a possible output from invoking Math.random()?
- (a) 3.43 (b) 0.5 (c) 1 (d) 1.0
12. Assume x = 4 and y = 5, which of the following is true?
- (a) x < 5 && y < 5 (b) x < 5 || y < 5 (c) x > 5 && y > 5 (d) x > 5 || y > 5
13. Suppose x=10 and y=10. What is x after evaluating the expression (y > 10) && (x-- > 10)?
- (a) 9 (b) 10 (c) 11 (d) 12
14. "abc".compareTo("aba") returns.....
- (a) 1 (b) -2 (c) -1 (d) 2
15. Assume s is "ABCABC", the method returns an array of characters.
- (a) String.toCharArray() (b) s.toCharArray() (c) String.toCharArray() (d) toChars(s)
16. Assume double[][] x = new double[4][5], what are x.length and x[2].length?
- (a) 4 and 4 (b) 5 and 4 (c) 4 and 5 (d) 5 and 5
17. Suppose your method does not return any value, which of the following keywords can be used as a return type?
- (a) void (b) int (c) double (d) public
18. represents an entity in the real world that can be distinctly identified.
- (a) A class (b) A method (c) An object (d) A data field
19. The default value for data field of a boolean type, numeric type, object type is, respectively.
- (a) true, 1, Null (b) false, 0, null (c) true, 0, null (d) true, 1, null
20. Which of the following are correct ways to declare variables?
- (a) int length, width; (b) int length; width (c) int length, int width; (d) int length : width

Answer Table

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

II. Write the output of the following blocks of code:

(10 Marks)

No	Code	Output
1.	<pre>for (int i = 1; i <= 10; i++) { System.out.print(i + " "); i++; }</pre>	
2.	<pre>double[] myList = {1, 5, 5, 5, 5, 1}; double max = myList[0]; int indexOfMax = 0; for (int i = 1; i < myList.length; i++) { if (myList[i] > max) { max = myList[i]; indexOfMax = i; } } System.out.println(indexOfMax);</pre>	
3.	<pre>String s1 = new String("Welcome to Java!"); String s2 = s1.toUpperCase(); if (s1 == s2) System.out.println("s1 and s2 reference to the same String object"); else if (s1.equals(s2)) System.out.println("s1 and s2 have the same contents"); else System.out.println("s1 and s2 have different contents");</pre>	
4.	<pre>static void nPrint(String message, int n) { while (n > 0) { System.out.print(message); n--; } }</pre> What is k after invoking nPrint("A message", k)? int k = 2; nPrint("A message", k);	
5.	<pre>int j = 0; int i = ++j + j * 5; System.out.println("What is i? " + i);</pre>	
6.	<pre>int[][] values = {{3, 4, 5, 1}, {33, 6, 1, 2}}; int v = values[0][0]; for (int[] list : values) for (int element : list) if (v > element) v = element; System.out.print(v);</pre>	
7.	<pre>double x = 5.5; int y = (int)x; System.out.println("x is " + x + " and y is " + y);</pre>	

8.	<pre> int sum = 0; int item = 0; do { item++; sum += item; if (sum > 4) break; } while (item < 5); </pre>	
9.	<pre> int number = 6; while (number > 0) { number -= 3; System.out.print(number + " "); } </pre>	
10.	<pre> System.out.println("Java is neat".replaceAll("is", "AAA")); </pre>	

III. Underline the error in each block of code below and correct it:

(10 Marks)

No	Code	Correction
1.	<pre> int count = 0; while (count ≤ 10) { System.out.println("Welcome to Java"); count++; } </pre>	
2.	<pre> int i = 3434; double d = 3434; System.out.printf("%5.1f %5.1f", i, d); </pre>	
3.	<pre> int x; double d = 1.5; switch (d) { case 1.0: x = 1; case 1.5: x = 2; case 2.0: x = 3; } </pre>	
4.	<pre> public class Foo { private int x; public static void main(String[] args) { Foo foo = new Foo(); System.out.println(foo.x); } } </pre>	
5.	<pre> final int[] x = {1, 2, 3, 4}; int[] y = x; x = new int[2]; for (int i = 0; i < y.length; i++) System.out.print(y[i] + " "); </pre>	

II. Write the output of the following blocks of code:

(10 Marks)

No	Code	Output
1.	<pre>for (int i = 1; i <= 10; i++) { System.out.print(i + " "); i++; }</pre>	
2.	<pre>double[] myList = {1, 5, 5, 5, 5, 1}; double max = myList[0]; int indexOfMax = 0; for (int i = 1; i < myList.length; i++) { if (myList[i] > max) { max = myList[i]; indexOfMax = i; } } System.out.println(indexOfMax);</pre>	
3.	<pre>String s1 = new String("Welcome to Java!"); String s2 = s1.toUpperCase(); if (s1 == s2) System.out.println("s1 and s2 reference to the same String object"); else if (s1.equals(s2)) System.out.println("s1 and s2 have the same contents"); else System.out.println("s1 and s2 have different contents");</pre>	
4.	<pre>static void nPrint(String message, int n) { while (n > 0) { System.out.print(message); n--; } }</pre> What is k after invoking nPrint("A message", k)? <pre>int k = 2; nPrint("A message", k);</pre>	
5.	<pre>int j = 0; int i = ++j + j * 5; System.out.println("What is i? " + i);</pre>	
6.	<pre>int[][] values = {{3, 4, 5, 1}, {33, 6, 1, 2}}; int v = values[0][0]; for (int[] list : values) for (int element : list) if (v > element) v = element; System.out.print(v);</pre>	
7.	<pre>double x = 5.5; int y = (int)x; System.out.println("x is " + x + " and y is " + y);</pre>	

8.	<pre> int sum = 0; int item = 0; do { item++; sum += item; if (sum > 4) break; } while (item < 5); </pre>	
9.	<pre> int number = 6; while (number > 0) { number -= 3; System.out.print(number + " "); } </pre>	
10.	<pre> System.out.println("Java is neat".replaceAll("is", "AAA")); </pre>	

III. Underline the error in each block of code below and correct it:

(10 Marks)

No	Code	Correction
1.	<pre> int count = 0; while (count ≤ 10) { System.out.println("Welcome to Java"); count++; } </pre>	
2.	<pre> int i = 3434; double d = 3434; System.out.printf("%5.1f %5.1f", i, d); </pre>	
3.	<pre> int x; double d = 1.5; switch (d) { case 1.0: x = 1; case 1.5: x = 2; case 2.0: x = 3; } </pre>	
4.	<pre> public class Foo { private int x; public static void main(String[] args) { Foo foo = new Foo(); System.out.println(foo.x); } } </pre>	
5.	<pre> final int[] x = {1, 2, 3, 4}; int[] y = x; x = new int[2]; for (int i = 0; i < y.length; i++) System.out.print(y[i] + " "); </pre>	

IV. Write Java programs for the following :

(10 Marks)

1. A program that reads an unspecified number of integers, determines how many positive and negative values have been read, and computes the total and average of the input values (not counting zeros). Your program ends with the input 0.

2. A program with a method that checks whether two words are anagrams. Two words are anagrams if they contain the same letters in any order. For example, silent and listen are anagrams. The header of the method is: **public static boolean isAnagram(String s1, String s2)** the program will prompt the user to enter two strings and, if they are anagrams, displays two strings are anagrams, and displays two strings are not anagrams if they are not anagrams.

=== With My Best Wishes ===

Dr. Dalia Nashat



2015/2016
2nd Term 2015/2016
Date: Jun, 14, 2016

Final Exam for Level 4
Subject: Cryptography course, MC466
Time: 2 Hours
50 points

Mathematics Dept.
Faculty of Science
Assiut University

Q1. (25 points)

Q1.1 Choose the correct answer: (13 points)

1-- We use Cryptography term to transforming messages to make them secure and immune to

- a) Change b) Idle c) Attacks d) Defend

2-- In cryptography, the order of the letters in a message is rearranged by

- a) Transpositional ciphers b) Substitution ciphers
c) Both (a) and (b) d) None of the mentioned

3-- In asymmetric key cryptography, the private key is kept by

- a) Sender b) Receiver
c) Sender and receiver d) All the connected devices to the network

4-- What is data encryption standard (DES)?

- a) Block cipher b) Stream cipher
c) Bit cipher d) None of the mentioned

5-- Cryptanalysis is used

- a) To find some insecurity in a cryptographic scheme b) To increase the speed
c) To encrypt the data d) None of the mentioned

6-- This is a trial and error method used to decode encrypted data

- a) Chaffing and winnowing b) Cryptanalysis
c) Serendipity d) Brute force cracking

7-- This is the inclusion of a secret message in otherwise unencrypted text or images.

- a) Masquerade b) Steganography
c) Spoof d) Eye-in-hand system

8-- In this technique a plaintext is paired with a random secret key.

- a) Tunneling
- b) Personalization
- c) Van Eck phreaking
- d) One-time pad

9-- This is an encryption/decryption key known only to the party that exchange secret messages.

- a) e-signature
- b) Digital certificate
- c) Private key
- d) Security token

10-- Heart of Data Encryption Standard (DES), is the

- a) Cipher
- b) Rounds
- c) Encryption
- d) DES function

11-- In Cryptography, original message, before being transformed, is called

- a) Simple Text
- b) Plain Text
- c) Empty Text
- d) Filled Text

12-- For RSA to work, value of P must be less than value of

- a) p
- b) q
- c) n
- d) r

13-- Data Encryption Standard (DES), was designed by

- a) Intel
- b) IBM
- c) HP
- d) Sony

14-- In symmetric key cryptography, key used by sender and receiver is

- a) Shared
- b) different
- c) two keys are used
- d) None

15-- Keys used in cryptography are

- a) Secret key
- b) Private key
- c) Public key
- d) All of them

16-- A(n) _____ algorithm transforms ciphertext to plaintext.

- a) Encryption
- b) Decryption
- c) Either (a) or (b)
- d) Neither (a) nor (b)

17-- In a(n) _____ cipher, a pair of keys is used.

- a) Symmetric-key
- b) Asymmetric-key
- c) Either (a) or (b)
- d) Neither (a) nor (b)

18-- A _____ cipher replaces one character with another character.

- a) Substitution
- b) Transposition
- c) Either (a) or (b)
- d) Neither (a) nor (b)

19-- The Caesar cipher is a _____ cipher that has a key of 3.

- a) Transposition
- b) Additive
- c) Shift
- d) None of the above

20-- The _____ cipher reorders the plaintext characters to create a ciphertext.

- a) Substitution
- b) Transposition
- c) Either (a) or (b)
- d) Neither (a) nor (b)

21-- A(n) _____ is a keyless substitution cipher with N inputs and M outputs that uses a formula to define the relationship between the input stream and the output stream.

- a) S-box
- b) P-box
- c) T-box
- d) None of the above

22-- A(n) _____ is a keyless transposition cipher with N inputs and M outputs that uses a table to define the relationship between the input stream and the output stream.

- a) S-box
- b) P-box
- c) T-box
- d) None of the above

23-- DES has _____ rounds.

- a) 14
- b) 15
- c) 16
- d) None of the above

24-- DES uses a key generator to generate _____ round keys.

- a) 32-bit
- b) 48-bit
- c) 54-bit
- d) 42-bit

25-- A modern cipher is usually a complex _____ cipher made of a combination of different simple ciphers.

- a) Round b) Circle c) Square d) None of the above

26-- Types of Cryptanalytic Attacks are

- a) cipher text only b) known plaintext
c) Either (a) or (b) d) Neither (a) nor (b)

Q1.2 Complete the following sentences: (8 points)

1- _____ is the information used in cipher and known only to sender/receiver.

2- _____ is the field of both cryptography and cryptanalysis.

3- _____ dissipates statistical structure of plaintext over bulk of ciphertext.

4- _____ makes relationship between ciphertext and key as complex as possible.

5- In Steganography the sender of a message would hide it in a _____ file

6- Steganography System Requirements are _____, _____ and _____.

7- DES has _____ permutation, which we call _____.

Q1.3 Encrypt and decrypt the next secret message By RSA algorithm: (4 points)

using the two prime numbers 11, 3

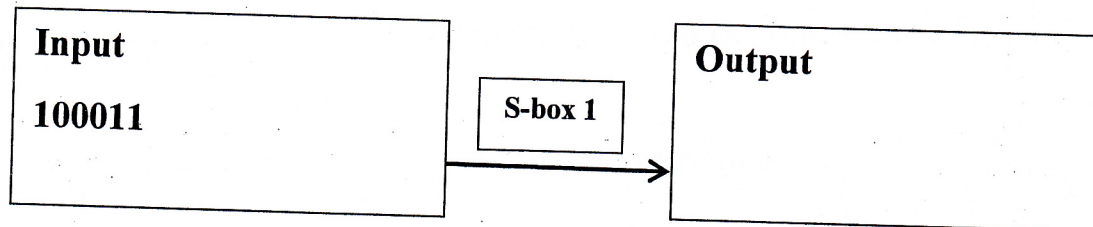
secret message is $E = 5$

Q2. (15 points)

Q2.1 The input to S-box 1 is 100011. What is the output? (5 points)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	14	04	13	01	02	15	11	08	03	10	06	12	05	09	00	07
1	00	15	07	04	14	02	13	10	03	06	12	11	09	05	03	08
2	04	01	14	08	13	06	02	11	15	12	09	07	03	10	05	00
3	15	12	08	02	04	09	01	07	05	11	03	14	10	00	06	13

S-box 1



Q2.2 Draw figures to illustrate:

(10 points)

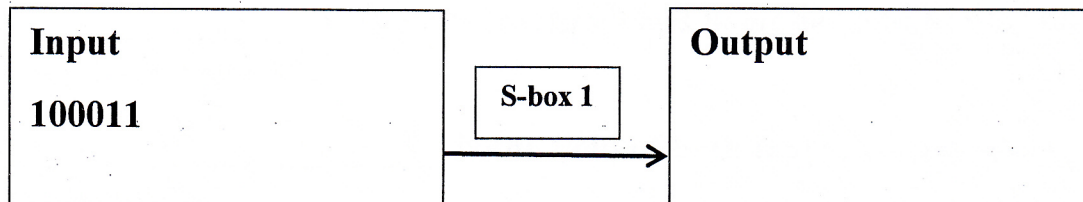
1. Steganographic system
2. A round in DES (encryption site)
3. DES function

Q2. (15 points)

Q2.1 The input to S-box 1 is 100011. What is the output? (5 points)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	14	04	13	01	02	15	11	08	03	10	06	12	05	09	00	07
1	00	15	07	04	14	02	13	10	03	06	12	11	09	05	03	08
2	04	01	14	08	13	06	02	11	15	12	09	07	03	10	05	00
3	15	12	08	02	04	09	01	07	05	11	03	14	10	00	06	13

S-box 1

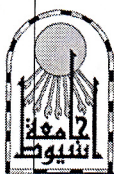


Q3. Write the code that illustrate

(10 points)

1. Vigenere cipher algorithm.

2. LSB algorithm



المادة : تحليل عددي (٢)
الفرقة : المستوى الرابع (٤٢٤)
من :- ثلاث ساعات
وتاريخ : ٢٠١٦/٦/١٤

قسم الرياضيات
كلية العلوم
جامعة أسسوط
إمتحان الفصل الدراسي الثاني

Answer five questions only :-

1-a) Prove that the error bound of Euler method for solving I.V.P

$$y' = f(t, y) \quad a \leq t \leq b, \quad y(a) = \alpha$$

Satisfies the following relation ,

$$|y(t_i) - w_i| \leq \frac{hM}{2L} [e^{L(t_i-a)} - 1]$$

for each $i = 0, 1, 2, \dots, N$, where M, L are constant such that $|y''| \leq M$ and L is Lipchitz constant.

(5Marks)

b) Compute the value of h necessary for $|y(t_i) - W_i| \leq 0.1$ for

$$\text{solving the I.V.P } y' = \frac{1}{t^2} - \frac{y}{t} - y^2, 1 \leq t \leq 2,$$

$$(\text{exact solution } y(t) = -\frac{1}{t})$$

(5Marks)

2-a) Derive Adams-Bash forth three step method and show that error is

$$\frac{3}{8} y^4(\xi) h^4 \quad t_{i-2} \leq \xi \leq t_{i+1} \quad (5\text{Marks})$$

b) Solve the following I.V.P using the method in (a) (5Marks)

$$y' = y - t^2 + 1 \quad 0 \leq t \leq 2, \quad y(0) = 0, \quad h = 0.5$$

3-a) Derive Rung-Kutta of second order for the numerical solution of

$$\text{I.V.P } y' = f(x, y) \quad y(x_0) = y_0$$

(5Marks)

b) Show that the non linear system

$$x_1^2 - 10x_1 + x_2^2 + 8 = 0, \quad x_1x_2^2 + x_1 - 10x_2 + 8 = 0$$

has a unique solution in $D = \{(x_1, x_2) | 0 \leq x_1, x_2 \leq 1.5\}$, and explain Newton fixed point to find the solution. (5Marks)

P.T.O

4-a) Find the least square approximation polynomial of degree two for the function $f(x) = \cos \pi x$ in the interval $[0, 1]$. (5Marks)

b) Discuss the linear shooting method to approximate the solution of the boundary value problem

$$-y'' + p(x)y' + q(x)y + r(x) = 0, \quad a \leq x \leq b, \quad y(a) = \alpha, y(b) = \beta$$

(5Marks)

5-a) Prove that for any $x^{(0)} \in R^n$ the sequence $\{x^k\}_{k=0}^{\infty}$ defined by

$$x^k = T x^{k-1} + c \text{ for each } k \geq 1 \text{ converge to the unique solution } x = Tx + c \text{ iff } \rho(T) < 1.$$

(5Marks)

b) Solve the following linear system using Gauss Seidel iteration method (Note : use three iteration only)

$$10x_1 + x_2 + 2x_3 = 13$$

$$x_1 + 10x_2 + 3x_3 = 14$$

$$3x_1 + 2x_2 + 10x_3 = 15$$

$$\text{take } X^{(0)} = (0, 0, 0)$$

(5Marks)

5) Using the finite difference method to approximate the solution of the boundary value problem

$$y'' + y = 0 \quad 0 \leq x \leq \pi, \quad y(0) = 1, \quad y(\pi) = -1, \quad h = \pi/3$$

(10Marks)

انتهت الأسئلة مع تمنياتنا بالتوفيق والنجاح

د.د. / فاطمة عبد المنعم



2015/2016
2nd Term 2015/2016
Date: Jun, 5, 2016

Final Exam for Level 4
Subject: Distributed Computing, MC452
Time: 2 Hours
50 points

Mathematics Dept.
Faculty of Science
Assiut University

Q 1: Complete the following sentences: (1 point to each space) [15 points]

- Q 1.1** 1. In _____ Computing each processor has its own private memory and the information is exchanged by passing messages between the processors, while in _____ Computing all processors may have access to a shared memory to exchange information between processors.
2. The two important categories of parallel computers are _____ and _____.
3. _____ is a standard specification for message passing libraries.
4. Independent tasks apply same operation to different elements of a data set are called _____.
5. Processors in a parallel computer may communicate over _____ or _____ interconnection media.
6. In a/an _____ the ratio of switch nodes to processor nodes is greater than 1: 1, such as _____ network.
7. The min no. of edges between switch nodes that must be removed to divide the network into 2 halves is called _____.
8. _____ is the largest distance between two switch nodes.
9. The number of switched nodes needed for a binary tree of depth 5 is _____.
10. In Flynn's Taxonomy, MISD means _____.
11. _____ focus on data first, then associate computation with data.
12. The communication is called _____ when a task needs values from a small number of other tasks.
13. Amdahl's Effect, increasing size of problem, leads to _____ speedup.

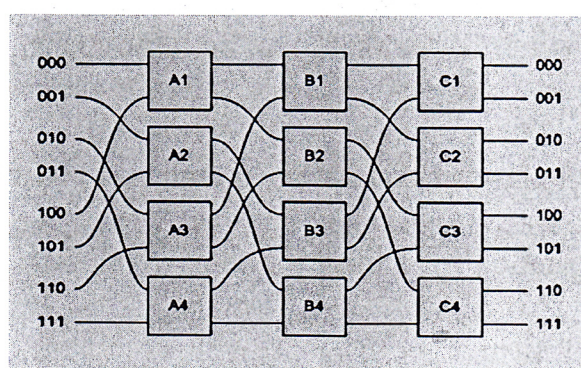
Q 2: [10 points]

Q 2.1 Draw the data dependence graph of the following code, and explain dependents or independents between $S_1, S_2, S_3, S_4, S_5, S_6$. (5 points)

S_1) $acum = 0$;
 S_2) $acum_t = 0$;
 S_3) $n = x$;
 S_4) $for(int\ i = 1 ; i \leq n/2; i++)$
 $acum += i$;
 S_5) $for(int\ i = n/2 + 1; i \leq n; i++)$
 $acum_t += i$;
 S_6) $acum += acum_t$;

Q 2.2 An **Omega network** is an indirect topology and it is illustrated for 8 processors in the figure (on the right). (5 points)

- Give the route to send a message from processor 000 to processor 011.
- Give the route to send a message from processor 101 to processor 010.
- Write the rules that you are applied.



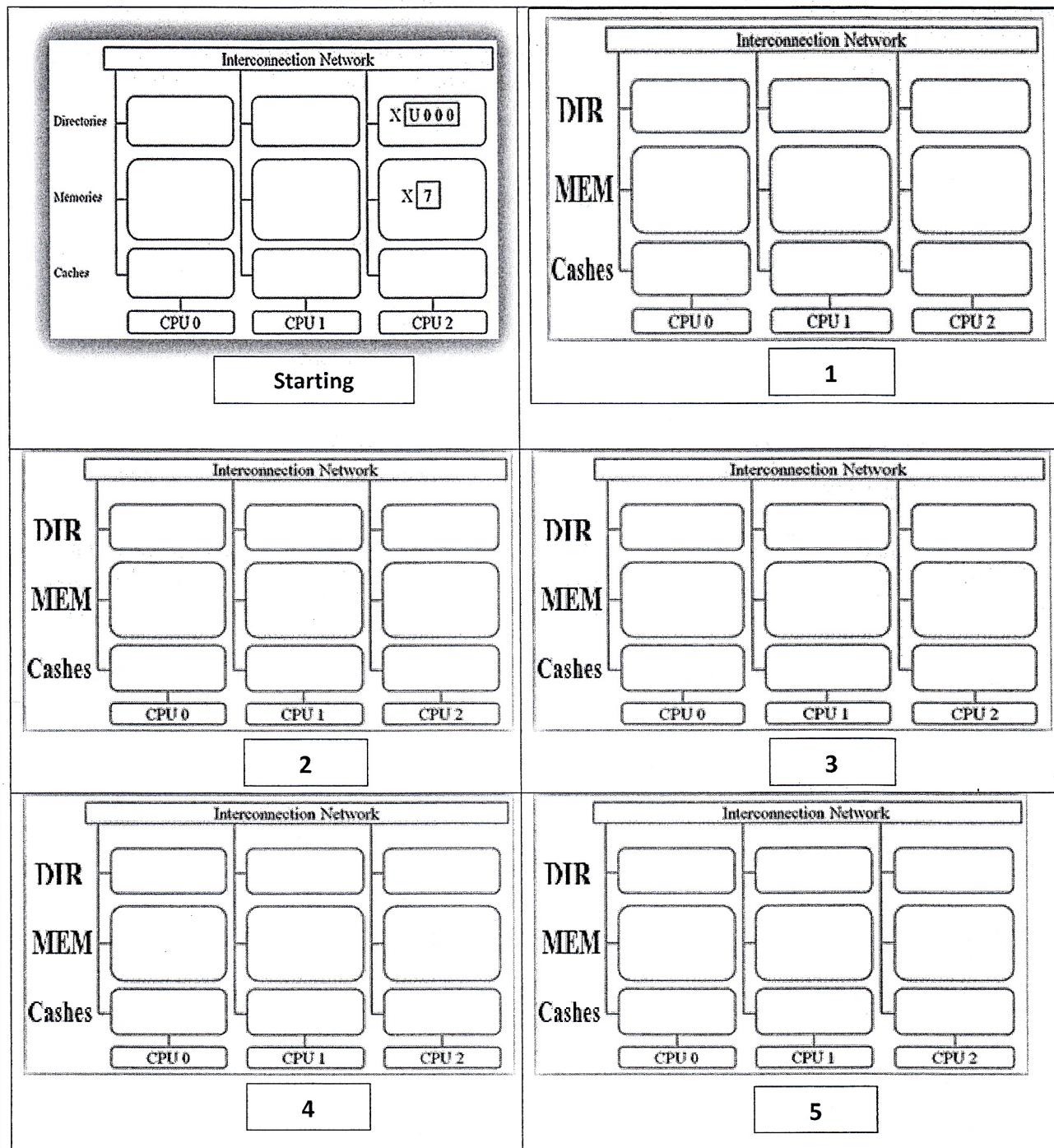
Rules

Route of operation (a) is	
Route of operation (b) is	

Q3: [7 points]

Q3.1

Consider the directory-based protocol for the cache coherence problem for the shown architecture. Assume the following five operations now occur in order listed: CPU 2 reads X, CPU 2 writes 9 to X, CPU 1 reads X, CPU 0 reads X, and CPU 1 write 9 to X. Show the states of the directories, caches, and memories after each of these operations. (5 points)



Q3.2

Illustrate by figures the difference between Asymmetrical multicomputer and Symmetrical multicomputer (figures only). **(2 points)**

Asymmetrical multicomputer

Symmetrical multicomputer

[10 points]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slightly textured appearance and some minor discoloration or shadows, suggesting it might be a scan of a physical document. There is no handwriting or other markings on the page.

Q3.2

Illustrate by figures the difference between Asymmetrical multicomputer and Symmetrical multicomputer (figures only). **(2 points)**

Asymmetrical multicomputer

Symmetrical multicomputer

Q3.2

Illustrate by figures the difference between Asymmetrical multicomputer and Symmetrical multicomputer (figures only). **(2 points)**

Asymmetrical multicomputer

Symmetrical multicomputer

Q5: [8 points]

Q5.1 Define Speedup and Efficiency measures of parallel performance analysis. [2 points]

Q5.2 A parallel program achieves a speedup of 9 on 10 processors. What is the maximum fraction of the computation that may consist of inherently sequential operations? [3 points]

Q5.3

Write a comment about next figure (figure (1)).

[3 points]

Assume that execution time components are

Computations that must be performed sequentially: $\sigma(n)$ Computations that can be performed in parallel: $\phi(n)$ Communication operations: $\kappa(n,p)$ Where, p is the number of processors and n is the size of the problem

$$\phi(n)/p + \kappa(n,p)$$

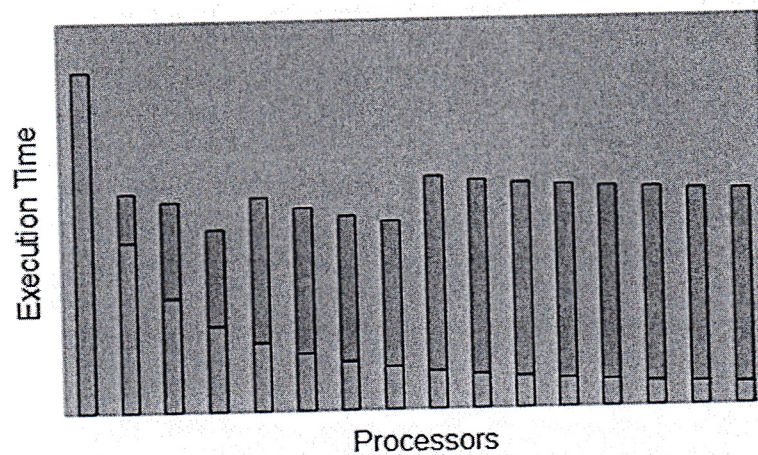


Figure (1)

Comment: _____

Best Wishes, Dr. Yara S. Raslan



Answer each of the following questions:

Question 1: [25 Marks]

- Write the k-Nearest Neighbour Classification Algorithm.
- Demonstrate the main differences between different types of attribute/variable.
- Illustrate the complete knowledge discovery process.
- Write the K-means Clustering Algorithm.
- Derive the linear regression model in just one dimensional case.

Question 2: [25 Marks]

- Write the Naive Bayes Classifier algorithm.
- Build Naïve Bayes Classification model on the following dataset:

Day	season	wind	Rain	Class
weekday	spring	none	None	on time
weekday	winter	none	Slight	on time
weekday	winter	none	Slight	on time
weekday	winter	high	Heavy	Late
saturday	summer	normal	None	on time
weekday	autumn	normal	None	very late
Holiday	summer	high	Slight	on time
Sunday	summer	normal	None	on time
weekday	winter	high	Heavy	very late
weekday	summer	none	Slight	on time
saturday	spring	high	Heavy	cancelled
weekday	summer	high	Slight	on time
saturday	winter	normal	None	Late
weekday	summer	high	None	on time
weekday	winter	normal	Heavy	very late
saturday	autumn	high	Slight	on time
weekday	autumn	none	Heavy	on time
Holiday	spring	normal	Slight	on time
weekday	spring	normal	None	on time
weekday	spring	normal	Slight	on time

- Find the most likely classification for an unseen instance such as: weekday, winter, high, and heavy.

Answer only five of the following questions:

1- a) Mention with details five properties that are satisfied in Real Analysis and not satisfied in Complex Analysis. (12 degrees)

b) Evaluate $\int_C \frac{z^4}{(z^2 + 1)^3} dz$ where C is the circle $|z - i| = 1$ described counterclockwise. (8 degrees)

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

b) Solve the equations:

$$e^{1-2z} = 1 - \sqrt{3}i, \quad \sin z = \cosh 4, \quad \cosh z = -2, \quad \ln z = \frac{1}{2} \ln(2) - \frac{\pi}{4}i. \quad (16 \text{ degrees})$$

3- a) Write (i) with proof Cauchy Integral Formula. (4 degrees)

(ii) Laurent series of the function $\frac{5}{(z+2)(z^2+1)}$, $1 < |z| < 2$. (4 degrees)

b) Show that the functions $f + F, f - F, f \cdot F, \frac{f}{F}; F(z) \neq 0 \forall z$, are continuous at the point z_0 where f, F are continuous at z_0 . (12 degrees)

4-a) Let $z_1 \neq 0, z_2 \neq 0, z_3 \neq 0$. Is:

$$(I) \frac{z_3 z_4}{z_1 z_2} = \left(\frac{z_3}{z_1} \right) \left(\frac{z_4}{z_2} \right), \quad (II) \overline{\sinh(iz)} = \sinh(-iz), \quad (III) ||z_1| - |z_2|| \leq |z_1 - z_2| \leq |z_1| + |z_2|,$$

$$(IV) \arg\left(\frac{z_1}{z_2}\right) = \arg(z_1) - \arg(z_2), \quad (V) \frac{z_1}{z_2 z_3} = \frac{|z_1|}{|z_2| |z_3|} e^{i(\arg(z_1) - \arg(z_2) - \arg(z_3))},$$

b) What do you think about the following implication:

satisfactory of Cauchy-Riemann equations at $z_0 \Rightarrow$ existence of $f'(z_0)$. (20 degrees)

To behind

5- a) Conclude that the limit of a complex-valued function f as $z \rightarrow z_0$ leads to the limit of a function $\sqrt{|f|}$ given by

$$\sqrt{|f|}(z) := \sqrt{|f(z)|} \quad \forall z \in \mathbb{C}.$$

as $z \rightarrow z_0$.

(5 degrees)

b) Verify that

$$(i) \quad |\cosh(z)|^2 = \sinh^2(\operatorname{Re}(z)) + \cosh^2(\operatorname{Im}(z)),$$

$$(ii) \quad |e^{z^2} + e^{\bar{z}}| \leq e^{|z|^2} + |e^z|,$$

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

(15 degrees)

6- a) Using Residue Theorem, find $\int_{|z|=2} \frac{z^5}{1-z^2} dz$ in the positive direction.

(6 degrees)

b) Show that $x \cos(x) \cosh(y) + y \sin(x) \sinh(y) - 3e^{-x} \cos(y)$ is a harmonic function.

Also, determine the corresponding analytic function f where the given function is an imaginary component of f with $f(0) = -3$. Finally, verify that $f(z) - f(-z) + 6 \cosh(z) = 0$.

(14 degrees)

Finish

GOOD LUCK



Forth Level :Computer Science Section Time:3 H
Science Faculty Operation Research(2) 426 R June2016
Math. Depart Total degree (50)

Answer four questions only from the following questions:

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

$$\text{Min } f(x) \quad (6 \text{ points})$$

- b) Find the extreme points and extreme functions of the following function .

$$f(x) = 3x^4 - 8x^3 - 6x^2 + 24x + 12 \quad (6.5 \text{ points})$$

- 2-a) The Newton-Raphson method used to solve the non-linear equation $f(x) = 0$ can be easily modified to find the extreme values of the single variable problems . Derive this modified formula and then use it to solve the following problem

$$\text{Min } f(\underline{x}) = x_1^2 + 2x_2^2 - 4x_1 - 2x_1x_2, \quad \underline{x}^0 = (0.1) \quad , \varepsilon = 10^{-4}$$

for 2 iterations only (7.5 points)

- b) Verify whether the vector $d=(2,1)$ at the point $(0,0)$ is a descent direction for the function

$$f(x) = x_1^2 - x_1x_2 + 2x_2^2 - 2x_1 + e^{(x_1+x_2)} \quad (5 \text{ points})$$

See Next Page

3-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 (6.5 points)

-b) Find the extreme points of the function

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

4-a) Derive the necessary condition of the constrained variation method used to solve the following problem

$$\begin{aligned} &\text{Minimize } f(x_1, x_2) \\ &\text{Subject to } C(x_1, x_2) = 0. \end{aligned} \quad (6.5 \text{ points})$$

-b) Use the derived method to solve the problem

$$\begin{aligned} &\text{Minimize } f(\underline{x}) = (x_1 - 1)^2 + x_2^2 \\ &\text{Subject to } x_1^2 + x_2^2 = 4. \end{aligned} \quad (6 \text{ points})$$

5-a) Use the constraint variation method to derive the Lagrange multiplier method for the following problem

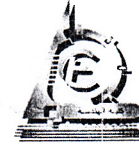
$$\text{Mini } f(x_1, x_2) \quad \text{Subject to } g(x_1, x_2) = 0 \quad (6 \text{ points})$$

-b) Use the Lagrange multiplier method to find the extreme points of the problem

$$\begin{aligned} &\text{Maximize } f(\underline{x}) = x_1^2 + x_2^2 - 2x_1 + 1 \\ &\text{S.t } g(\underline{x}) = x_1^2 + x_2^2 = 4 \end{aligned} \quad (6.5 \text{ points})$$

With best wishes

Taha Elgindy



Important remarks	• This exam measures ILOs no.: (a1, b3 and c1) • No. of pages: 5 - No. of questions: 3
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Question No.1 (15 points)

- a) Show schematically the following processes:
- 1) Warm and cold frontal precipitation.
 - 2) Hydrological cycle.

Answer of Question1

1)

2)



- b) In a given year, a catchment with an area of 2500km^2 received 130 cm of precipitation. The average flow rate measured in the river draining the catchment was $30\text{m}^3/\text{s}$.
- 1) How much runoff reached the river for the year (in m^3)?
 - 2) Estimate the amount of water lost due to the combined effects of evapotranspiration and infiltration to groundwater (in m^3)?
 - 3) How much precipitation is converted into river runoff (in percentage)?

Answer of Question1

b)



Question No.2 (10 points)

A catchment area of 100 ha has three rain gauges. In a certain month, during a rainfall, 100 mm were recorded in gauge A, 50 mm in gauge B and 0 mm in gauge C. Try to answer the following requirement:

- (a) Calculate the areal rainfall over the catchment (mm)
- (b) During previous rainfall years, a runoff coefficient of 0.8 was recorded. What is the runoff expected for the rainfall? (m^3/sec)
- (d) Observed catchment concentration of phosphorous was 0.20 mg/l. What is the mass transport of phosphorous at the end of the month? (mg)

Answer of Question2

(a)

(b)

(c)

Good Luck with Success

The Examiners:

Prof.Gamal Abo-Zeid

Dr. Wael Elham Mohamed Sabry



Question No.3 (25 points)

Over a period of 7 months, records of daily rainfall data have been collected. One site gauge "A" was inspected. Use the double mass analysis technique to carry out the following operations using the data shown in the table below:

- determine the approximate date of the first significant change of Gauge "A" readings.
- Evaluate a correction ratio that can be used to adjust incorrect values.
- Apply the correction process on the incorrect values to get the correct readings.

Month	Reading "Gauge A"	Reading "others"
1	200	340
2	220	410
3	140	251
4	184	312
5	72	264
6	55	210
7	47	180

Answer Question3

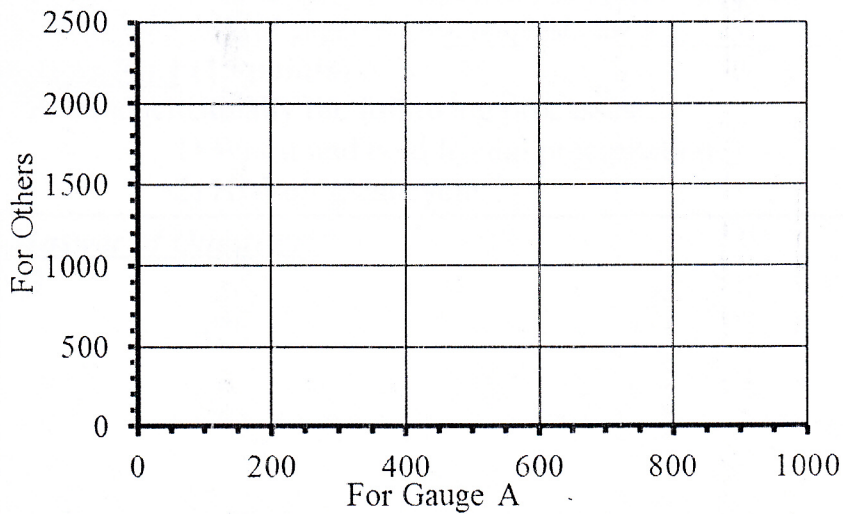
(a)

Good Luck with Success

The Examiners:

Prof. Gamal Abo-Zeid

Dr. Wael Elham Mohamed Sabry



(b) Correction ratio

Correction ratio=

(c)

Values Before Correction			
Values After Corrections			



2015/2016

Summer term

Date: 27-8-2016

Final Exam for Level 4

Subject: Scientific computing 1

Time: 2 Hours

Mathematics Dept.

Faculty of Science

Assiut University

Answer the Following Questions: (50 marks)

Q1.

a) Find a solution by a falsi-position method to the equation $x^3 - 2x - 3 = 0$. (hint: $a = 0$, $b = 2$, continue three times)

(10 marks)

b) Write a falsi-position method Algorithm.

Q2.

a) Solve the following differential equation

(15 marks)

$\frac{dy}{dx} = (x + y)y$, $y(0) = 1$ Using the milne method to find $y(0.4)$. (hint: find $y(0.1)$, $y(0.2)$ and $y(0.3)$ from Runge kutta of order 2).

b) Write a M-file MATLAB to compute the Milne method
(hint: find $y(0.1)$, $y(0.2)$ and $y(0.3)$ from Euler method).

Q3.

a) Use Lagrange interpolation method to find $f(0.36)$

(15 marks)

X	0.1	0.25	0.37	0.45	0.6
F(x)	1.172	1.008	0.878	0.828	0.720

b) Write the M-file MATLAB to compute the Lagrange interpolation Method to solve the previous question (how run the code in command window).

Q4.

a. Use the simpson rule to approximate value to

(10 marks)

$$\int_{0.4}^2 \sqrt{1+x^3} \, dx \quad (h=0.2)$$

b) Write the M-file MATLAB to compute the Lagrange interpolation Method in the previous question (how run the code in command window).

Best Wishes, Dr. Alaa F. Mohamed