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ACCREDITED 2016
وحدة ضمان الجودة
كلية العلوم - جامعة طنطا
QUALITY ASSURANCE UNIT
FACULTY OF SCIENCE - TU

المستوى الثالث

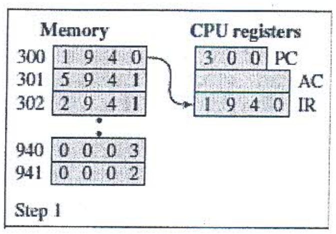
علوم الحاسب

DEPARTMENT OF MATHEMATICS
TANTA UNIVE RSITY
FACULTY OF SCIENCE
(Computer Science Division)

EXAMINATION FOR PROSPECTIVE STUDENTS (3[RD] YEAR)		
COURSE TITLE: COMPUTER ARCHITECTURE	**DATE: 4/6/2017**	**COURSE CODE: CS 3206**

Question 1: **(50 Marks)**

a. Using the following figure explain the Fetch-Decode cycle that adds the contents of the memory word at address 940 to the contents of the memory word at address 941 and stores the result in the latter location?



b. What are the solutions that were be taken to avoid the gap of performance (performance balance) between the processor and other computers components?

Question 2: **(50 Marks)**

a. Describe in details the different generations of computers. Support your explanation by examples of each generation?

b. Define interrupts? Draw Instructions cycle with interrupts? List and briefly define two approaches to dealing with multiple interrupts?

c. What are the differences among direct mapping, associative mapping, and set associative mapping? Support your answer by drawing?

Question 3: **(50 Marks)**

a. What is the benefit of using a multiple-bus architecture compared to a single-bus architecture? Describe bus types? What is the meaning of bus arbitration?

b. Describe in details the memory hierarchy? And explain the concept of principle of locality?

c. What is a stored program computer? What is the distinction between computer structure and computer function? List and briefly define the main structural components of a computer?

EXAMINERS	DR/ RASHA ELAGAMY	PPROF. ENTSAR ALKHOLY

With my best wishes

Tanta University, Faculty of Science	TIME DURATION: 2h
SUBJECT: **Systems Simulation**	**LEVEL 3 (Computer)**
CODE: CS3208	SEMESTER 2, 2016-2017

Answer the following questions

QUESTION 1:

(i) The population of a certain species of fish living in a large lake at time t can be modeled using *Verhulst's equation*, otherwise known as the *logistic equation*,

$$\frac{dP}{dt} = P(\beta - \delta P),$$

Where $P(t)$ is the population of fish measured in tens of thousands, and β and δ are constants representing the birth and death rates of the fish living in the lake, respectively. Use the linear stability analysis as well as a graphical argument to classify the critical points of the equation. Suppose that $\beta = 0.1$, $\delta = 10^{-3}$, and the initial population is 50×10^4. Solve this initial value problem and interpret the results in physical terms.

(ii) Find the Hamiltonian and then make an approximate sketch for the following system:

$$\dot{x} = y, \qquad \dot{y} = x + x^2.$$

QUESTION 2:

(i) Define trajectories, phase portrait and qualitatively equivalent systems. Find the manifolds, isoclines and the sign of $\frac{dy}{dx}$ in different regions of the plane for the following system, then sketch phase portraits for this system and its qualitatively equivalent one:

$$\dot{x} = -x - 3y, \qquad \dot{y} = -3x - y.$$

(ii) By considering the flow across the rectangle with corners at $(-1,2)$, $(1,2)$, $(1,-2)$, and $(-1,-2)$, prove that the following system has at least one limit cycle:

$$\dot{x} = y - 8x^3, \qquad \dot{y} = 2y - 4x - 2y^3.$$

QUESTION 3:

(i) Investigate the stability of the origin for the system $\dot{x} = x(x - \alpha)$, $\dot{y} = y(y - \beta)$ using the Lyapunov function $V(x, y) = (\frac{x}{\alpha})^2 + (\frac{y}{\beta})^2$.

(ii) Sketch a phase portrait for the system $\dot{x} = 0$, $\dot{y} = x + 2y$.

(iii) State with proof the Dulac's criteria.

(iv) In two different ways, prove that the following system has no limit cycles:

$$\dot{x} = y^2 - x, \qquad \dot{y} = y + x^2 + yx^3.$$

With my best wishes

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS		
EXAMINATION FOR LEVEL THREE STUDENTS OF COMPUTER SCIENSE		
COURSE TITLE: OPERATING SYSTEMS		COURSE CODE: CS3204
DATE: 13-6-2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 150 | TIME ALLOWED: 2 HOURS

Answer all the following questions:

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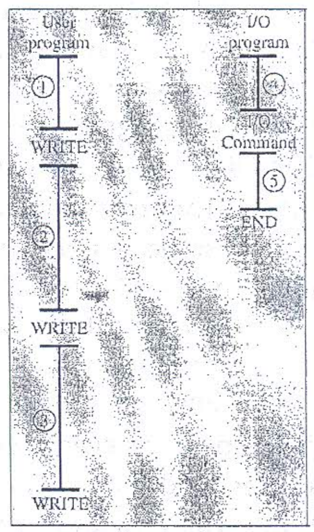
QUESTION 1: [Total marks: 50]

1. Compare between each pair of the following: (20 marks; 4 points for each)
   a. I/O bound and CPU bound processes.
   b. Short-term and long-term schedulers.
   c. Independent and cooperating processes.
   d. Hard real-time and soft real-time systems.
   e. Message passing and shared memory communications models.
2. Consider the following diagram that illustrates the user program with two WRITE system calls interleaved with processing. Code segments 1, 2, and 3 refer to sequences of instructions that do not involve I/O operations. I/O program consists of three sections: segment 4 refers to sequence of instructions preparing the actual I/O operation; actual I/O command; and segment 5 refers to sequence of instructions completing the operation. Assume that segments 1, 2, 3, 4, and 5 take 30, 50, 50, 25, and 25 ms, respectively.
   I. Show the path of execution followed by CPU, based on the given diagram, in the following cases: (15 marks: 5 for each point)
      a. Without interrupt.
      b. With interrupts and I/O wait 30 ms.
      c. With interrupts and I/O wait 70 ms.
   II. Give the waiting time for the CPU in each of the above three cases. (15 marks: 5 for each point)



QUESTION 2: [Total marks: 50]

1. What are the scheduling algorithms goals for all, batch, interactive, and real-time systems. (8 marks)
2. Consider the following Table that contain information about five processes. Assume that the processes arrive for execution at the times indicated with CPU burst length given in milliseconds.

Processes	Arrival time	Burst time	Priority
P_1	0	12	3
P_2	1	8	1
P_3	2	7	2
P_4	3	3	5
P_5	4	4	4

Compute the average waiting time for these processes with: (30 marks; 6 points for each)
   a. FCFS algorithm;
   b. Non-preemptive SJF algorithm;
   c. Preemptive SJF algorithm;

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	DEPARTMENT OF MATHEMATICS TANTA UNIVE RSITY FACULTY OF SCIENCE (Computer Science Division)	
	EXAMINATION FOR PROSPECTIVE STUDENTS (3RD YEAR)	
COURSE TITLE: SYSTEM ANALYSIS AND DESIGN	DATE: 22/6/2017	COURSE CODE: CS 3210

Question 1: **(50 Marks)**

a. Explain why professional software is not just the programs that are developed for a customer? What are the essential attributes of good software? Explain different kinds of software?

b. What is software process? Describe software process available models? In your opinion, which model is the best?

c. Different models can represent system from different perspectives, describe these perspectives?

Question 2: **(50 Marks)**

a. What are software requirements? How can you gather requirements? What are types of requirements (support your answer by examples)? Explain the four activities for requirements engineering process?

b. Describe state machine model? Support your answer by drawing a state diagram of a microwave oven?

c. Explain why change is inevitable in complex systems and give examples (as prototyping and incremental delivery) of software process activities that help predict changes and make the software being developed more resilient to change?

Question 3: Choose the correct answer: **(50 Marks)**

1. **Which model in system modeling depicts the dynamic behavior of the system?**
   a) Context Model
   b) Behavioral Model
   c) Data Model
   d) Object Mode
2. **Which perspective in system modeling shows the system or data architecture?**
   a) Structural perspective
   b) Behavioral perspective
   c) External perspective
3. **Which of the following diagram is not supported by UML considering Data-driven modeling?**
   a) Activity
   b) Data Flow Diagram (DFD)
   c) State Chart
   d) Component
4. **What is the major advantage of using Incremental Model?**
   a) Customer can respond to each increment
   b) Easier to test and debug
   c) It is used when there is a need to get a product to the market early
   d) Both b & c
5. **Agile Software Development is based on**
   a) Incremental Development
   b) Iterative Development
   c) Linear Development
   d) Waterfall Model
   e) Both a and b

EXAMINERS	DR/ RASHA ELAGAMY	PROF. ALSAEID AMMAR

With my best wishes

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
	EXAMINATION FOR SOPHOMORES (THIRD YEAR) STUDENTS OF STATISTICS			
	COURSE TITLE:	Statistical Programs		COURSE CODE: ST 3204
DATE:	28/5/2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Final Examination Paper

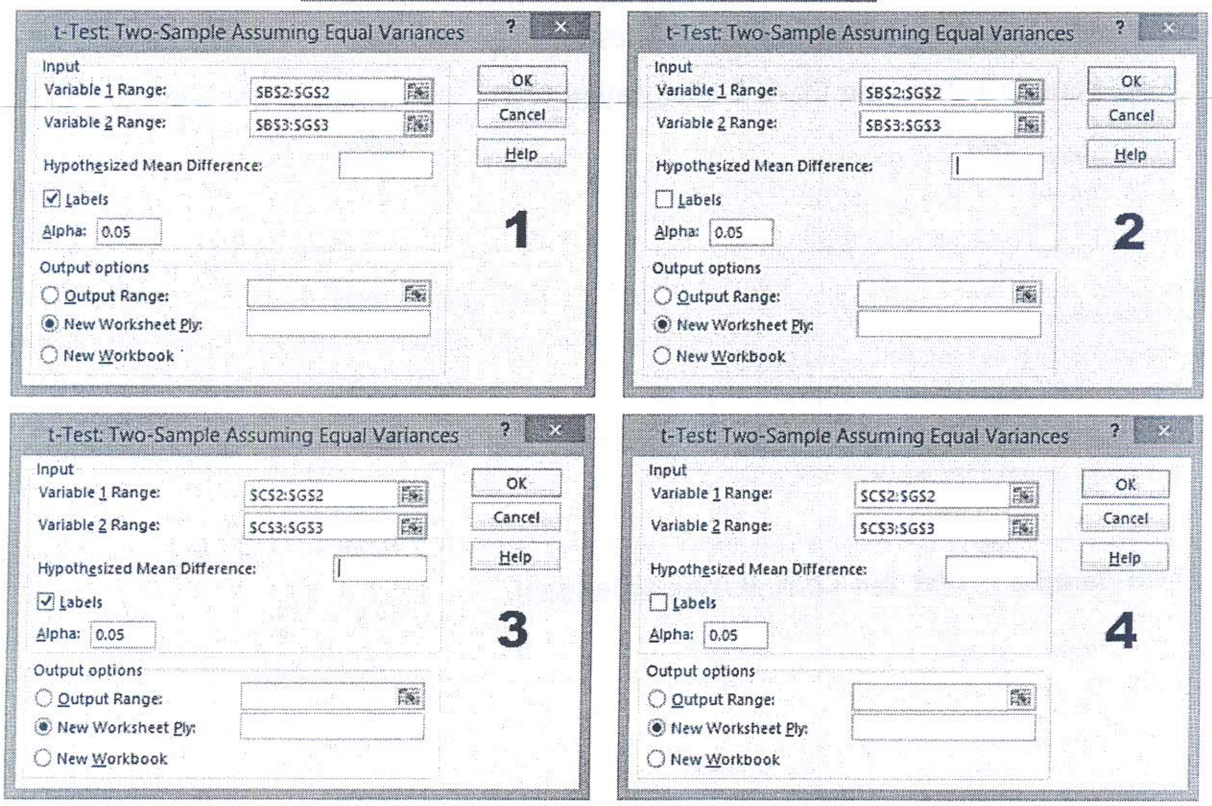
Answer the following questions:

Q1: a. Construct a questionnaire consists of at least 10 questions about any topic (Arabic language can be used).

b. Show that the two-sample t-test (unequal variance) can be used in excel to perform the one-sample t-test.

c. Consider the given data in Excel; explain in details the difference between the following four pictures then write down the result in each case:

	A	B	C	D	E	F	G	H
1								
2		A	23	15	43	19	26	
3		B	26	18	26	31	14	
4								



EXAMINERS	DR. ELSAEED AMMAR	DR. MOHAMED M. EZZAT

Q2: a. From the following table, write the regression equation:

	Coefficients	Standard Error	t Stat	P-value
Intercept	19.188	4.551	4.216	0.003
X	1.016	0.294	3.457	0.010

b. Using this table, complete the following sentence:

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*
Blocks	27.33	3	9.11	....	0.0126
Treatments	1038.50	2	519.25	....	0.0002
Error	6.17	6	1.02		
Total	1072	11			

The name of this test is ....; the number of blocks is .... while the number of treatments is .... The values of the two F statistics are .... and .... Using the p-values we can say that .... between treatments and .... between blocks.

Q3: Complete the following tables and run the test:

a. **Two-Sample T-Test and CI: A, B (<u>two-tailed test</u>)**

```
     N   Mean   StDev  SE Mean
A    6  16.50   1.87     0.76
B    9  [    ]  3.16     [  ]

Difference = μ (A) - μ (B)
Estimate for difference:  -16.50
95% CI for difference:  (-19.62, -13.38)
T-Test of difference = 0 (vs [ ]): T-Value = [    ]  P-Value = 0.000  DF = [ ]
Both use Pooled StDev = 2.7386
```

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b. **Two-Sample T-Test and CI: A, B (<u>one-tailed test</u>)**

```
     N   Mean   StDev  SE Mean
A    9  15.89   1.90     0.63
B    7  [    ]  2.37     [  ]

Difference = μ (A) - μ (B)
Estimate for difference:  -16.68
95% upper bound for difference:  -14.71
T-Test of difference = 0 (vs [ ]): T-Value = [    ]  P-Value = 0.000  DF = 11
```

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c. Paired T-Test and CI: D, E (two-tailed test)

	N	Mean	StDev	SE Mean
D	8	24.75	☐	1.10
E	8	45.00	2.83	☐
Difference	8	☐	1.982	0.701

```
95% CI for mean difference: (☐, ☐)
T-Test of mean difference = 0 (vs ☐): T-Value = ☐   P-Value = 0.000
```

d. One-Sample T: C (one-tailed test)

Test of μ = 20 vs ☐

Variable	N	Mean	StDev	SE Mean	95% Upper Bound	T	P
C	12	16.250	2.340	☐	☐	☐	0.000

e. One-way ANOVA: A, C, E

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	☐	☐	☐	391.36	0.000
Error	☐	133.7	☐		
Total	25	☐			

Critical Values of t-Distribution

df	0.1000	0.0500	0.0250	0.0100	0.0050	0.0010	0.0005
1	3.078	6.314	12.706	31.821	63.657	318.309	636.619
2	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850

Good Luck

EXAMINERS	DR. ELSAEED AMMAR	DR. MOHAMED M. EZZAT

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
	FINAL EXAM FOR FRESHMEN (LEVEL 3) STUDENTS OF MATH.			
	COURSE TITLE:	Mathematical PROGRAMMING		COURSE CODE:3208
DATE:	MAY,28 , 2017	TERM: SECOND	TOTAL ASSESSMENT MARKS:150	TIME ALLOWED:TWO HOURS

Answer on the following questions :

Question 1 :(30 marks)

Model and solve the following programming problem

Factory plans to produce two items, if the first item you needs to output to 3 units of wood 3 units of iron and 5 units of aluminum. The second item needs for production to one unit of wood, 8 units of iron and 4 units of aluminum, if you knew that the maximum available are: 53 units of wood, 176 of iron and 100 of aluminum. What can the factory produces from each item to maximize the profit if the price of the first item is 1$ and of the second item is 3$.

Question 2 :(40 marks)

Determine the value of unknown A for which the problem characterized by the following table is feasible and find the optimum value when B= - 2 , C= -5

	-z	-w	X_1	X_2	X_3	U_1	U_2	d
-z	1	0	B	-1	C	0	0	0
-w	0	1	2	-3	1	0	0	A
U_1	0	0	12	2	20	1	0	24
U_2	0	0	1	1	1	0	1	3

Question 3: (40 marks)

Find the solution of dual without making duality for the following program

$$\max Z = X_1 + 2X_2$$

Subject to

$$X_1 + X_2 \le 20,$$
$$2X_1 + 3X_2 \le 60,$$
$$X_1 , X_2 \ge 0$$

Question 4 : (40 marks)

Show how to put a system of linear equations in its canonical form and how to perform the pivoting to obtain another canonical form

EXAMINERS		PROF. EBRAHIM YOUNESS
		DR. ATEF ABD-ELGLEEL

Tanta UNIVERSITY-FACULTY OF SCIENCE-DEPARTMENT OF MATHEMATICS			
EXAMINATION FOR FRESHMEN (THEIRD YEAR) STUDENTS OF STATISTICS			
COURSE TITLE:	Decision Theory Examination		COURSE CODE:ST3208
DATE: 25 – 5 - 2017	TERM: (2)	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED:2 h.

Answer the following questions

1) –a- Define the pure action and the admissible decision. Also Consider the following utilities table:

	θ_1	θ_2	θ_3
a_1	100	25	0
a_2	75	50	25
a_3	50	50	50

and determine the optimal decision. (25 mark)

-b- Consider the following utilities table:

	θ_1	θ_2	θ_3
a_1	1	1	8
a_2	3	5	1
a_3	3	5	5

i-Determine an inadmissible decision. ii-Determine an infeasible decision. (25mark)

2) -a- Consider the prior distribution for state of nature θ follows Uniform distribution with parameter P in the interval [0,1] ,Z is random variable follows binomial distribution function. Determine the Posterior Bays utility. (25 Mark)

-b- Define the regret criterion and Spyproof. Also, Computing a Randomized Saddle Point, where the simplest case is when both players have only two actions. (25 Mark)
Let the cost matrix be defined as:

	V	
U	3	0
	-1	1

3)-a- Prove that the new posterior distribution is the same as the posterior distribution using the results of the two experiments after considering the original prior distribution for state of nature. (25 Mark)

-b-Consider the proir distribution of state nature follows Beta distribution with parameters a=3,b=5 and conditional observation follows binomial distribution b(10, θ). For the following table of utility

	$H_0: \theta \leq \theta_0$	$H_0: \theta > \theta_0$
a_1	S	S-$\lvert\theta-\theta_0\rvert$
a_2	S-$\lvert\theta-\theta_0\rvert$	S

test the following composite hypothesis by using bayes method. $H_0: \theta \leq \frac{1}{2}$, $H_1: \theta > \frac{1}{2}$, z=2. (25mark)

ASS.PROF.DR. HALA FERGANY	DR. MOHAMED ELHADIDY	EXAMINERS

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	Tanta University Faculty of Science Department of Mathematics		
1969	Final term exam for the first semester 2016-2017		
	Course title:	Special Functions	Course code: MA3212
	Date: 25 /5/2017	Total Marks: 150	Time allowed: 2 Hours

Answer the following questions:

First question: (36 Marks)

(a) Prove the following:

(i) $\Gamma(x)=\lim_{n\to\infty}\dfrac{n!}{x(x+1)(x+2)\cdots(x+n)}$ (ii) $\dfrac{1}{\Gamma(x)}=xe^{\gamma x}\prod_{n=1}^{\infty}\left(1+\dfrac{x}{n}\right)e^{-\frac{x}{n}}$

(b) Prove that $\Gamma(x)\Gamma\left(x+\dfrac{1}{2}\right)=2^{-2x+1}\sqrt{\pi}\,\Gamma(2x)$

(c) Prove that $\psi(x)=-\gamma-\dfrac{1}{x}-\sum_{n=1}^{\infty}\left(\dfrac{1}{n}-\dfrac{1}{n+x}\right)$, where $\psi(x)=\dfrac{\Gamma'(x)}{\Gamma(x)}$

Second question: (36 Marks)

(a) Find the general solution of the differential equation:

$$4x^2y''+4xy'+\left(4x^2-9\right)y=0$$

in terms of the functions *cos x* and *sin x*

(b) Prove that $\int_0^1 xJ_n(\lambda x)J_n(\mu x)\,dx=\begin{cases}0, & if \quad \lambda\neq\mu\\ \dfrac{1}{2}J_{n+1}^2(\lambda), & if \quad \mu=\lambda\end{cases}$

(c) Prove that $J_n(x)=\dfrac{1}{\pi}\int_{-\pi}^{\pi}\cos(x\sin\theta-n\theta)\,d\theta$

Third question: (36 Marks)

(a) Prove that $\int_0^{\infty}e^{-x^2}H_nH_m(x)\,dx=\begin{cases}0, & if \quad m\neq n\\ 2^n n!\sqrt{\pi}, & if \quad m=n\end{cases}$

(b) Prove that $H_n(x)=(-1)^n e^{x^2}D^n\left(e^{-x^2}\right)$, where $D^n=\dfrac{d^n}{dx^n}$ .Hence or otherwise, find $H_0(x)$, $H_1(x)$, $H_2(x)$, $H_3(x)$ and $H_4(x)$.

(c) If $x^2=\sum_{n=0}^{\infty}A_nH_n(x)$. Find A_n.

(d) If $\psi_n(x)=e^{-\frac{1}{2}x^2}H_n(x)$. Prove that $\psi_n''(x)+\left(2n+1-x^2\right)\psi_n=0$

Fourth question: (36 Marks)

(a) Prove that $P_n(x)={}_2F_1\left(-n,n+1;1;\dfrac{1-x}{2}\right)$. Hence or otherwise find $P_{2n-1}(0)$ and $P_{2n}(0)$.

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(b) Prove that :

(i) $L_{n+1}(x)=(2n+1-x)L_n(x)-n^2L_{n-1}(x)$

(ii) $nL_{n-1}(x)=nL'_{n-1}(x)-L'_n(x)$

(iii) $xL''_n(x)+(1-x)L'_n(x)+nL_n(x)=0$

(c) Prove that ${}_2F_1(a,b,c;x)=\dfrac{1}{\beta(b,c-b)}\displaystyle\int_0^1 t^{b-1}(1-t)^{c-b-1}(1-tx)^{-a}\,dt$

(d) Find the values of the following integrals:

$$(i)\ \int_0^{\frac{\pi}{2}}\left(1-x^2\sin^2\theta\right)^{\frac{1}{2}}d\theta \qquad (ii)\ \int_0^{\frac{\pi}{2}}\left(1-x^2\sin^2\theta\right)^{\frac{1}{-2}}d\theta$$

(Best wishes)

Examiners:	1- Prof. Dr. S. Abdel Aziz	2- Prof.Dr. S. El Sharkawy

ميكا ، الكم (١)

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS				
EXAMINATION FOR PROSPECTIVE STUDENTS (3^{RD} YEAR) STUDENTS OF MATHEMATICS				
COURSE TITLE: QUANTUM MECHANICS I			COURSE CODE: MA3206	
DATE: 11	JUN 2017	TERM: FIRST	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer the following questions:

1) a) Define Black body radiation, Angular momentum operator, Linear operator, Hermitian operator, and Matrix elements of operator. (15 Marks)

b) State the Bohr postulates and find the radius of Hydrogen atom.

(15 Marks)

2) a) Find the eigenvalues and eigenfunction of the harmonic oscillator.

(30 Marks)

b) Find the result of the commutation relation $[z, L_y] = \cdots$ (10 Marks)

3) a) Use the number state $|n\rangle$ to calculate the matrix of the momentum $\hat{P}_x$.

(20 Marks)

b) Use the quantum postulates to derive the eigenfunctions corresponding to distinct eigenvalues of a Hermitian operator must be orthogonal.

(20 Marks)

4) Derive the radial wave functions. (40 Marks)

EXAMINERS	PROF/AHMED ABOANBER	DR/ ABDALLAH A. NAHLA
	DR/	DR/

With my best wishes

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	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS		
	EXAMINATION FOR JUNIORS (THIRD YEAR) STUDENTS OF STATISTICS		
	COURSE TITLE: ORDER STATISTICS		COURSE CODE: ST3206
DATE: JUNE, 2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOUR

Answer the following questions:

1-(a) If X_1, X_2, X_3, X_4, X_5 is a random sample of size 5 from the uniform distribution on $(0, b)$, then find probability density function (p.d.f.) of the sample median and the mean of the sample median. (20 Marks)

(b) Let Y_1, Y_2, Y_3, Y_4 denote the order statistics of a random sample of size 4 from a population with a p.d.f.

$f(x) = \frac{x}{2}, \quad 0 < x < 1,$

find the p.d.f. of Y_3 and $p(Y_3 > 0.5)$. (15 Marks)

(c) If $Y_1, Y_2, \ldots, Y_6$ is an order sample of size 6 from the exponential distribution with parameter λ, then find the joint p.d.f. of $Y_1, Y_2, \ldots, Y_6$ and the joint p.d.f. of Y_1 and Y_6. (15 Marks)

****

2- (a) Define: population, order statistics, parameter, statistic, midrange, random sample, coverage. (15 Marks)

(b) Find the mean and the variance of $F_n(x)$, where $F_n(x)$ is the cumulative distribution function of the random sample of size n from a population with a cumulative distribution function (C.D.F.) $F(x)$. (20 Marks)

(c) Deduce the C.D.F. of the maximum and the C.D.F of the minimum of the random sample $X_1, X_2, \ldots, X_n$. (15 Marks)

****

3-(a) If W_{ij} is the area between the order statistics Y_i and Y_j, $i < j$ with the p.d.f.

$$k_{W_{ij}}(w) = \frac{n! W^{j-i-1}}{(j-i-1)!\,(n-j+i)!}(1-W)^{n-j+i}, \quad 0 < w < 1,$$

then find the mean and the variance of the coverage C_i. (25 Marks)

(b) If X_1, X_2, X_3 is a random sample of size 3 from the uniform distribution on $(0,1)$, then find the p.d.f. of the sample range. (25 Marks)

EXAMINERS	PROF. DR./M. M. EZAT	DR/ HAMDY M. ABOU-GABAL

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	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
	EXAMINATION FOR PROSPECTIVE STUDENTS (3RD YEAR) STUDENTS OF MATHEMATICS			
	COURSE TITLE: QUANTUM MECHANICS I		COURSE CODE: MA3206	
DATE: 11	JUN 2017	TERM: FIRST	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer the following questions:

1) a) Define Black body radiation, Angular momentum operator, Linear operator, Hermitian operator, and Matrix elements of operator. (15 Marks)

b) State the Bohr postulates and find the radius of Hydrogen atom. (15 Marks)

2) a) Find the eigenvalues and eigenfunction of the harmonic oscillator. (30 Marks)

b) Find the result of the commutation relation $[z, L_y] = \cdots$ (10 Marks)

3) a) Use the number state $|n\rangle$ to calculate the matrix of the momentum $\hat{P}_x$. (20 Marks)

b) Use the quantum postulates to derive the eigenfunctions corresponding to distinct eigenvalues of a Hermitian operator must be orthogonal. (20 Marks)

4) Derive the radial wave functions. (40 Marks)

EXAMINERS	PROF/AHMED ABOANBER	DR/ ABDALLAH A. NAHLA
	DR/	DR/

With my best wishes

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR JUNIORS (THIRD YEAR) STUDENTS OF STATISTICS			
COURSE TITLE:	**Statistical Methods**		COURSE CODE:ST3212
DATE:15 JUNE, 2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

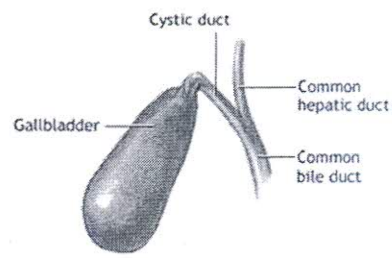
Answer the Following Questions: **Total Mark: 150**

Q1. A sample of scores on an examination given in Statistics are:

Men	72	69	98	66	85	76	79	80	77
Women	81	67	90	78	81	80	76		

At $\alpha = 0.05$, test the homogeneity and then test is the mean grade of the men is differ than the women mean grade. **(35 Mark)**

Q2. The gallbladder function was examined before and after fundoplication – a surgery used to stop stomach contents from flowing in patients with gastroeso-phageal reflux disease. The gallbladder functionality measured by calculating the gallbladder ejection fraction (GBEF) before and after fundoplication. The goal of fundoplication is to increase GBEF. We wish to know what is the conclusion provided from the following data? Take $\alpha = 0.05$



Pre-op	22	63.3	96	9.2	3.1	50	33	69
Post-op	63.5	91.5	59	7.8	10.1	19.6	41	87.8

(35 Mark)

Q3. It is desired to test whether the number of gamma rays emitted per second by a certain radioactive substance is a random sample having Poisson distribution with $\lambda = 3$. Use the following data for 300 one second intervals. Take $\alpha = 0.05$. **(40 Mark)**

Number of gamma rays	0	1	2	3	4	5	6	7 or more
Frequency	19	48	66	74	44	35	10	4

Q4. For the following data, test at $\alpha = 0.05$ **(40 Mark)**

(i) Is there a significant positive correlation between the two variables?

(ii) Find the least square regression model $y = a + bx$ and test the null hypothesis $H_0: b = 0$ *against* $H_1: b > 0$ using t-test if the sample data are as follows:

X	12	10	14	11	12	9
Y	18	17	23	19	20	15

You May Use: $t_{(0.05,4)} = 2.132$, $t_{(0.05,14)} = 1.761$, $t_{(0.025,14)} = 2.145$, $t_{(0.025,16)} = 2.12$, $t_{(0.05,8)} = 1.86$, $t_{(0.05,7)} = 1.895$, $\chi^2_{(0.05,7)} = 14.07$, $F_{(0.025,8,6)} = 5.6$, $F_{(0.05,8,6)} = 4.15$, $F_{(0.025,6,8)} = 3.58$, $\chi^2_{(0.05,8)} = 15.51$

With all my best Wishes

EXAMINERS	PROF.DR. HALA FERGANY	DR. WAFAA ANWAR ABD EL-LATIF

نموذج اخره

Tanta University Faculty of Science Department of Mathematics			
Examination for :	Level Three – Mathematics		
Course Title: Elasticity		Course Code:	MA3216
Time: 15/ 6/ 2017	Term: Second	Total Assessment Marks: 150 M	Time Allowed: 2H

Answer the following questions:

First question: (35 Marks)

(a) Define the following: Homogeneous and isotropic material-Cauchy stress principle – types of deformation- Elasticity and Plasticity materials.

(b) Discuss Cauchy's stress surface.

Second question: (40 Marks)

For the following stress: $\sigma_{ij} = \begin{pmatrix} 3 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{pmatrix}$

(i) Determine the principle stresses an dprinciple directions and find the stress vector on a plane with unit normal vector $n = (0,\ 1,\ 1)/\sqrt{2}$.

(ii) By using Hook's law, find the corresponding strain tensor at p, if $E = 1,\ \nu = 2$.

(iii) Determine the normal and shearing stresses N, S and the maximum shearing $S_{\max}$.

Third question: (35 Marks)

(a) Find the Longitudinal and Transverse vibrations in an unbounded elastic medium.

(b) Deduce the differential equations of plain strain problem $u = u(x,z),\ v = 0,\ w = w(x,z)$.

Forth question: (40 Marks)

(a) Drive the strain compatibility equations.

(b) Discuss the problem of pure bending of a prismatical bar and determine its displacement components.

With best wishes
Prof. Dr. Magdy Serwah and Dr. Kh. El-Morabie

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS
	EXAMINATION FOR PROSPECTIVE STUDENTS (3^{RD} YEAR) STUDENTS OF COMPUTER SCIENCES
	COURSE TITLE: STOCHASTIC PROCESSES — COURSE CODE: ST3212

DATE: 18-6-2017	JUNE, 2017	TERM: 2^{ND}	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer the following questions:

(I) (a) Show that if $\{X(n); n \ge 0\}$ be a sequence of independent identically distributed random variables with mean 0 and variance 1 then $X(n)$ is WSS. **(25 marks)**

(b) Let $X(t) = R|\cos 2\pi ft|$, $\cos 2\pi ft \neq 0$ be a rectified cosine signal having a random amplitude R with the probability density function:

$$f_R(r) = \begin{cases} \frac{1}{10} e^{-\frac{r}{10}}, & r \ge 0 \\ 0, & Otherwise. \end{cases}$$

What is the probability density function of $X(t)$? **(25 marks)**

(II) (a) State and prove Chapman-Kolmogorov theorem. **(18 marks)**

(b) The transition probability matrix of a Markov chain $\{X_n\}$ with three states 1, 2 and 3 is given by,

$$P = \begin{bmatrix} 0 & 0.5 & 0.5 \\ 0 & 0 & 1 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$$ **(32 marks)**

and the initial distribution is $P^{(0)} = (0.4, 0.4, 0.2)$.

(i) Is the chain an irreducible? Explain. **(ii)** Find communicating classes.

(iii) Find $P\{X_2 = 2\}$.

(iv) Find $P\{X_3 = 3, X_2 = 2 | X_1 = 3\}$.

(III) (a) Are the following statements true or false? Verify your answer **(25 marks)**

(i) The simple random walk has a Markov property.

(ii) The number of transitions is affected on Markov chain.

(iii) Poisson process is a wide sense stationary process.

(b) Prove that, if $\{M_k; k = 0,1,2,...\}$ is a simple random walk process then $\frac{1}{k} M_k \to 0$, almost surely, as $k \to \infty$. **(25 marks)**

EXAMINERS	PROF. DR./ MEDHAT EL-DAMCESE	
	DR./ MOHAMED ABD ALLAH EL-HADIDY	

With best wishes

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

1969

EXAMINATION FOR PROSPECTIVE STUDENTS (3^{RD} YEAR) STUDENTS OF COMPUTER SCIENCES

COURSE TITLE: STOCHASTIC PROCESSES			COURSE CODE: ST3212	
DATE: 18-6-2017	JUNE, 2017	TERM: 2^{ND}	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

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(b) Prove that, if $\{M_k; k = 0,1,2,\ldots\}$ is a simple random walk process then $\frac{1}{k} M_k \to 0$, almost surely, as $k \to \infty$. **(25 marks)**

EXAMINERS	PROF. DR./ MEDHAT EL-DAMCESE	
	DR./ MOHAMED ABD ALLAH EL-HADIDY	

With best wishes

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS
	EXAMINATION FOR PROSPECTIVE STUDENTS (3RD YEAR) STUDENTS OF COMPUTER SCIENCES
	COURSE TITLE: STOCHASTIC PROCESSES | COURSE CODE: ST3212
DATE: 18-6-2017 | JUNE, 2017 | TERM: 2ND	TOTAL ASSESSMENT MARKS: 150 | TIME ALLOWED: 2 HOURS

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EXAMINERS	PROF. DR./ MEDHAT EL-DAMCESE	
	DR./ MOHAMED ABD ALLAH EL-HADIDY	

With best wishes

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
EXAMINATION FOR SENIORS STUDENTS OF STATISTICS			
COURSE TITLE: SELECTED TOPIC IN STATISTICS (1)			COURSE CODE: ST3214
DATE: 18/6/2017	TERM :SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer the following questions

First question

(1) Prove that: $var(X) = E[var(X|Y)] + var(E[X|Y])$.

(2) If $P(A) > 0, P(B) > 0$, show that A, B are independent events iff

$$P(A \cap B) = P(A)\, P(B)$$

Second question

(1) If X_1 and X_2 are two independent random variables follow binomial distribution with parameters (n_i, p) for $i = 1,2$. Show that the random variable $Z = X_1 + X_2$ follows binomial distribution with parameters $(n_1 + n_2, p)$.

(2) Prove that: $var(X_1 - X_2) = var(X_1) + var(X_2) - 2cov(X_1, X_2)$.

Third question

(1) Let X be a random variable follows exponential distribution with mean $\left(\frac{1}{\lambda}\right)$. Find $E(X|X > 1)$.

(2) Show that the two random variables X and Y are independent iff $M(t_1, t_2) = M(t_1, 0)M(0, t_2)$.

Fourth question

Let (X, Y) have a joint density function of

$$f(x,y) = \begin{cases} x\, e^{-x}\, e^{-y}, & x, y > 0 \\ 0, & otherwise \end{cases}$$

Find the distribution for the variables Z and U, where $Z = X + Y$ and $U = {}^{Y}/_{X}$.

Examiners	Dr. ABD EL-MONIEM TEAMAH	Dr. NEAMA TEMRAZ

With my best wishes

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
EXAMINATION FOR SENIORS STUDENTS OF STATISTICS			
COURSE TITLE: SELECTED TOPIC IN STATISTICS (1)			COURSE CODE: ST3214
DATE: 18/6/2017	TERM :SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

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With my best wishes

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
EXAMINATION FOR SENIORS STUDENTS OF STATISTICS			
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Examiners	Dr. ABD EL-MONIEM TEAMAH	Dr. NEAMA TEMRAZ

With my best wishes

50

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS
	EXAMINATION FOR LEVEL THREE STUDENTS OF COMPUTER SCIENSE
	COURSE TITLE: SOFTWARE DESIGN & ANALYSIS — COURSE CODE: CS3212
DATE: 18-6-2017 — TERM: SECOND	TOTAL ASSESSMENT MARKS: 150 — TIME ALLOWED: 2 HOURS

Answer all the following questions:

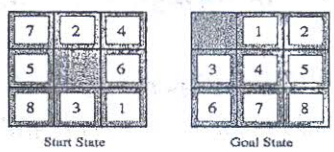
الاختبار من ورقتين

QUESTION 1: [Total marks: 55]

1. Compare among the algorithms in the following Table with respect to the items indicated by filling in the blank cells with (true), (false), or the complexity value.
(16 marks)

Algorithm/items	Completeness	Optimality	Time complexity	Space complexity
Breadth-first				
Depth-first				
Uniform-cost				
Depth-limited				
Iterative deepening				
Bidirectional				
Greedy best-first				
A^*				

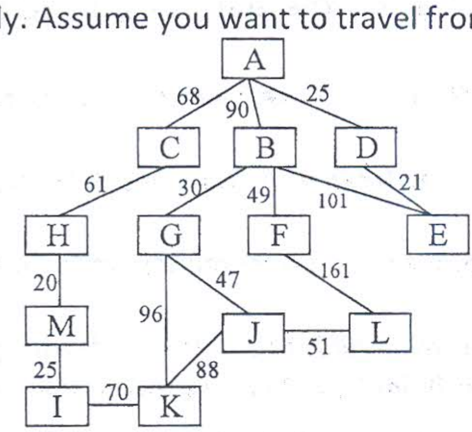
2. Discuss the task environment properties. (12 marks)
3. For the 8-puzzel problem define the following:



   a. The five components of problem formulation. (10 marks)
   b. The task environment properties. (6 marks)
4. Define the utility-based agent. What are its advantages over other structures? How can it improve its performance through learning? (11 marks)

QUESTION 2: [Total marks: 50]

1. Consider the following road map of cities: The lines and associated numbers between cities represent the roads connecting them and the distance between cities, respectively. Assume you want to travel from city *A* to the city *L*.



A: 316
B: 203
C: 279
D: 324
E: 330
F: 126
G: 143
H: 94
I: 92
J: 50
K: 110
L: 0
M: 191

Find the path from A to L using the following algorithms:
   a. Depth first search, (12 marks)
   b. Uniform-cost, (12 marks)
   c. Greedy best-first search, (13 marks)
   d. A* search. (13 marks)

انظر خلفه

QUESTION 3: [Total marks: 45]

Part1: Choose the best answer from A, B, C, and D: (25 marks: 5 for each point)

1. Complexity for any search strategy is expressed in terms of some quantities, such as:
   I. Branching factor or maximum number of successors of any node.
   II. Depth of the shallowest goal node.
   III. Maximum length of any path in the state space.

   A. I and II only B. I and III only C. II and III only D. I, II, and III
2. Heuristic search strategy can find solutions more efficiently than can an uninformed strategy. This because heuristic search strategy:
   A. Uses problem-specific knowledge beyond the definition of the problem itself.
   B. Uses evaluation function $f(n)$ for each node n.
   C. Expands node with the lowest evaluation first.
   D. All of the above.
3. Which of the following search strategies depends on the path cost from the start node to current node (node ***n***) only at evaluating node ***n***?
   A. A* algorithm. B. Iterative deepening.
   C. Uniform cost. D. Greedy best-first.
4. The main tasks of learning element in learning agent are:
   I. Uses feedback from the critic on how the agent is doing.
   II. Determines how the performance element should be modified to do better in the future.
   III. Takes in percepts and decides on actions.

   (A) I and II only. (B) I and III only. (C) II and III only. (D) I, II, and III.
5. Which of the following is <u>**not**</u> true about structured representation?
   I. Splits up each state into a fixed set of variables or attributes, each of which can have a value.
   II. Each state of the world is indivisible.
   III. Two different structured states have nothing in common.

   A. I and II only B. I and III only C. II and III only D. I, II, and III

Part2: Put (√) or (×) for each of the following sentences: (20 marks: 4 for each point)

1. The atomic representation considers the state as a black box with no internal structure.
2. Heuristic function is admissible if it is never overestimates the cost to reach the goal.
3. Space complexity is the main drawback of A^* because it keeps all generated nodes in memory.
4. A rational agent acts to minimize its performance measure, given the percept sequence it has seen.
5. Depth-limited search is used to avoid the infinite depth problem of DFS, by constraining the search only until depth L. This algorithm will be more efficient if we choose $L < d$.

Examiners:	1- Prof. Dr.Mohammed Kamel Gaber 2- Dr. Mossad Wageh Hassan

50

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR LEVEL THREE STUDENTS OF COMPUTER SCIENSE

COURSE TITLE: SOFTWARE DESIGN & ANALYSIS	COURSE CODE: CS3212		
DATE: 18-6-2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer all the following questions:

الاختبار من ورقتين

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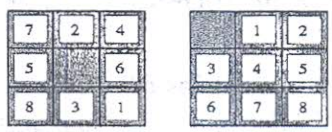

Start State   Goal State

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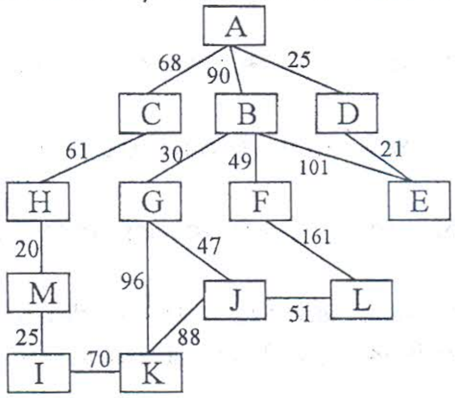

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Examiners:	**1- Prof. Dr.Mohammed Kamel Gaber 2- Dr. Mossad Wageh Hassan**

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
EXAMINATION FOR LEVEL THREE STUDENTS OF COMPUTER SCIENSE			
COURSE TITLE: SOFTWARE DESIGN & ANALYSIS		COURSE CODE: CS3212	
DATE: 18-6-2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer all the following questions:

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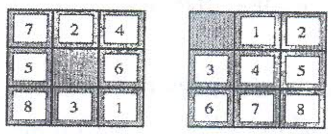
QUESTION 1: [Total marks: 55]

1. Compare among the algorithms in the following Table with respect to the items indicated by filling in the blank cells with (true), (false), or the complexity value. (16 marks)

Algorithm/items	Completeness	Optimality	Time complexity	Space complexity
Breadth-first				
Depth-first				
Uniform-cost				
Depth-limited				
Iterative deepening				
Bidirectional				
Greedy best-first				
A^*				

2. Discuss the task environment properties. (12 marks)
3. For the 8-puzzel problem define the following:

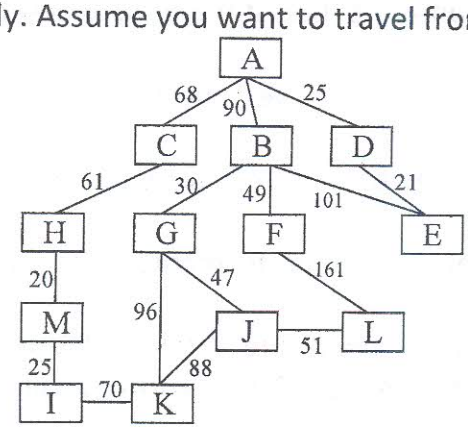


Start State Goal State

   a. The five components of problem formulation. (10 marks)
   b. The task environment properties. (6 marks)
4. Define the utility-based agent. What are its advantages over other structures? How can it improve its performance through learning? (11 marks)

QUESTION 2: [Total marks: 50]

1. Consider the following road map of cities: The lines and associated numbers between cities represent the roads connecting them and the distance between cities, respectively. Assume you want to travel from city *A* to the city *L*.



A: 316
B: 203
C: 279
D: 324
E: 330
F: 126
G: 143
H: 94
I: 92
J: 50
K: 110
L: 0
M: 191

Find the path from A to L using the following algorithms:

   a. Depth first search, (12 marks)
   b. Uniform-cost, (12 marks)
   c. Greedy best-first search, (13 marks)
   d. A* search. (13 marks)

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QUESTION 3: [Total marks: 45]

Part1: Choose the best answer from A, B, C, and D: (25 marks: 5 for each point)

1. Complexity for any search strategy is expressed in terms of some quantities, such as:
   - I. Branching factor or maximum number of successors of any node.
   - II. Depth of the shallowest goal node.
   - III. Maximum length of any path in the state space.

   A. I and II only B. I and III only C. II and III only D. I, II, and III
2. Heuristic search strategy can find solutions more efficiently than can an uninformed strategy. This because heuristic search strategy:
   - A. Uses problem-specific knowledge beyond the definition of the problem itself.
   - B. Uses evaluation function $f(n)$ for each node n.
   - C. Expands node with the lowest evaluation first.
   - D. All of the above.
3. Which of the following search strategies depends on the path cost from the start node to current node (node ***n***) only at evaluating node ***n***?

   A. A* algorithm. B. Iterative deepening.
   C. Uniform cost. D. Greedy best-first.
4. The main tasks of learning element in learning agent are:
   - I. Uses feedback from the critic on how the agent is doing.
   - II. Determines how the performance element should be modified to do better in the future.
   - III. Takes in percepts and decides on actions.

   (A) I and II only. (B) I and III only. (C) II and III only. (D) I, II, and III.
5. Which of the following is **not** true about structured representation?
   - I. Splits up each state into a fixed set of variables or attributes, each of which can have a value.
   - II. Each state of the world is indivisible.
   - III. Two different structured states have nothing in common.

   A. I and II only B. I and III only C. II and III only D. I, II, and III

Part2: Put (√) or (×) for each of the following sentences: (20 marks: 4 for each point)

1. The atomic representation considers the state as a black box with no internal structure.
2. Heuristic function is admissible if it is never overestimates the cost to reach the goal.
3. Space complexity is the main drawback of A* because it keeps all generated nodes in memory.
4. A rational agent acts to minimize its performance measure, given the percept sequence it has seen.
5. Depth-limited search is used to avoid the infinite depth problem of DFS, by constraining the search only until depth L. This algorithm will be more efficient if we choose $L < d$.

Examiners:	1- Prof. Dr.Mohammed Kamel Gaber 2- Dr. Mossad Wageh Hassan

احصاء - علوم الحاسب

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS		
	Final Exam 2^{nd} Term 2016-2017		
	4^{th} year, statistics	**Course Title:** Time Series Analysis	**Course Code: ST4204**
1969	**Date: 12-6-2017**	**Total Mark:** 150 Marks	**Time Allowed:** 2 Hours

Answer all the following questions:

Q # (1)

a. Discuss the wide sense stationarity of the stochastic model $X_t = A_1 + A_2 t^2$ where A_1, A_2 are independent variables with mean $E[A_i] = a_i$ and variance $\mathrm{Var}[A_i] = \sigma_i^2$. (15 marks)

b. For the inverted form of ARIMA(p,d,q) model, show that $\sum_{j=1}^{\infty} \pi_j = 1$ that, where π_j are model parameters, and then put ARIMA(0,1,1) in its inverted form. (20 marks)

c. Define: Discrete-valued time series, Invertibility, Linear process, Autoregressive integrated moving average process and Periodogram. (15 marks)

Q # (2)

a. State (without proof) all the properties of the autocovariance and spectral density functions. (15 marks)

b. Consider the model $Y_t = Y_{t-3} + a_t - 0.1a_{t-1}$: Discuss stationarity and invertibility of Y_t and state if $Z_t = (1 - \mathrm{B}^3)Y_t$ stationary or not. Compute, when possible, the spectrum of Y_t and Z_t. (25 marks)

c. Discuss the invertibility of the MA(1) model, and then derive its autocorrelation and spectral density functions. (15 marks)

Q # (3)

a. State the importance of that the time series ARMA models be stationary. (10 marks)

b. For an AR(2) time series: Get its autocorrelation (AC) and spectral density functions. (20 marks)

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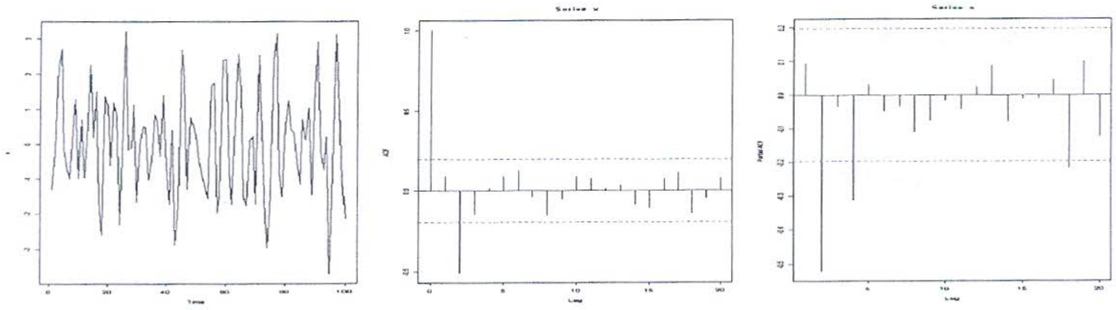
c. Describe the AR time series (left plot), that is stationary or not. What is the order of the model based on PACF (right plot)? and describe the AR ACF (middle plot): (15 marks)



Best wishes

Examiners	1- Dr. *Hassan S. Bakouch* & 2- Dr. *Marwa Seyam*