Tanta UNIVERSITY

FACULTY OF SCIENCE - MATHEMATICS DEPARTMENT

EXAMINATION for 3RD LEVEL (STATISTICS)

COURSE TITLE: Statistical Programs (ST3204)

DATE: 27th May 2018 | TERM: Second | TOTAL ASSESSMENT MARKS: 150 | TIME ALLOWED: 2 Hours

Final Examination Paper

Answer the following questions:

Q1: a. Define in details the use of these buttons:

Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align

b. How to activate the "Data Analysis" menu in Excel.

Q2: Complete the following tables and run the test:

a.

	N	Mean	Std. Deviation	Std. Error Mean
Anger Expression	78	37.0000		1.46533

One-Sample Test

	Test Value = 45					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Anger Expression	-5.460		.000		-10.9178	-5.0822

b.

		Type of Sports				
		Tennis	Football	Running	Swimming	Total
Gender	Male		5		10	
	Female	14		12		
Total			27	13	15	78

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square			.002

c.

Correlations

		Anger-Out	Anger-In
Anger-Out	Pearson Correlation		.016
	Sig. (2-tailed)		.889
	N	78	78
Anger-In	Pearson Correlation	.016	1
	Sig. (2-tailed)	.889	
	N	78	78

EXAMINERS | DR. MOHAMED M. EZZAT | DR. EMAN GHAREIB

Q3: Complete the following outputs and run the test:

a.

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Anger Expression	Male	25	30.9600		2.10751
	Female	53		13.07434	1.79590

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Anger Expression	Equal variances assumed	.642	.426			.004		2.99154
	Equal variances not assumed					.002		2.76891

b.

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups				1.027	.386
Within Groups	12380.381				
Total		77			

c.

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Anger-Out	Male	25		3.14272	.62854
	Female	53		4.61838	.63438

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Anger Expression	Equal variances assumed		.030	-1.149		.254	-1.17283	1.02113
	Equal variances not assumed			-1.313		.194	-1.17283	.89303

Good Luck

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دعاء [illegible]

EXAMINERS	DR. MOHAMED M. EZZAT	DR. EMAN GHAREIB

1969	Tanta University Faculty of Science Department of Mathematics		
	Final Exam for the Second Semester 2017-2018		
	Course title:	Analytical dynamics	**Course Code:** MA3202
	Date: 27/5/2018	**Total mark:** 150 Marks	**Time allowed:** 2 Hours

Answer all the following questions:

First question: (40 Marks)

a-Put true sign (√) or wrong sign (X) in front of all the following **(20 Marks)**

1. If the total force equals zero, then the linear momentum is conserved.
2. When the virtual work done by the force of constraints vanishes, the constraints are called ideal constraints.
3. Lagrange's equations are considered as third order nonlinear differential equations.
4. If a transformation is canonical, then its inverse transformation is not canonical.
5. The Poisson's bracket for the functions u and v (depending on position q_i, momentum p_i and time t) can be expressed as $[u,v]=\sum_{i=1}^{n}(\frac{\partial v}{\partial q_i}\frac{\partial u}{\partial p_i}-\frac{\partial v}{\partial p_i}\frac{\partial u}{\partial q_i})$.
6. In Brachistocrone problem it is required a curve of fast descent of a particle under the gravity force.
7. Hamilton's principle can't be obtained from Newton's equations.
8. The equation $H(q_i,\frac{\partial S}{\partial q_i},t)+\frac{\partial S}{\partial t}=0$ represents Hamilton-Jacobi equation.
9. For the Poisson's bracket, we get $[q_i,q_j]\neq 0$.
10. A point particle moving on a line has three degrees of freedom.

b- Choose the correct answer for all the following **(20 Marks)**

1. A pendulum with rigid arm has .... degree of freedom.
   a. one b. two c. three d. six
2. For the Poisson's bracket, we get $[p,H]=$ ....
   a. $\frac{\partial H}{\partial q}$ b. $-\frac{\partial H}{\partial q}$ c. $\frac{\partial H}{\partial p}$ d. $-\frac{\partial H}{\partial p}$
3. The cyclic coordinate of a moving particle in spherical coordinates (r,θ,φ), in which the potential depends only on r and θ axis is.........
   a. ρ b. θ c. r d. φ
4. Hamilton's canonical equations are .... nonlinear differential equations.
   a. first order b. second order c. third order d. fourth order
5. If the mechanical system doesn't contain ignorable coordinates then .... where R, H and L are Routhian , Hamiltonian and Lagrangian functions respectively.
   a. $R=H$ b. $R\neq H$ c. $R\neq L$ d. $R=L$
6. If a constraint's equation is given in the form $f(\underline{r}_i,\dot{\underline{r}}_i;t)=0;\quad i=1, 2, ..., n$ then the constraint is called ....
   a. holonomic b. geometric c. differential d. rehonomic
7. If the equations of the system depend on time explicitly, the system is said to be ..... system.
   a. Holonomic b. Scleronomic c. Conservative d. Rehonomic

(*Please Turn the Paper*)

8. Lagrange's equations for holonomic conservative systems are expressed by .... $j = 1,...,n$.

a. $\frac{d}{dt}(\frac{\partial L}{\partial q_j}) - \frac{\partial L}{\partial \dot{q}_j} = 0;$ b. $\frac{d}{dt}(\frac{\partial L}{\partial \dot{p}_j}) - \frac{\partial L}{\partial p_j} = 0;$ c. $\frac{d}{dt}(\frac{\partial L}{\partial \dot{q}_j}) - \frac{\partial L}{\partial q_j} = 0;$ d. $\frac{d}{dt}(\frac{\partial L}{\partial p_j}) - \frac{\partial L}{\partial \dot{p}_j} = 0;$

9. The Poisson's bracket $[u,v]$ equals..............

a. $-[v,u]$ b. $-[u^2,v^2]$ c. $\frac{\partial}{\partial t}[v,u]$ d. $\frac{\partial}{\partial t}[u,v]$

10. For the generating function $F_1 = F_1(q_i, Q_i, t)$ one has ....

a. $p_i = \frac{\partial F_1}{\partial q_i},\ q_i = \frac{\partial F_1}{\partial Q_i}$ b. $p_i = \frac{\partial F_1}{\partial q_i},\ P_i = -\frac{\partial F_1}{\partial Q_i}$

c. $Q_i = \frac{\partial F_1}{\partial q_i},\ P_i = -\frac{\partial F_1}{\partial Q_i}$ d. $q_i = \frac{\partial F_1}{\partial q_i},\ P_i = -\frac{\partial F_1}{\partial Q_i}$

Second question: (35 Marks)

a. **Find the generalized forces of a particle m connected with a fixed elastic spring.** **(15 Marks)**

b. **A dynamical system has two degrees of freedom, it's kinetic and potential energies are $T = \frac{\dot{q}_1^2}{2(a+bq_2^2)} + \frac{1}{2}\dot{q}_2^2$, $V = c + dq_2^2$, where a,b,c and d are constants. Find the coordinates q_1 and q_2.** **(20 Marks)**

Third question: (35 Marks)

a. **Find the equation of path of the shortest curve between two points in a plane.** **(15 Marks)**

b. **Discuss the motion of a particle falling under gravity, using Hamilton-Jacobi equation.** **(20 Marks)**

Fourth question: (40 Marks)

a. **Writes down Lagrange's equation from the Lagrangian given by $L = \frac{1}{2}q^2\dot{q}^2 - q^3$. Also, find the solution of the resulting equation.** **(15 Marks)**

b. **If $F_2 = \sum_i q_i P_i$ is a generating function, Prove that F_2 generates an identity transformation.** **(15 Marks)**

c. **If u, v and w are functions of position, generalized momentum and time. Prove that $[u+v,w] = [u,w]+[v,w]$ where $[u,v]$ is the Poisson's bracket for the functions u and v.** **(10 Marks)**

(Best wishes)

Examiners:	1- Prof. Dr. M. O. Shaker	2- Prof. Dr. Tarek Amer

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS EXAMINATION FOR FRESHMEN (THIRD LEVEL) STUDENTS OF STATISICAL MATHEMATICS

COURSE TITLE:	**Functional analysis & Optimal control**		COURSE CODE: MA3210
DATE: JUN 7, 2018	TERM: SECOND	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer the following questions

First: Optimal Control:

1-a) Determine an extremal for the functional **(mark 38 degree)**

$$J(x)=\int_0^2 [\dot{x}^2(t)+2x(t)\dot{x}(t)+4x^2(t)]dt$$

Where $x(0)=1$ *and* $x(2)$ *is free.*

b) Using Lagrange multiplier method to find extremum values of functional

$$J(x_1,x_2)=\int_0^1 \{\frac{1}{2}[(\dot{x}_1)^2+(\dot{x}_2)^2]+x_1x_2\}dt$$

Subject to the differential constraint $\dot{x}_2-x_1=0$

The end conditions for $x_1(t)$ *and* $x_2(t)$ *are*

$$x_1(0)=0,\ x_1(1)=0,\ x_2(0)=0,\ x_2(1)=1.$$

2-a) Find an extremal for the functional **(mark 37 degree)**

$$J(x)=\int_0^{\frac{\pi}{2}} [\dot{x}_1^2+\dot{x}_2^2+2x_1x_2]dt$$

Subject to boundary conditions

$$x_1(0)=0,\ x_1(\frac{\pi}{2})=1,\ x_2(0)=0,\ x_2(\frac{\pi}{2})=1.$$

b) Using the Hamiltonian method to solve the following optimal control problem

$$\max\ J=\int_0^3 (4x-5u^2)dt$$

Subject to $\dot{x}=8u$

$$x(0)=2,\quad x(3)=117.2.$$

من فضلك انظر أسئلة التحليل الدالى

Functional Analysis

Third question: (38 Marks)

(a) Define the following:

(1) The set M is bounded in metric space (X,d).

(2) Convergent sequence in metric space (X,d).

(3) Cauchy sequence in metric space (X,d).

(4) Complete metric space.

(5) Incomplete metric space.

Hence or otherwise prove that:

(i) The convergent sequence is bounded.

(ii) The space $\left(\left[\frac{1}{2},1\right),d\right)$ is incomplete metric space.

(b) Prove that the metric space (l_p,d) is complete.

(c) Prove that the normed space $(C[0,1],\|\cdot\|)$ is Banach space.

convergent sequence is bounded.

Fourth question: (38 Marks)

(a) Define the following:

(1) Fixed point.

(2) Contraction mapping.

(3) Continuous mapping.

Hence or otherwise state and prove "Fixed point theorem".

(b) If we define in inner product space X, $\|x\|^2=(x,x)$. Prove that $(X,\|\cdot\|)$ is normed space.

(c) If $S=\{x: x=(\xi_1,\xi_2,\cdots,\xi_n,\cdots)\}$ and $d(x,y)=\sum_{j=1}^{\infty}\frac{1}{2^j}\frac{|\xi_j-\eta_j|}{1+|\xi_j+\eta_j|}$. Prove that:

(1) $d(x,y)$ is finite.

(2) (S,d) is metric space.

(3) $(S,\|\cdot\|)$, where $\|x\|=d(x,0)$ is not normed space.

Examiners:	1- Prof. M. Abd-El Hady	2-Prof. S. Abd-El Aziz

<table>
<tr><td rowspan="4">1969</td><td colspan="3">Tanta University
Faculty of Science
Department of Mathematics</td></tr>
<tr><td colspan="3">Final term exam for the second semester 2017-2018</td></tr>
<tr><td>Course title:</td><td>Optimal Control (1) رياضيات</td><td>Course code: MA3210</td></tr>
<tr><td>Date:7 /6/2018</td><td>Total Marks: 150</td><td>Time allowed: 2 Hours</td></tr>
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Answer all the following questions:

First question: (40 Marks)

(a) Show that the following set $S=\{x:|x|\le 2\}\subset R$ is convex set.

(b) Find a necessary condition of extremum of the functional

$$J(x)=\int_{t_0}^{t_f} F\left(x(t),x'(t),t\right)dt$$

Where $t_0, x(t_0)$, and t_f are specified, and $x(t_f)$ is free.

(c) In seeking an extremal $J(x)=\int_{t_0}^{t_f} F\left(x(t),x'(t),t\right)dt$, Show that:

(i) Euler's equation can also be expressed as $\frac{d}{dt}\left(F-x'\frac{\partial F}{\partial x'}\right)-\frac{\partial F}{\partial t}=0$

(ii) If F is not an explicit of t , then $F-x'\frac{\partial F}{\partial x'}=c$.

Second question: (40 Marks)

(a) Optimize $J(x)=\int_0^1 \left(13t-3x'^2+36xt\right)dt$, $x(0)=2,\quad x(1)=4$

(b) Evaluate the variation of the functional. $J(x(t))=\int_{t_0}^{t_f}\left[2x^2(t)+3x(t)+4\right]dt$

(c) Find the extremals and stationary function of the functional :

$J[x(t)]=\int_0^1 xx'^2\,dt$ that satisfy the boundary conditions $x(0)=1, x(1)=\sqrt[3]{4}$

Third question: (30 Marks)

(a) Using Lagrange multipliers method to Minimize the performance index $J=\int_0^{t_f}\left[\frac{1}{2}x_1^2+\frac{1}{2}x_2^2\right]dt$, $x_1'(t)=x_2(t)$ and $x_1(0)=0,\quad x_2(0)=1$.

(b) Solve the problem: $\min\int_0^1\left(x^2+x'^2\right)dt$, $x(0)=1,\quad x(1)$ free .

أنظر باقي الأسئلة خلف الورقة

Fourth question: (40 Marks)

(a) Using Lagrange multipliers method to Minimize the performance index $J=\int_0^{t_f}\left[\frac{1}{2}x_1^2+\frac{1}{2}x_2^2\right]dt$, $x_1'(t)=x_2(t)$ and $x_1(0)=0, \quad x_2(0)=1$.

(b) Solve the following problem: $\min \quad J[x_1,x_2]=\int_0^{\frac{\pi}{2}}\left(x_1'^2+x_2'^2+2x_1x_2\right)dt$

such that $x_1(0)=x_2(0)=0$ and $x_1\left(\frac{\pi}{2}\right)=1, \quad x_2\left(\frac{\pi}{2}\right)$ is free

(c) Find the extremal of the functional: $J(x)=\int_0^1\left(360t^2x-x''^2\right)dt$

under the conditions $x(0)=0, x'(0)=1, x(1)=0, \quad x'(1)=2.5$.

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Examiners:	1- Prof. Dr. S. Ammat	2- Dr. N. El-Kholy

(Best wishes)

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR LEVEL THREE STUDENTS OF COMPUTER SCIENSE

COURSE TITLE: SYSTEM ANALYSIS AND DESIGN | COURSE CODE: CS3210

DATE: 22-5-2018 | TERM: SECOND | TOTAL ASSESSMENT MARKS: 150 | TIME ALLOWED: 2 HOURS

Answer all the following questions:

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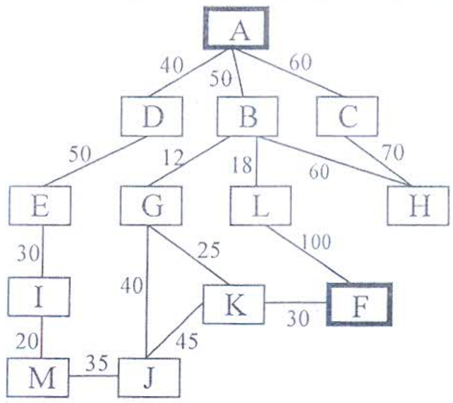
QUESTION 1: [Total marks: 50]

1. Define the queuing structures used in DFS, UCS, BFS, and Best-first search and explain why each uses their particular style. (10 marks)
2. Describe the differences between UCS, greedy best-first search, and A* search. What advantages does A* have over UCS and greedy best-first search? (10 marks)
3. Find the shortest path from A to F in the following Figure using: (30 marks: 10 for each point)

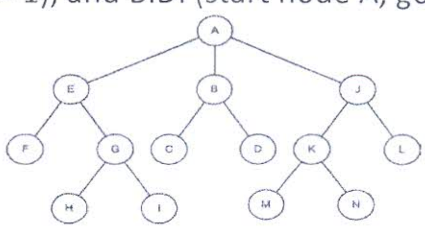


A: 150
B: 100
D: 120
C: 145
H: 160
L: 60
G: 70
E: 80
M: 90
K: 25
J: 50
F: 0
I: 100

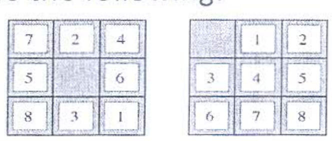
   a. UCS algorithm, find its complexities (time and space).
   b. Greedy best-first search algorithm, find its complexities (time and space).
   c. A* search algorithm, find its complexities (time and space).

QUESTION 2: [Total marks: 50]

1. What is uninformed (or blind) search and how does it differ from informed (or heuristic) search? (5 marks)
2. Briefly explain the advantages of bidirectional search over BFS. What are the difficulties of bidirectional search? (10 marks)
3. Provide the search order for the nodes shown in the following Figure for DFS, BFS, DLS (d=2), IDS (start depth = 1), and BIDI (start node A, goal node I). (15 marks)



4. For the 8-puzzel problem define the following:



Start State Goal State

   a. The task environment properties. (12 marks)
   b. Two heuristics functions. Are these heuristics admissible? (8 marks)

انظر خلفه

QUESTION 3: [Total marks: 25]

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

1. When an agent is able to act independently, not subject to external control. What is this property called?
   A. Cooperative B. Communicative C. Autonomous D. Rational
2. If an algorithm always finds a solution in a graph, what is this property called?
   A. Completeness. B. Time complexity. C. Space complexity. D. Optimality.
3. If an algorithm always finds the best solution, what is this characteristic?
   A. Completeness. B. Time complexity. C. Space complexity. D. Optimality.
4. .... agent architecture introduces the ability for agents to migrate from one host to another:
   A. Blackboard. B. Mobile. C. Hybrid. D. Deliberative.
5. Which of the following is true about the task environment properties for vacuum cleaner agent?
   I. The environment contain only single agent.
   II. The environment is fully observable to the agent, nothing is hidden.
   III. The changes of environment are based on the action selected by the agent.

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

QUESTION 4: [Total marks: 25]

Put (√) or (×) for each of the following sentences: (25 marks: 5 for each point)

1. BFS is better than DFS with non-weighted graph, since BFS algorithm will always find the best solution for a non-weighted graph.
2. In general, IDS is the preferred uninformed search method when the search space is small and the depth of solution is known.
3. Blackboard architecture operates around a global work area called the blackboard which contains information about environment and intermediate results.
4. System analysis specifies "how to accomplish the objective of the system" while system design focuses on "what the system should do".
5. Open system interacts with its environment, since it receives inputs from the environment and delivers outputs to the environment.

Examiners:	**1- Dr. Mossad Wageh Hassan 2- Dr.** AL Saed Ammar