



المستوى الثالث احصاء



Tanta University Faculty of Science

Department of Mathematics
Final term exam for the Second semester 2016-2017

I mai term exam for the Second Semester 2010 2017					
Course title:	Optimal Control +Functional	Course code: MA3210			

Date: 4 /6/2017 Total Marks: 150 Time allowed: 2 Hours

Answer all the following questions:

First question: (45 Marks)

(a) Show that the set $S = \{(x_1, x_2) \in \mathbb{R}^2 : |x_1| + |x_2| < 1\}$ is convex set.

(b) Find a necessary condition for a function to be an extremal for the functional $J(x) = \int_{t_0}^{t_f} F(x(t), x'(t), t) dt$, where $t_0, x(t_0), t_f(x(t))$ are specified?.

(c) Show that:

(i) Euler's equation can be written in the form: $\frac{d}{dt} \left(F - x' \frac{\partial F}{\partial x'} \right) - \frac{\partial F}{\partial t} = 0.$

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

Second question: (30 Marks)

(a) On what curves can the functional:

$$J[x(t)] = \int_{1}^{2} (x'^{2} - 2xt) dt$$
, $x(1) = 0$, $x(2) = -1$

attain an extremum.

(b) Optimize $J(x) = \int_{t_0}^{t_f} (2x'^2 - 42xt + 11t) dt$ s.t. $x(t_0) = x_0$ and $x(t_f) = x_f$

(c) Find the extremals of the problem corresponding to the functional

$$J = \int_{0}^{\frac{\pi}{2}} \left(2x_{1}x_{2} - 2x_{1}^{2} + x_{1}^{2} - x_{2}^{2} \right) dt \text{ s.t. } x_{1}(0) = 0, x_{1}\left(\frac{\pi}{2}\right) = 1, x_{2}(0) = 0, x_{2}\left(\frac{\pi}{2}\right) = 1.$$

- (a) Define the following:
- (1) Bounded set 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 (X,d). (5) Incomplete metric space (X,d).
- (6) Contraction mapping (7) Continuous mapping. (8) Linear space.
- (9) Normed space $(X, \|.\|)$ (10) Fixed point
- (b) State and prove Cauchy's inequality. Hence or otherwise prove that the space $\left(R^n,d\right)$ is complete metric space while the metric space $\left((0,1],d\right)$ is incomplete metric space.
- (c) Prove that the space l_p with $||x|| = \left(\sum_{j=1}^{\infty} |x_j|^p\right)^{\frac{1}{p}}$ is Banach space.

Fourth Equestion: (38 Marks)

(a) If f(x) and $\varphi(x) \in L_2(a,b)$, moreover $\int_a^b \int_a^b k^2(x,y) dx dy < \infty$. Prove

that the Fredholm integral equation $f(x) = \varphi(x) + \lambda \int_{a}^{b} k(x, y; f(y)) dy$ has a

unique point if
$$|\lambda| < \left(\int_{a}^{b} \int_{a}^{b} k^{2}(x,y) dx dy \right)^{-\frac{1}{2}}$$
.

(b) Prove that the functions " d(x,y), contraction mapping and ||x|| " are continuous functions.

(c) If
$$S = \{x : x = (\xi_1, \xi_2, \dots, \xi_n, \dots), \xi_i \in \mathbb{R} \ \forall j = 1, 2 \dots \}$$
 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) (S,d) is metric space.
- (2) $(S, \|.\|)$ is not normed space, where $\|x\| = d(x, 0)$.

(d) In
$$R^n$$
, we define $d_1(x,y) = \max\{|x_j - y_j|\}, d_2(x,y) = \sum_{j=1}^n |x_j - y_j|$ and

$$d_3(x,y) = \sqrt{\sum_{j=1}^n (x_j - y_j)^2}$$
. Prove that d_1, d_2, d_3 are equivalent.

Examiners:

1- Prof. Dr. S. Abdel Aziz-





Tanta University Faculty of Science Department of Mathematics

Final	term	exam	for	the	Second	semester	2016-2017	7
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Date:4 /6/2017	Total Marks: 150	Time allowed: 2 Hours

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(a) If f(x) and $\varphi(x) \in L_2(a,b)$, moreover $\int_a^b \int_a^b k^2(x,y) dx dy < \infty$. Prove

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Examiners:

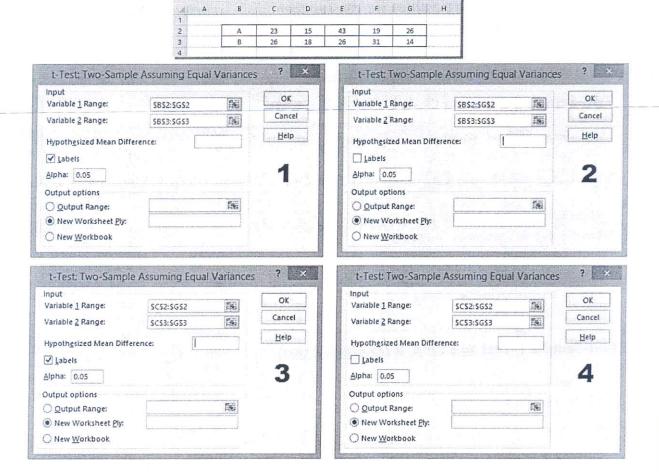
1- Prof. Dr. S. Abdel Aziz-

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS EXAMINATION FOR SOPHOMORES (THIRD YEAR) STUDENTS OF STATISTICS COURSE TITLE: Statistical Programs 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:



Q2: a. From the following table, write the regre	ssion equation:
--	-----------------

		Standard		
	Coefficients	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	\$1550.01 (MINERY STATE AND	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
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 (two-tailed test)

```
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

b. Two-Sample T-Test and CI: A, B (one-tailed test)

```
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

EXAMINERS DR. ELSAEED AMMAR DR. MOHAMED M. EZZAT



Tanta University Faculty of Science Department of Mathematics

Final term exam for the Second semester 2016-2017

Course title: Optimal Control +Functional Course code: MA3210
Analysis

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1 2

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1- Prof. Dr. S. Abdel Aziz-



Tanta University Faculty of Science Department of Mathematics

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C.	Paired T	-Test an	d CI: D, E	(two-tai	iled test)			,
		N	Mean St	Dev SE M	ean			
	D	8 2	24.75	1	.10			
	E	8	15.00 2	.83				
	Differenc	e 8	1.	982 0.	701			
	95% CI fo	r mean di	fference	: (], [)		
	T-Test of	mean dit	ference :	= 0 (vs [): T-Va	lue =	P-Va	alue = 0.000
d.	One-Sam	nple T: C	(<u>one-tai</u>	led test)				
2	Test of µ	= 20 vs						
	Variable			SE Mean	n 95% Upr	oer Bound	Т	P
		12 16.2			7			0.000
e.	One-way	ANOVA	: A, C, E					
	Source D	F Adj SS	Adj MS	F-Value	e P-Value	9		•
	Factor			124	6 0.00			
	Error [133.7]				
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	10001 2	٠ L	J					
ritical V	alues of t-I	Distributi	on	44				
	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	- 12 Charles of the Control of the C			
,	3	1.638	0.050	Home Printers of the Control of the	6,965	9.925	22.327	31.599
	- Lesson - a when I		2.353	3.182	4.541	9.925 5.841	22.327	31.599 12.924
	4	1.533	2.353				Chicago positive to an artist	
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	- II Line Gott To the Ministration		2.132	3.182 2.776	4.541 3.747	5.841 4.604	*10.215 7.173	12.924 8.610
	5	1.476	2.132 2.015	3.182 2.776 2.571	4.541 3.747 3.365	5.841 4.604 4.032	*10.215 - 7.173 - 5.893	12.924 8.610 6.869
	5 6	1.476 1.440	2.132 2.015 1.943	3.182 2.776 2.571 2.447	4.541 3.747 3.365 3.143	5.841 4.604 4.032 3.707	*10.215 7.173 5.893 5.208	12.924 8.610 6.869 5.959
	5 6 7	1.476 1.440 1.415	2.132 2.015 1.943 1.895	3.182 2.776 2.571 2.447 2.365	4.541 3.747 3.365 3.143 2.998	5.841 4.604 4.032 3.707 3.499	10.215 7.173 5.893 5.208 4.785	12.924 8.610 6.869 5.959 5.408
	5 6 7 8	1.476 1.440 1.415 1.397	2.132 2.015 1.943 1.895 1.860	3.182 2.776 2.571 2.447 2.365 2.306	4.541 3.747 3.365 3.143 2.998 2.896	5.841 4.604 4.032 3.707 3.499 3.355	*10.215 7.173 5.893 5.208 4.785 4.501	12.924 8.610 6.869 5.959 5.408
	5 6 7 8 9	1.476 1.440 1.415 1.397 1.383	2.132 2.015 1.943 1.895 1.860 1.833	3.182 2.776 2.571 2.447 2.365 2.306 2.262	4.541 3.747 3.365 3.143 2.998 2.896 2.821	5.841 4.604 4.032 3.707 3.499 3.355 3.250	*10.215 7.173 5.893 5.208 4.785 4.501 4.297	12.924 8.610 6.869 5.959 5.408 5.041 4.781
	5 6 7 8 9	1.476 1.440 1.415 1.397 1.383 1.372	2.132 2.015 1.943 1.895 1.860 1.833 1.812	3.182 2.776 2.571 2.447 2.365 2.306 2.262 2.228	4.541 3.747 3.365 3.143 2.998 2.896 2.821 2.764	5.841 4.604 4.032 3.707 3.499 3.355 3.250 3.169	*10.215 7,173 5.893 5.208 4.785 4.501 4.297 4.144	12.924 8.610 6.869 5.959 5.408 5.041 4.781 4.587
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	5 6 7 8 9 10 11	1.476 1.440 1.415 1.397 1.383 1.372 1.363 1.356	2.132 2.015 1.943 1.895 1.860 1.833 1.812 1.796	3.182 2.776 2.571 2.447 2.365 2.306 2.262 2.228 2.201 2.179	4.541 3.747 3.365 3.143 2.998 2.896 2.821 2.764 2.718 2.681	5.841 4.604 4.032 3.707 3.499 3.355 3.250 3.169 3.106 3.055	10.215 7.173 5.893 5.208 4.785 4.501 4.297 4.144 4.025 3.930	12.924 8.610 6.869 5.959 5.408 5.041 4.781 4.587 4.437 4.318
	5 6 7 8 9 10 11 12 13	1.476 1.440 1.415 1.397 1.383 1.372 1.363 1.356 1.356	2.132 2.015 1.943 1.895 1.860 1.833 1.812 1.796 1.782 1.771	3.182 2.776 2.571 2.447 2.365 2.306 2.262 2.228 2.201 2.179 2.160	4.541 3.747 3.365 3.143 2.998 2.896 2.821 2.764 2.718 2.681 2.650	5.841 4.604 4.032 3.707 3.499 3.355 3.250 3.169 3.106 3.055 3.012	*10.215 7.173 5.893 5.208 4.785 4.501 4.297 4.144 4.025 3.930 3.852	12.924 8.610 6.869 5.959 5.408 5.041 4.781 4.587 4.437 4.318 4.221
	5 6 7 8 9 10 11 12 13	1.476 1.440 1.415 1.397 1.383 1.372 1.363 1.356 1.350 1.345	2.132 2.015 1.943 1.895 1.860 1.833 1.812 1.796 1.782 1.771	3.182 2.776 2.571 2.447 2.365 2.306 2.262 2.228 2.201 2.179 2.160 2.145	4.541 3.747 3.365 3.143 2.998 2.896 2.821 2.764 2.718 2.681 2.650 2.624	5.841 4.604 4.032 3.707 3.499 3.355 3.250 3.169 3.106 3.055 3.012 2.977	*10.215 7.173 5.893 5.208 4.785 4.501 4.297 4.144 4.025 3.930 3.852 3.787	12.924 8.610 6.869 5.959 5.408 5.041 4.781 4.587 4.437 4.318 4.221 4.140
	5 6 7 8 9 10 11 12 13 14 15	1.476 1.440 1.415 1.397 1.383 1.372 1.363 1.356 1.350 1.345 1.341	2.132 2.015 1.943 1.895 1.860 1.833 1.812 1.796 1.782 1.771 1.761 1.753	3.182 2.776 2.571 2.447 2.365 2.306 2.262 2.228 2.201 2.179 2.160 2.145 2.131	4.541 3.747 3.365 3.143 2.998 2.896 2.821 2.764 2.718 2.681 2.650 2.624 2.602	5.841 4.604 4.032 3.707 3.499 3.355 3.250 3.169 3.106 3.055 3.012 2.977 2.947	10.215 7.173 5.893 5.208 4.785 4.501 4.297 4.144 4.025 3.930 3.852 3.787 3.733	12.924 8.610 6.869 5.959 5.408 5.041 4.781 4.587 4.437 4.318 4.221 4.140 4.073

EXAMINERS DR. ELSAEED AMMAR DR. MOHAMED M. EZZAT

2.539

2.528

2.861

2.845

3.579

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3.850

Good Luck

2.093

2.086

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20

1.328

1.325

1.729

1.725