جامعة طنطا   الفرقة: الرابعة (ش.الرياضيات)   دور يناير ٢٠١٥

كلية العلوم   المادة: التحليل الدالي   الزمن: ساعتان

<u>أجب عن الأسئلة التالية:</u>

1) a. Define M.S X and give 3 examples .
   b. Define H.S X and give 2 examples .

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2) a. $x_n \to x$ $\Longleftrightarrow$ ... $\Longleftrightarrow$ ... $\Longleftrightarrow$ ...

   b. { x_n }is C.seq $\Longleftrightarrow$ ... $\Longleftrightarrow$ ... $\Longleftrightarrow$ ...

   c. P.t $d(x,y) = \sqrt[3]{|x-y|}$ is dist. F in R.

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3) a. Give 3 examples of N.S X .
   b. P.t x y $\Longleftrightarrow$ $\|x-3y\|^2 = \|x\|^2 + 9\ \|y\|^2$.

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4) a. $\|x-3y\|^2 + \|x+3y\|^2 = \ldots + \ldots$.
   b. (x-3y , x+3y) = ... - ... .
   c. Solve I.E $y^2(x) = 25 - 6\int_2^x y\ (t)\ dt$.

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5) a. P.t F(x) = (x,y) is B.F – L.F – C.F in H.S X .
   b. P.t $Ay(x) = C + \frac{3}{5}\int_0^x y(t)\,dt$ is contra.Op in C [0,1] .

مع أطيب التمنيات بالنجاح .. د .سعيد أحمد أبوالعلا واللجنة

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

FINAL EXAM FOR FOURTH LEVEL (MATH STUDENTS)

1969

COURSE TITLE: NUMERICAL ANALYSIS (2)		COURSE CODE: MA4109	
DATE: 31/12/2014	TERM: FIRST	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer the following questions:

(I) (a) Find the general solution for the following difference equation:

$$f(x+4)-\frac{5}{4}f(x+3)+\frac{5}{2}f(x+1)-f(x)=1\ ;$$
$$f(0)=0\,,f(1)=11\,,f(2)=-8\,,f(3)=6\ .$$ (20 marks)

(b) Discuss the stability for the following numerical procedure with respect to its initial values:

$$y_n-y_{n-3}=\frac{3h}{8}[\,f(x_{n-3},y_{n-3})+3f(x_{n-2},y_{n-2})+3f(x_{n-1},y_{n-1})\,],n\geq 3.$$ (20 marks)

(II) (a) Apply the method of nets to compute the numerical solutions for the following mixed problem: $\frac{\partial^2 u}{\partial t^2}-\frac{\partial^2 u}{\partial x^2}=t+x-1,$

$$u(x,0)=ln(3-x),\ \frac{\partial u(x,0)}{\partial t}=0\ \ (0\leq x\leq 1);$$
$$u(0,t)=ln3,\ u(1,t)=ln2,\ h=0.05\,.$$ (20 marks)

(b) By the method of finite differences, find the numerical solutions for the following linear boundary value problem:

$$y''+(1+x^2)y'-xy=0\,,\ \ x\in[0\,,1.5];\ y(1)=0,\ \ y(1.5)=1.62\,,h=0.01\ .$$ (15 marks)

(III) (a) Define: An interior nodal point - The collocation points - The iterated and the degenerate kernels - The Dirichlet problem. (15 marks)

(b) Find an approximate solution for the following Fredholm's integral equation:

$$x(t)=t^2-2+\int_0^1 (s+1)\,e^{-ts^2}\,x(s)\,ds\ ,t\in[0,1].$$ (20 marks)

(IV) (a) Making use the collocation method, derive an approximate analytical solution for the following boundary value problem:

$$x^2y''-xy'+2y=x^2\,,\ \ x\in[-1\,,0];\ y(-1)=y(0)=0\,.$$ (20 marks)

(b) Define ill and well conditioned problems and whence discuss the stability of the following initial value problem with respect to its initial condition:

$$y'(x)=-[y(x)]^2\,,\ 0\leq x\leq b\ ;\ y(0)=1\,.$$ (20 marks)

EXAMINERS	PROF. DR. A. R. M. EL-NAMOURY	DR. M. A. SERWAH

With our best wishes

جامعة طنطا امتحان الفصل الدراسي الأول المستوى الثالث-علوم الحاسب

كلية العلوم ٢٠١٤-٢٠١٥ المادة:توبولوجي وجبرحديث

(MA4121)

قسم الرياضيات الزمن:ساعتان

Modern Algebra.

Answer the following:

1- Show that Z[x], the set of all polynomials in an indeterminate x with integral coefficients, is a commutative ring with no zero divisors. (10 marks).

2- Let φ: (C ; +, .) → $(M_2(R))$;+ ,.)

a+ib→ $\begin{bmatrix} a & b \\ -b & a \end{bmatrix}$ be a map from the field of complex numbers into the ring of all square matrices of degree 2 with real entries. Show that φ is a ring homomorphism. Find the kernel of φ . Is φ onto?.(10 marks).

3- Prove that if φ is a ring homomorphism, then kerφ is an ideal. (10 marks).

4- Determine all ideals that contain the integer 6, and those that contain the integer 8, then deduce the ideal generated by the two integers {6,8} . (10 marks).

5- Find out the zeros of the polynomial $x^4 + 4x^3$+ $6x$+2x+3 ∈ Z_8 [x],then factorize the polynomial as a product of two polynomials of less degrees. (10 marks).

WiThBeStWisHes

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATH.		
	APPLIED EXAMINATION FOR FOURTH YEAR STUDENTS OF QUANTUM MECHANICS		
	COURSE TITLE: QUANTUM MECHANICS	COURSE CODE: MA4115	
DATE:	JANUARY, 2015	TERM: 1	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2H.

1. (a) In a three dimension Cartesian coordinate system, is there is any possibility to obtain the eigenfunctions and the corresponding eigenvalues for a particle of mass m vibrates about the center under the influence of attracted force, which is proportional to the distance from an equilibrium position?. (15 mark)

   (b) Prove that the eigenvalues of the operators L_z is and $m\hbar$. (10 mark)

2. (a) Drive the matrix formulae of the operators $\hat{P}_x$, $\hat{P}_x^2$, $\hat{X}$ and $\hat{X}^2$ for a particle having a simple harmonic motion (pure state), apply the matrix element to find $\langle x \rangle$ and $\langle P_x \rangle$. (20 mark)

   (b) Complete the following: $|\propto\rangle + |\beta\rangle$ if and only if ... (5 mark)

3. (a) Show that the uncertainty principle for the wave function $\Psi(x,t) = \frac{1}{\sqrt{2}}\left[\Psi_0(x,t) + \Psi_1(x,t)\right]$ is verified, where the matrix elements of the Hamiltonian of the linear harmonic oscillator are known. (20 mark)

   (b) Operation on a ket vector giving:

   (1) The same ket (2) Different ket (3) Both (1) and (2) (5 mark)

4. (a) Discuss the approximate method for solving the Schrodinger wave equation briefly. (15 mark)

   (b) prove that the angular momentum Ω is given by:

$$\Omega = \frac{1}{\sin\theta}\frac{\partial}{\partial\theta}\sin\theta\frac{\partial}{\partial\theta} + \frac{1}{\sin^2\theta}\frac{\partial^2}{\partial\phi^2}.$$ (10 mark)

Best Wishes,

Prof. Dr. Ahmed E. Aboanber

	TANTA UNIVERSITY FACULTY OF SCIENCE - MATHEMAICS DEP.			
	FINAL EXAM FOR FOURTH LEVEL STUDENTS (MATHEMATICAL STATISTICS)			
	COURSE TITLE: TOPOLOGY		COURSE CODE: MA4121	TIME ALLOWED: 2 HOURS
DATE: 6/1/2015	TERM: FIRST		TOTAL ASSESSMENT MARKS: 150	

Answer the following questions:

1. (a) Let (X,τ) be a topological space and $A,B \subset X$. Show that

$(A \cup B)' = A' \cup B'$. **(20 marks)**

(b) Show that the intersection of an infinite number of open sets in $\mathbb{R}$ is not necessarily an open set. **(15 marks)**

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2. (a) Consider $X = \{a,b,c,d,e\}$ with topology $\tau = \{X, \emptyset, \{a\}, \{c,d\}, \{a,c,d\}, \{b,c,d,e\}\}$ and $A = \{c,d,e\}$. Find A', A°, $\overline{A}$, A^b, $ex(A)$, the neighborhood system of e and the relative topology τ_A on A. **(25 marks)**

(b) Let $X = \{a,b,c,d,e\}$ and $S = \{\{a,b,c\}, \{c,d\}, \{d,e\}\}$. Find the topology on X generated by S. **(10 marks)**

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3. (a) Let (Y,τ_Y) be a subspace of (X,τ). If $\beta = \{B_i : i \in I\}$ is a base for τ, prove that $\eta = \{Y \cap B_i : i \in I\}$ is a base for τ_Y. **(20 marks)**

(b) Let (X,τ) be a topological space and $A \subset X$. Show that

$\overline{(H \cap \overline{A})} = \overline{H \cap A}$ where $H \in \tau$. **(20 marks)**

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4. (a) Let f be a mapping from a space (X,τ) into a space (Y,σ), show that :

i) f is continuous if and only if $\forall\ x \in X$ and $\forall\ W \subset Y$ is a neighborhood of $f(x) \implies \exists\ V \subset X$ is a neighborhood of x such that $f(V) \subset W$. **(15 marks)**

ii) f is open if and only if $f(A^{\circ}) \subset (f(A))^{\circ}$ $\forall\ A \subset X$. **(15 marks)**

b) Let $X, Y, and\ Z$ be topological spaces. If $f: X \longrightarrow Y$ and $g: Y \longrightarrow Z$ are continues. Prove that $g \circ f: X \longrightarrow Z$ is continues. **(10 marks)**

EXAMINERS	DR. M. A. SERWAH	DR. O. A. EMBABY

With our best wishes

	Tanta University Faculty of Science Department of Mathematics		
	Final term exam for the first semester 2014-2015		
	Course title:	Operarions Research (1)	**Course code: MA4105**
1969	**Date: 15 /1 /2015**	Total Marks: 150	**Time allowed:** Hours

Answer all the following questions:

First question: (40 Marks)

(a) Prove that The positive semidefinite quadratic form $f(X) = X'CX$ is a convex function for all X in R^n.

(b) Using the Kuhn–Tucker conditions to obtain the optimal solution of the following NLPP $\min f = x_1 + \frac{4}{x_1} + \frac{x_2}{40x_1} + \frac{5x_1}{8x_2}$ subject to $x_1 + x_2 \le 11, x_1, x_2 \ne 0$.

Second question: (40 Marks)

(a) Define separable function–separable programming and then formulate the approximate LPP for the following separable programming

$$\max Z = 3x_1^2 + 2x_2^2 \text{ subject to } x_1^2 + x_2^2 \le 9, \quad x_1 + x_2 \le 3, x_1, x_2 \ge 0.$$

(b) Show that $f(X) = x_1^2 + 4x_2^2 + 3x_3^2 - 4x_1x_2$ is positive semidefinite.

(c) Find the local extrema $f(x_1, x_2, x_3) = x_1^2 + (x_1 + x_2)^2 + (x_1 - x_3)^2$.

Third question: (30 Marks)

(a) Minimize $f(X) = x_1^2 + x_2^2 + 2x_1 + 4x_2 + 5$ using the steepest descent method starting at the point $x_1 = 0$ and $x_2 = 0$.

(b) By direct substitution method solve the following NLPP

$$\min f(X) = f(x_1, x_2) = 4x_1^2 + 5x_2^2 \text{ subject to } 2x_1 + 3x_2 = 6.$$

Fourth question: (40 Marks)

(a) Show that the following function is convex, concave or neither:

$$f(x, y) = xe^{x+y}$$

(b) Obtain the necessary conditions for the optimum solution of the following NLPP by Lagrange multiplier method: $\min \ f(x_1, x_2) = 3e^{2x_1+1} + 2e^{2x_2+5}$

subject to $g(x_1, x_2) = x_1 + x_2 - 7 = 0$

(Best wishes)

Examiners:	**1- Prof. Dr. E.A. Youness**	**2- Dr. S. Ammar**	**3-Dr.N. El-Kholy**

قسم الرياضيات - العلمية . ٤ نسخ

+ ١ الجودة

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR (FOURTH YEAR) STUDENTS OF MATHEMATICAL

COURSE TITLE: DIFFERENTIAL GEOMETRY			COURSE CODE: MA4107
DATE:19\1\2015	TERM: 1	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 3 HOURS

Answer the Following Questions:

QUESTION 1:

a) Find the involutes of the unit circle. (20)

b) For a space curve $\alpha(t)$ find $k(t)$ in terms of the derivatives of $\alpha(t)$. (20)

QUESTION 2:

State and prove the isoperimetric inequality. Find the upper bound of the area included by a simple closed curve of length $l = 2\sqrt{\pi}$. (30)

QUESTION 3:

a) Prove that the matrix (g_{ij}) is non – singular. (20)

b) Find the area of the tours $\chi(t,\theta) = ((a + r\cos t)\cos\theta, (a + r\cos t)\sin\theta, r\sin t)$

$0 < t < 2\pi \quad , 0 < \theta < 2\pi$. (20)

QUESTION 4:

a) Show that the sphere $x^2 + y^2 + z^2 = 1$ is a surface. (20)

b) Find the equation of the tangent plane to the surface $\chi(u^1, u^2) = (u^1, u^2, u^1u^2)$ at the point $u^1 = a, u^2 = b$. (20)

EXAMINERS	PROF. DR. M. BELTAGY	PROF.DR. SANAA ELASSAR

With best wishes