Tanta University
Faculty of Science
Math. Department

Topic: Theoy of Elasticity
Date: 12-01-2013
Time: 3 hours
4th Year

First Semester Exam. (Jan. 2013)

Please answer the following questions:

[1] (a) Derive the surface conditions for a stresses acting on area inclined to the co-ordinate planes

(b) for a stress tensor τ Calculate: H, (H), Λ, N_i and l_i, m_i, n_i

$$\tau = \begin{pmatrix} 7 & 0 & -3 \\ 0 & 4 & 0 \\ -3 & 0 & 6 \end{pmatrix}$$

[2] Derive τ_{uu}, τ_{uv} and τ_{uw} in general form and then in plane yx at $\alpha = \frac{\pi}{2}$ Calculate τ_{uu}, τ_{uv} and τ_{uw}. [Plot your answer]

[3] (a) Derive e_{xh}, e_{yh}, e_{zh} in terms of u, v, and w

(b) when $u = xyz^2$, $v = y^2 z$, and $w = x^2 y^2$ Calculate e_{xh}, e_{yh}, and e_{zh} at point $(1,2,1)$, $l = m = n$

[4] (a) Derive the differential eqn. of equilibrium in plane (r, θ)

(b) On the basis of Fourier's method, prove that the longitudinal vibrations of a Bar satisfy $\frac{\partial^2 u}{\partial t^2} = \frac{E}{\rho}\frac{\partial^2 u}{\partial x^2}$

[5] (a) On the basis of elasticity principals prove that

$$\tau_{xx} = \lambda\theta + 2\mu e_{xx}$$
$$\tau_{yy} = \lambda\theta + 2\mu e_{yy}$$
$$\tau_{zz} = \lambda\theta + 2\mu e_{zz}$$

(b) Calculate Lame's coefficients λ, μ, E, K when $\sigma = 0.3$, $u = -2x+1$, $v = 3y+1$ and

$$\tau = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 4 \\ 3 & 4 & 0 \end{pmatrix}$$

with best wishes

Tanta University Faculty of Science	Probability Theory Examination	Time: 3 hours January 2013

Answer the following questions

1- (a) Prove that if (X,Y) has a bivariate normal distribution, then X and Y are independent if and only if X and Y are uncorrelated.

(b) Given two random variables (r.v.'s) X and Y with joint probability mass function

y \ x	0	1	2
0	0.1	0.1	0
1	K	0.2	0.1
2	0	0.1	0.1
3	0.1	0	0.2

Find: K , *the correlation coefficient* $\rho(X,Y)$ and $E(X/Y=2)$.

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2-(a) Find the characteristic function of the random variable $Y=(X-np)/\sqrt{npq}$, where X follows the binomial distribution.

(b) Suppose that the joint probability density function (p.d.f.) of X and Y is given by

$$f(x,y)=4y(x-y)e^{-x-y}, \ 0\le x<\infty, \ 0\le y\le x.$$

Compute $E(X/Y=y)$.

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3- (a) If the probability mass function (p. m. f.) of the random variable X is

$f_x(x)=\frac{3}{4}\left(\frac{1}{4}\right)^{x-1}, x=1,2,3,\ldots,$ then find the p. m. f. of $Y=X^2$.

(b) If the joint probability mass function of the discrete r. v.'s X and Y is $f(x,y)=\frac{\lambda^y}{(y-x)!\,x!}e^{-2\lambda}, x=0,1,2,\ldots,y$ *and* $y=0,1,2,\ldots$,

then calculate $f_y(y)$ and the conditional variance of X given that $Y=3$.

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4- (a) If $X_1, X_2, \ldots, X_n$ are independent and identically distributed r.v.'s having an exponential distribution with parameter μ, then find the distribution of

$Z=X_1+X_2+\ldots+X_n$.

(b) Let X_1 and X_2 be a random sample of size 2 from the distribution having p. d.f. $f(x)=e^{-x}$, $x>0$.

Find the p. d. f. of $Y=X_1+X_2$ and the p. d. f. of $Z=\frac{X_1}{X_1+X_2}$.

مع أطيب الأماني بالنجاح والتوفيق

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR PROSPECTIVE STUDENTS (4^{TH} YEAR) STUDENTS OF MATHEMATICS

COURSE TITLE: GENERAL RELATIVITY & ELECTRODYNAMICS			COURSE CODE: 14016	
DATE:16	JAN, 2013	TERM: FIRST	TOTAL ASSESSMENT MARKS: 63	TIME ALLOWED: 3 HOURS

Answer 5 questions only:

1- i) Consider the boundary between free space and a perfect dielectric having $\varepsilon_r = 9, \mu_r = 1$ and $\sigma = 0$. If a uniform plane wave $\underline{E_I} = \cos(\omega t - \frac{4\pi}{3} z)\,\underline{\hat{\imath}}$ and frequency of 200MHz is incident from free space normal to the dielectric. Find the time domain forms of the reflected and transmitted fields.

ii) Consider an electric field $\underline{E} = E_0\, r\, e^{-at}\, \underline{\hat{k}}$, where E_0 is constant. Find the magnetic field produced by this varying field.

2- Derive the reflection and transmission coefficient through linear media.

3- Discuss the TM waves guided by a rectangular guide.

4- Discuss Einstein field equations, then by using the Bianchi identity:

$$R^n_{i\,j\,k//l} + R^n_{i\,k\,l//j} + R^n_{i\,l\,j//k} = 0, \qquad \text{Prove that} \qquad G^i_{j//i} = 0$$

5- i) Using $\left(A_i\, B_j\right)_{//k} = A_i\left(B_{j//k}\right) + \left(A_{i//k}\right) B_j$ determine $A_{i\,j//k}$, $\left(A_{i//j}\right)_{//k}$

ii) Prove that the derivative of a scalar function is a covariant vector (tensor).

iii) Show that $g^{\alpha\beta} g_{\alpha\beta} = n$ for n-dimensional space.

6- Prove that i) $\Gamma^i_{j\,k} = \frac{\partial}{\partial x^k} \ln\sqrt{g}$

ii) $[p\,q, r] = [q\,p, r]$

iii) $[p\,q, r] = g_{r\,s}\,\Gamma^s_{p\,q}$

EXAMINERS	PROF. DR/MOHAMED O. SHAKER	DR/ MOHAMED M. SHAHIN
	DR/ ABDALLAH A. NAHLA	DR/

With my best wishes

TANTA UNIVERSITY
FACULTY OF SCIENCE
COMPUTER DEPARTMENT

EXAMINATION FOR FOURTH YEAR (شعب: كيمياء) CODE 14045

COURSE TITLE: COMPUTER (DATABASE PRINCIPALS)

DATE: 21-1-2013 | 30 DEGREES | TIME 2 HOURS

1- For the following statements, Put the (√) sign beside the correct statements and put the (X) sign beside the incorrect statements and correct them:

(a) A cross tab query can contain up to 4 columns header
(b) In database Report we can make up to 4 grouping and sorting according up to 12 fields
(c) A Bound object in a Form can be used to make a calculation
(d) The data type of Phone Number in a table of database must be Number
(e) More conditions in the same Criteria raw in query design view make (OR) Conditions between many Records (5 Degrees)

2- Rewrite the following statements and Complete it:

(a) A primary Key cannot allow ------------ and must have a ------- index
(b) To create a many to many relationships between two tables we need ------------ Table
(c) The type of a field containing a Photo in a table must be --------
(d) The three parts in a report page are-----------------, --------------- and ----------------------
(e) There are many types of queries such as --------------, ------------, --- ---------------------, ----------------------- (5 Degrees)

3- (a) Define only two of the following:
Expression Builder– Table Record – AutoForm

(b) Write the functions of only two of the following:
Form – Find Unmatched Query - Report

(10 Degrees)

4- Answer only two of the following:

(a) Write the different steps necessary to create a Report using the Report Wizard
(b) Write two methods used to create an AutoForm
(c) Show how to make criteria in a query (10 Degrees)

Best Wishes

TANTA UNIVERSITY FACULTY OF SCIENCE COMPUTER LAB.		
EXAMINAION FOR FOURTH YEAR STUDENTS		
COURSE TITLE: Computer		TIME ALLOWED: 2 HOURS
DATE: , JAN, 2013	TERM: FIRST	TOTAL ASSESSMENT MARKS: 30

First question:- (10 Marks)

Put (✓) or (x) in front of each phrase:

- You can't add Many-To-Many relationship to two tables. ( )
- There exists a relation between One-To- One relationship and the primary key ( )
- To obtain a report on the all fields of a table we use the Wizard method ( )
- No deference between the query and the form ( )
- The AutoReport gives a report for the all fields of query ( ).

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Second question:- (8 Marks)

a- Define the primary key .

b- State the creating methods of the tables (state the steps in every method).

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Third question:- (12 Marks)

a - Define the Data word and the concept of the database.

b- In a table, write the deference between the Design View and Wizard methods to obtain a report.

انتهت الأسئلة مع كل التمنيات بالتوفيق

TANTA UNIVERSITY
FACULTY OF SCIENCE
MATHEMATIC DEPARTMENT

Final Writing Examination

Subject: AI & Prolog Language | **Code:** 14024
Examiner: Dr. Ing. Mahmoud Othman | 4th Year (Statistic & Computer Science)
Time Duration: 3h | **Term:** Sep./ Jan. 2012/2013

Answer all of the following questions:

Q1:

a. Define each of the following: Heuristic function, Completeness, Space Complexity and Admissible?
b. Write a prolog program to calculate the roots of the equation $ax^2 + bx + c = 0$?
c. Write a prolog program using the relation: **Evenaverage(L,L1,AV)** where L is a list of integer numbers, L1 is a list contains all even numbers of L and AV is the average of L1?

Q2:

a. What are the advantages and disadvantages of Depth-first and Breadth-first Search?
b. Compare among Diskstra's algorithm, A*, and Greedy Best-first Search from the point of view: optimality and completeness?
c. Discuss the generate-and-test algorithm?

Q3:

a. Explain the hill climbing algorithm, and then try to solve the 8-puzzle problem using it. Can you find a heuristic function that makes this work? Apply the algorithm using your heuristic function on the following example:

Start:

8	2	6
1		4
7	3	5

Goal:

1	2	3
8		4
7	6	5

b. Compare between Bi-directional Search and Iterative Deepening?

Q4:

a. Write a Prolog program using Depth-first search strategy to highlight all paths from initial start state to a goal state?
b. In some details, discuss the tasks of an artificial intelligence?

Q5: The mathematical function Fibonacci is defined as follows:

$$f(n)=f(n-1)+f(n-2) \text{ if } n>1 \text{ such that } f(0)=0 \text{ and } f(1)=1.$$

a. Write a prolog procedure fibonacci *(N,F)* that receives a nonnegative integer *N* and returns *F* the fibonacci of *N*?
b. Discuss the efficiency of the procedure developed in part (a)?
c. Write another procedure to calculate fibonacci value of *N* that is more efficient than the one developed in part (a)?

Good luck

بسم الله الرحمن الرحيم

جامعة طنطا
كلية العلوم
قسم الرياضيات

الفرقة : الرابعة (شعبة الرياضيات)
المادة : التحليل الدالى

دور يناير ٢٠١٣
الزمن = ٣ ساعات

أجب عن 5 أسئلة فقط :

(1) a. Define M.S X and give 3 examples.
b. Solve I-E $y^3(x) = c^3 - d^3 \int_0^x y^3(t)\,dt$

(2) a. P.t $d(x,y) = \sqrt{|x-y|}$ is a dist. F in $\mathbb{R}$
b. P.t $\|f\| = \sqrt{\ln 2}$, if $f(x) = \sqrt{\frac{2}{(x+1)(x+3)}} \in L_2[0,3]$

(3) a. Give 3 examples of N.S X.
b. P.t $\boxed{x \perp y} \Longleftrightarrow (x-y, x+y) = \|x\|^2 - \|y\|^2$

(4) a. $\boxed{x_n \to x} \Longleftrightarrow \boxed{\cdots} \Longleftrightarrow \boxed{\cdots} \Longleftrightarrow \boxed{\cdots}$
b. $\{x_n\}$ is C.seq $\Longleftrightarrow \boxed{\cdots} \Longleftrightarrow \boxed{\cdots} \Longleftrightarrow \boxed{\cdots}$
c. P.t $\|f\| = \sqrt{\ln 13}$, if $f(x) = \sqrt{\frac{50}{x(x^2+25)}} \in L_2[1,5]$

(5) a. Give 3 examples of L.S X
b. P.t $F(x) = (x, c)$ is L.F — B.F — C.F

(6) a. P.t : A is contra. Op $\Longrightarrow A^3$ is contra. Op
b. P.t f_1, f_2, f_3 are L. dep, if :
$f_1(x) = \frac{1}{x}$, $f_2(x) = \frac{x}{x^2+9}$, $f_3(x) = \frac{18}{x(x^2+9)}$

مع أطيب التمنيات بالنجاح .. أ.د سعيد أحمد أبو العلا

Tanta University
Faculty of Science
Department of Mathematics

1969

4th year of Mathematics
Statistical Mechanics
Time: 3 hours
January 2013

Answer the Following Questions:

1- (a) Prove that Maxwell distribution: $N(v) = 4\pi v^2 N(\frac{m}{2\pi KT})^{3/2} \exp(-\frac{mv^2}{2KT})$

(b) Use contribution of the mean free path in flow of density to find the diffusion coefficient.

2- (a) Use the Maxwell velocity distribution to find that: (i) PV=NKT
(ii) The total force on the wall of a cubical box with sides of length d.
(iii) Find the number of molecules hitting / cm^2 of the wall per sec. in x- direction.

(b) Let N=7 with macrostates (2, 4, 1), (0, 2, 5), (1, 3, 3). Find $\hat{n}_r$, $r = 1, 2, 3$

3- (a) Show that the Boltzmann statistics distribution is given by

$$n_k = \left(\frac{N}{\sum_{k=1}^{r} e^{-\varepsilon_k / KT}}\right) e^{-\varepsilon_k / KT}$$

(b) Find an expression for the average energy of molecules having 1-D harmonic motion, assume that the gas molecules obey a Boltzmann statistics.

4-(a) Consider an ideal gas consisting of N particles obeying Boltzmann classical statistics. Suppose that the energy of an particle ε is proportional to the magnitude of momentum p, $\varepsilon = cp$. Find the thermodynamic functions of this ideal gas without considering the internal structure of the particles.

(b) Calculate the Fermi potential μ and the internal energy E of an ideal Fermi gas composed of particles of spin 1/2 up to terms of the order T^4 when the degeneracy is sufficiently high.

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS		
	EXAMINATION FOR STATISTIC+COMPUTER SCIENCE (FOURTH YEAR) STUDENTS		
1969	COURSE TITLE:	TOPOLOGY+ OPERATION RES.(2)+NUMERICAL ANAL.(2)	COURSE CODE:14025
DATE:	5/1/2013	TERM:FINAL FIRST | TOTAL ASSESSMENT MARKS: 90	TIME ALLOWED: 3 H.

ANSWER THE FOLLOWING QUSETION:

[1] (a) Prove that the intersection of two neighborhoods of a point p of a space X is a neighborhood of p. (6 deg.)

b) Prove that a mapping f from a space X into a space Y is continuous iff the inverse image of each closed set in Y is closed in X. (6 deg.)

c) If A is a subset of a space X, show that $\overline{(X-A)} = X - A^\circ$. (6 deg.)

d) Let $A = \{\{a,b,c\},\{c,d\},\{d,e\}\}$ be a class of subsets of $X = \{a,b,c,d,e\}$.

Find the topology on X generated by A. (5deg.)

[2] (a) Define the following notation:

Convex Set, Polyhedron, Concave Function, Extreme point, Convex NLP, Optimal Solution. (6 deg.)

(b) Determine whether each of the following function is convex, concave or neither (for $x \in R$) !

$$1 - f_1(x) = x^2, \quad f_2(x) = e^x, \quad f_3(x) = \ln x, \quad f_4(x) = 1/x, \quad f_5(x) = 1/x^2$$ (5 deg.)

(c) Using the Lagrange multipliers to find the optimal solution of the following NLP:

$$Max\ z = -x_1^2 - x_2^2 + x_1x_2 + 8x_1 + 3x_2 \qquad \text{s.t.} \quad 3x_1 + x_2 = 10.$$ (6 deg.)

(d) Find the local and optimal point of the following NLP problems

$$Max\ f(x) = x(10-x) \qquad \text{s.t.} \quad 0 \le x \le 10.$$ (5 deg)

[3] (a) Define ill and well conditioned problems, then discuss the stability of the following numerical procedure w.r.to its initial values when applied the initial problem: $y' = f(x,y),\ y(x_0) = y_0$:

$$y_n = y_{n-2} + \frac{h}{3}[f(x_{n-2},y_{n-2}) + 4f(x_{n-1},y_{n-1}) + f(x_n,y_n)], \ n \ge 2.$$ (8 deg.)

(b) By the methods of lines, derive the general solution for the following homogenous mixed problem:

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad u(x,0) = 0 \quad (0 \le x \le X)$$

$$u(0,\ t) = 0, \quad u(X,\ t) = 0, \quad (0 \le t \le T)$$ (7 deg.)

(c) Show how you can apply the method of finite differences to solve the following boundary value problem, numerically:

$$x^2y'' + xy' + y = 7x, \quad x \in [0,1]$$

$$y(o) - y'(o) = 2$$

$$y(1) + y'(1) = -1, \ h = 0.05$$ (8 deg.)

[4] (a) Find the approximate solution for the following linear Fredholm integral equation:

$$X(t) = \frac{t+1}{2} + \int_0^1 (s+1)e^{-ts^2} X(s)ds, \quad t[0,1]$$ (7 deg.)

(b) Find the general solution for the following linear difference equation:

$$f(x+1) + (2x-1)f(x) = x^2 + 1.$$ (8 deg.)

(c) Apply the method of nets to compute the numerical solution of the following mixed problem:

$$\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2} + tx^2, \quad u(x,0) = \ln(2-x), \quad \frac{\partial u(x,0)}{\partial t} = 0 \quad (0 \le x \le 1)$$

$$u(0,\ t) = \ln 2, \quad u(1,\ t) = 0, \quad (t \ge 0), \ h = \ell = 0.2$$ (7 deg.)

EXAMINERS	PROF. M.E. ABD EMONSEF, PROF .A. ELNAMOURY AND PROF E. AMMAR	GOOD LOKE

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR (FOURTH YEAR) STUDENTS OF MATHEMATICAL STATISTICS

COURSE TITLE: STATISTICAL INFERENCE (2)	COURSE CODE: 14022

DATE:21-1-2013	JAN.2013	TERM: 1	TOTAL ASSESSMENT MARKS: 90	TIME ALLOWED: 3 HOURS

Answer the following Questions:

QUESTION 1:

a) State and prove Neyman and Fisher theorem.

b) Find the p.d.f. of maximum and minimum of a random sample of size m from a population with p.d.f. $g(x)$ and distribution function $G(x)$.

QUESTION 2:

Derive the statistic of the test of equality of several means.

QUESTION 3:

a) State and prove Neyman - Pearson theorem.

b) Let $X_1, X_2, ..., X_m$ be a random sample of size m from $N(\theta_1, \theta_2)$. Let $H_0 : \theta_1 = 0, \theta_2 \succ 0$, and $H_1 : \theta_1 \neq 0, \theta_2 \succ 0$. Explain how to test H_0 against all alternatives in H_1.

QUESTION 4:

a) Let X_1 and X_2 be a random sample of size 2 from exponential distribution with parameter $1/\theta$. Consider $H_0 : \theta = 2$, and $H_1 : \theta = 4$. Find the best critical region.

b) Derive the confidence interval for σ^2.

EXAMINERS	PROF. DR. A. R. EL-NAMOURY	DR/
	DR. A. M. T. ABD EL-BAR	DR/

With best wishes