1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
	EXAMINATION FOR FRESHMEN (FOURTH YEAR) STUDENTS OF COMPUTER SCIENCE			
	COURSE TITLE:	Operations Research (1)		COURSE CODE: MA4105
DATE:	JAN 4, 2023	TERM: FIRST	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer the following questions:

1- a) Solve the following linear programming problem:

$$\min 2x_1 - x_2 - 4x_3 + x_4$$
$$\text{subject to } x_1 + x_2 - x_3 + 2x_4 = 4$$
$$-x_1 + 2x_2 + x_3 + x_4 \le 2$$
$$x_1 + 4x_2 - x_3 - x_4 \ge 1$$
$$x_i \ge 0, i = 1,2,3,4.$$

b) Solve the following problem by using simplex method for the dual:

$$\min 20x_1 + 16x_2$$
$$\text{subject to } x_1 \ge 2.5,$$
$$x_2 \ge 6,$$
$$2x_1 + x_2 \ge 17,$$
$$x_1 + x_2 \ge 12,$$
$$x_1 \ge 0,\ x_2 \ge 0.$$

2- a) By using the simplex method, solve the following game problem:

		B		
A		1	2	3
	1	3	-4	2
	2	1	-3	-7
	3	-2	4	7

b) Using the methods:

- Minimum cost,
- Vogel's method (Penalty method),
- Northwest corner.

to Solve the following TP

	City 1	City 2	City 3	City 4	Supply
Plant 1	8	6	10	9	35
Plant 2	9	12	13	7	50
Plant 3	14	9	16	5	40
Demand	45	20	30	30	

1969	Tanta University Faculty of Science Department of Mathematics		
	Final exam for the first semester 2022-2023		
	Course title:	Functional Analysis (1)	**Course code: MA4101**
	Date: 28/12/2022	Total Marks: 150	**Time allowed:** 2 Hours

Answer the following questions:

First question:

(a) Prove the following inequalities:

(1) $\frac{x^p}{p}+\frac{y^q}{q}\geq xy, \quad \forall \frac{1}{p}+\frac{1}{q}=1$

(2) Holder's inequality

(3) Minkowski's inequality

Hence or otherewise prove that (l_p, d) is complete metric space, where

$$d^p(x,y)=\sum_{j=1}^{\infty}|x_j-y_j|^p .$$

(b) If $x_n=\left(1+\frac{1}{n}\right)^n$ .Prove that the sequence $\{x_n\}\in \mathrm{Q}$ is Cauchy sequence in Q. Hence prove that the metric space (Q,d) is incomplete .

Second question:

(a) Let $\frac{dy}{dx}=f(x,y)$ differential equation with the initial condition $y(x_0)=y_0$, where $f(x,y)$ is defined and continuous in plane region G which contains the point (x_0,y_0) and satisfies a Lipschitz condition with respect to y . Prove that the differential equation with the initial condition has a unique solution in $|x-x_0|\leq d, |y-y_0|\leq kd.$

(b) Prove that every subspace X_0 of separable metric space is separable.

Third question:

(a) Define the following:

(1) A set $M\subset(X,d)$ is compact,

(2) $M\subset X$ is an $\varepsilon-$net for the set E. Hence prove that if M is compact, then there exists a finite $\varepsilon-$net for the set M for every $\varepsilon>0$.

(b) Prove that the normed space $(C[a,b],\|.\|)$ is Banach space.

Fourth question

(a) If $A:(X,\|\bullet\|_X)\rightarrow(Y,\|\bullet\|_Y)$ is linear operator. Prove that A is bounded if and only if A is continuous.

P.T.O

(b) Prove that any two elements x, y of Euclidean space X satisfy Schwarz inequality. Hence prove that Euclidean space X becomes a normed space if $\|x\|^2 = (x, x)$

(c) If $x, y \in X$ (X Euclidean space), prove that:

(1) $\|x + y\|^2 + \|x - y\|^2 = 2\left(\|x\|^2 + \|y\|^2\right)$

(2) $\|\lambda x + y\|^2 = |\lambda|^2 \|x\|^2 + \|y\|^2$ if $x \perp y$ and $\lambda \notin C$.

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

TANTA UNIVERSITY- FACULTY OF SCIENCE-MATHEMATICS DEPARTEMENT			
FINAL EXAMINAION FOR FOURTH LEVEL STUDENTS (MATHEMATICS)			
COURSE TITLE: Fluid Mechanics (1) MA4103			TIME ALLOWED: 2 HOURS
DATE: JANUARY, 2023	TERM: FIRST	TOTAL MARKS: 150	

Solve the following questions:

First question: (40 marks)

a- Define the path lines and streamlines and write the streamlines equation in the general orthogonal curvilinear coordinates.

b- The velocity $\underline{q}$ of an incompressible two-dimensional flow is given by $\underline{q} = -\nabla \phi$, where $\phi = (t - x)(t - y)$, find the equation of streamlines and the equation of the path of the particle initially at the point $(2, 1, 0)$.

Second question: (30 marks)

Show that the equation $\frac{x^2}{a^2}\tan^2 t + \frac{y^2}{b^2}\cot^2 t = 1$, is a possible form for the bounding surface of a liquid and find an expression for the normal velocity.

Third question: (40 marks)

The space between two concentric spheres of radii $a, b\ (b > a)$ is filled with a liquid of density ρ. If the spheres are in motion, the inner one with velocity U in the x-direction and the outer with velocity V in the y-direction. Find the velocity potential and the kinetic energy of the liquid motion at the instant the two spheres are concentric.

Fourth question: (40 marks)

If $z = c\cos w$, show that $\frac{x^2}{c^2\cosh^2\psi} + \frac{y^2}{c^2\sinh^2\psi} = 1$. Hence prove that the streamlines are confocal ellipses and the equipotentials lines are confocal hyperbola. Prove that the circulation round any one of the ellipses is 2π.

انتهت الأسئلة

لجنة الممتحنين: أ.د. قدرى زكريا الشربينى - أ.د. مجدى على سرواح

Tanta University
Faculty of Science
Chemistry Department

Examination for fourth Year Students

Course Title: Chemistry of Textile fibers		Course Code:CH4121
Date: 16-1-2022	Total Assessment Marks: 50	Time Allowed: 2 hrs

1) Differentiate between each of the followings: (15 Mark)

1. Viscose and Flame Retardant Rayons
2. *m*-Aramid and *p*-Aramid fibers
3. Strength, resiliency, laundering, and effect of acids of wool and silk
4. Effect of acids and alkalis on polyamides and polyesters
5. Cross-Linking of wool and cotton

2) Mark (√) or (×) and correct the wrong statement: (10 Marks)

1. The most important polyester in commercial terms is PET ( )
2. Acrylic fibers have low resistance to mineral acids and to weak alkalis ( )
3. Cotton fibers are readily degraded by alkali, but more stable in acids ( )
4. In the absence of oxygen, PE is stable to over 300 °C ( )
5. The principal protein constituent of silk is keratin ( )
6. Increase the strength of intermolecular attractions decrease the fiber strength ( )
7. Above 140 °C, the mechanical performance of the wool is reduced ( )
8. Flexibility of the linear polymer chain is not important in fiber forming polymer ( )
9. The scouring process involves treatment of the cotton at the boil for two hours ( )
10. Oxidizing agents have little effect on acrylic fibers ( )

3) Choose the correct answer: (10 Marks)

1. The optimum conditions required for peroxide bleaching of cellulose are treatment for about two hours at a temperature of ....

a) 75 °C b) 95 °C c) 128 °C d) 140 °C

2. .... crystalline structure forms when cellulose is precipitated from solution in liquid ammonia

a) cellulose III b) cellulose II c) cellulose I d) cellulose IV

تابع الأسئلة في الصفحة القادمة

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR FOURTH YEAR (MATHEMATICS) SCIENCE STUDENTS

1969	COURSE TITLE:	OPERATION RESEARCH (1)		COUSE NO. MA 4105
DATE:	4/1/2023	FREST TERM	TOTAL ASSESSMENT MARKS:150	TIME ALLOWED: 2 H.

***ANSWER THE FOLLOWING QUSETION*:**

[1] (a) If M and S are two convex sets prove that: M+S, M-S and αM are convex sets?

(b) Draw and examine the convexity of the sets

$$M = \{(x,y) \in R^2 : x^2 + y^2 - 25 \le 0, \quad y \ge 3 - x, x, y \ge 0\},$$
$$S = \{(x,y) \in R^2 : y \le 4x^2, y \le 5 - x, x, y \ge 0\}.$$

(40 deg.)

[2] (a) Prove that; If f is a convex function on $S \subseteq R^n$, $\alpha \in R$ be a real number, then

(i) $L_\alpha = \{x : x \in S. f(x) \le \alpha\}$ is a convex set,

(ii) αf is a convex function (20 deg.)

(b) If $f(X)$ is differentiable in on a convex set M, then $f(X)$ is convex iff: (15 deg.)

$$f(x_1) - f(x_2) \ge (x_1 - x_2)^T \nabla f(x_2) \quad \forall x_1, x_2 \in M$$

[3] Solve the following CNLP using K-T conditions: (35 deg.)

$$\text{Min} \quad f(X) = x_1^2 + x_2^2 - 4x_1 - 6x_2$$
$$\text{Subject to } M = \{x_1 + x_2 \le 3, \ -2x_1 + x_2 \le 2, \ x_1, x_2 \ge 0\}.$$

[4] (a) Use the univariate method to

$$\min f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_2^2$$

with the starting point (0.0) and probe length $\theta = 0.01$. (20 deg.)

(b) Use newton method to minimize

$$f(X) = 6x_1^2 - 6x_1 x_2 + 2x_2^2 - x_1 - 2x_2$$

with the starting point at (0,0). (20 deg.)

EXAMINER	E. Ammar	Good luck

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS		
1969	Final Term Exam for the First Semester 2022-2023		
	Course Title:	**General Relativity**	**Course Code:** MA4113
	Date: 25-1-2023	**Total Mark:** 150 Marks	**Time Allowed:** 2 Hours

Answer all the following questions:

First Question:

a - Prove that $\Gamma^p_{pq} = \frac{\partial}{\partial x^q} \ln \sqrt{g}$

b- Show that $\delta^i_{j//k} = 0$

c- Prove that any tensor of rank two can be represented in terms of symmetric and skew symmetric tensors?

Second Question:

a- δ^p_q is a mixed tensor of rank two?

b- A surface of sphere has radius b. By using the coordinates $(x^1, x^2) = (\theta, \varphi)$ find a metric form g_{ij} and g^{ij} and determine the kind of the surface?

Third Question:

a- F^{ab}_n and H^{ps}_{rq} are two tensors. Prove that their multiplication is a tensor. Find also the possibilities of inner product?

(Best wishes)

Examiners:	**Dr. Afaf Mohamed Farag**

Tanta University | | Jan, 2022
Faculty of Science | | Quantum Mechanics (MA4115)
4^{th} year (Mathematics Dept.) | | Time: 2Hrs

ANSWER ONLY (5) QUESTIONS

---

1. (a) Show that, the eigenvectors corresponding to distinct eigenvalues of a Hermitian operator are orthogonal. (20 Degree)

   (b) Show by integration that the expectation value of the position and momentum for the mixed state are a periodic function, what is the frequency of the oscillation? (20 Degree)

2. Find, in the three-dimensional coordinate system, the eigenvalues and the corresponding eigenfunctions (eigen spectra) of a particle which is attracted isotropically to a fixed center by a force proportional to the displacement from that center. (40 Degree)

3. (a) Show that for the Hermitian operator A, all of its eigenvalues are real. (20 Degree)

   (b) Drive the matrix elements of the Hamiltonian operator H for the linear harmonic oscillator. (20 Degree)

4. Having the operator matrices of the Hamiltonian of the linear harmonic oscillator as a basis function, verify the uncertainty principle for the superposition state in form:

$$\Psi(x,t) = \frac{1}{\sqrt{2}}[\Psi_0(x,t) + \Psi_1(x,t)]$$ (20 Degree)

5. For the two-dimension isotropic harmonic oscillator, identify the eigenfunction and the corresponding eigenvalues and describe the degenerate instances. (20 Degree)

6. (a) In the spherical coordinate system, show that the time-independent Schrodinger wave equation can be written as a redial part $R(r)$ with a potential function $V(r)$ and an angular part $Y(\theta, \phi)$. (20 Degree)

   (b) Discuss non-degenerate first order perturbation theory for solving the independent Schrodinger wave equation. (20 Degree)

7. 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 prove the uncertainty principle for the harmonic motion. (20 Degree)