1969	Tanta University Faculty of Science Department of Mathematics		
	Final term exam for the summer semester 2022-2023		
	Course title:	Operations Research (1)	**Course code:** MA3103
	Date:5 /1/2023	Total Marks: 150	**Time allowed:** 2 Hours

Answer all the following questions:

First question:

(a) Prove that if a L.P.P. has at least two optimal feasible solutions, then there are infinite number of optimal solutions.

(b) Prove that the sum $S = S_1 + S_2$ of two convex sets S_1, S_2 in R^n is a convex set.

(c) Show that the set $S = \{x : x = (x_1, x_2) : x_1 \geq 2, \quad x_2 \leq 4\} \subset R^2$ is convex set?.

Second question:

(a) Solve graphically the following LPP:

$$\max z = 2x_1 + 3x_2 \quad s.t. \quad 3x_1 + x_2 \leq 1, \; 3x_1 + x_2 \leq 10, \quad x_1, x_2 \geq 0$$

(b) By Simplex method solve the following LPP:

$$\max z = x_1 - x_2 + 3x_3$$

$$s.t. \quad x_1 + x_2 + x_3 \leq 10; \; 2x_1 - x_3 \leq 3; \quad 2x_1 - 2x_2 + 3x_3 \leq 0; \; x_1, x_2, x_3 \geq 0.$$

Third question:

(a) State and prove the weak Duality theorem?

(b) Find the dual of the following L.P.P.

$$\min z = x_1 + x_2 + x_3 \text{ subject to}$$

$$x_1 - 3x_2 + 4x_3 = 5, \; x_1 - 2x_2 \leq 3, \; 2x_2 - x_3 \geq 4 \; x_1, x_2 \geq 0, x_3 \textit{ is unrestricted in sign}$$

Fourth question:

(a) Write a short note on " Transportation problem"

(b) Determine an initial basic feasible solution to the following transportation problem using Vogel's approximation method (VAM).

	d_1	d_2	d_3	
S_1	x_{11} 2	x_{12} 7	x_{13} 4	5
S_2	x_{21} 3	x_{22} 3	x_{23} 1	8
S_3	x_{31} 5	x_{32} 4	x_{33} 7	7
S_4	x_{41} 1	x_{42} 6	x_{43} 2	14
	7	9	18	

باقي الأسئلة خلف الورقة

(c) Solve the following game to find the saddle point.

		Player B				
		b_1	b_2	b_3	b_4	b_5
Player A	a_1	4	0	1	7	-1
	a_2	0	-3	-5	-6	5
	a_3	3	2	2	4	3
	a_4	-6	1	-2	0	-5

Examiner:	Dr. N. El-Kholy

Tanta University
Faculty of Science
Department of Mathematics

Examination for **Third level – Mathematics**			
Course Title: Electro-magnetostatics كهرومغناطيسية		Course Code: **MA3105**	
Time: 1/ 1/ 2023	Term: Second	Total Assessment Marks: 1٥0 M	Time Allowed: 2H

Answer all the following questions:

First question: (30 Marks)

a. State the **units** of the following quantities:

Electric work- electric potential – capacitance – magnetic field - magnetic potential – permittivity and permeability of free space - electric force - magnetic flux.

b. Assume two infinite sheets having uniform densities of σ (C/m^2) and $-\sigma$ (C/m^2), and the distance between them is d. Find the electric field of two sheets.

Second question: (30 Marks)

Solve Laplace's equation in cylindrical Coordinates (x, y, z).

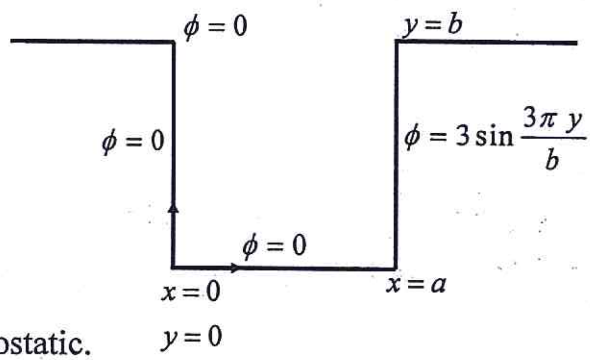
Third question: (30 Marks)

a. State some properties of the electric conductors.

b. Define the electric dipole, derivemathematical the magnetic potential $\mathbf{\Phi}$, and the electricfield$\boldsymbol{E}$ for the electric dipole.

Forth question: (30 Marks)

Consider an infinitely long rectangular slot cut in a semi-infinite plane conducting slap held at zero potential, as shown by the cross-sectional view, transverse to the slot. The potential in the slot (at $x=a$) is $\phi = 3\sin\frac{3\pi y}{b}$. Find the electric potential distribution in the slot.



Fifth question: (30 Marks)

a. Compare between the Electrostatic and Magnetostatic.

b. Calculate the magnetic induction **B** at a distance R from an infinitely long straight wire carries a current I, by using Ampere's law.

(Best wishes)

Examiners:	1-Prof. Dr. Kadry Zakaria	2 - Prof. Dr. Khaled Elmorabie

TANTA UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS

EXAMINATION FOR PROSPECTIVE STUDENTS (3RD YEAR) STUDENTS OF MATHEMATICES

COURSE TITLE: Algebra 1			COURSE CODE:MA 3107
DATE:24/1/2023	FIRST TERM	TOTAL ASSESSMENT MARKS 150	TIME ALLOWED:2 HOUR

Answer the following questions

Question 1(50 = 5 × 10)

1- Discuses: Any group isomorphic to a group of permutations.

2- State and prove the second isomorphism Theorem of groups.

3- Prove that a group G is abelian iff$(ab)^2 = a^2b^2, \forall a, b \in G$.

4- If K is a normal subgroup of a group G_1 and f is a homomorphism of a group G into a group G_1, verify that $f^{-1}(K)$ is a normal subgroup of G containing $Ker\ f$.

5- Define and give an example: Infinite cyclic group – Finite simple group.

Question 2 (50 = 10+20+ 20)

1- Let G_1, G_2 be groups. (i) Prove that $G = G_1 \times G_2$ is a group.

(ii) Find two normal subgroups H, K of G such that $G = HK, H \cap K = \{e\}$, where e is the identity element of$G$. Give an example to clarify your answer.

2- Explain and give an example to clarify the following statement:

A group G is an internal direct product of a family of its normalsubgroups.

Question 3(50 = 5× 10)

(a) Let N be a normal subgroup of a group G. Define a relation $\theta_N$on$G$as follows:

$(x, y) \in \theta_N \iff xy^{-1} \in N$. Prove that

(1) $\theta_N$is a congruence relation on G. (2) $[e]\theta_N = N$,where e is the identity of G

(3)$[a]\theta_N = a[e]\theta_N, \forall a \in G$(4) Clarify your answer, whenever $G = (\{1, -1, i, -i\}, \cdot)$

(b) Construct an epimorphism $f: S_3 \to G = (\{1, -1\}, \cdot)$. Find the congruence θ_f on S_3 which corresponding to f and describe the canonical homomorphism $\gamma: S_3 \to S_3/\theta_f$.

EXAMINERS	PROF. DR./ABD EL-MOHSEN BADAWY

1969

Tanta University
Faculty of Science
Department of Mathematics

Final Term Exam for the first Semester 2022-2023
Third Level Students of Mathematics

Course title:	**Special Relativity**	**Course code: MA3111**
Date: 17/1/2023	**Total Mark: 150 Marks**	**Time allowed: 2 Hours**

Answer all the following questions:

First question: **[35 Marks]**

a. Prove that: the Lorentz transformations are given by the relations:

$$x' = \frac{(x-vt)}{\sqrt{1-\frac{v^2}{c^2}}}, \quad y' = y, \quad z' = z, \quad t' = \frac{(t-\frac{v}{c^2}x)}{\sqrt{1-\frac{v^2}{c^2}}}.$$ [20 Marks]

b. Show that a particle which travels at the speed of light must have a zero rest mass. [15 Marks]

Second question: **[40 Marks]**

a. Study the time dilation between the two frames S and S'? [20 Marks]

b. A muon has a lifetime of 2×10^{-6} s in its rest frame. It is created 100 km above the earth and moves towards it at a speed of 2.97×10^{8} m/s. At what altitude does it decay? According to the muon, how far did it travel in its brief life? [20 Marks]

Third question: **[35 Marks]**

a. Drive the relativistic kinetic energy? And find the relation between the relativistic energy and momentum? [20 Marks]

b. In a laboratory a particle accelerator can do $2 \times 10^{12} ev$ of work on a proton. If all the work is transformed into kinetic energy of the proton, find the velocity of this proton, where the mass of proton is $1.62 \times 10^{-27} kg$. [15 Marks]

Fourth question: **[40 Marks]**

a. By using Lorentz transformations, prove that the component of momentum and energy in the frames S and S' are given by: $p'_x = \frac{m_0\, u'_x}{\sqrt{1-\frac{u'^2_x}{c^2}}}$, $\quad E' = \frac{E-vp_x}{\sqrt{1-\frac{v^2}{c^2}}}$. [20 Marks]

b. Prove that: $\Delta\lambda = \frac{h}{m_0 c}(1-\cos\theta)$ is a Compton wave length. [20 Marks]

(With my best wishes)

Examiners:	**Dr. Maha Selim**