	Tanta university - faculty of science Department of Mathematics		
1969	Final Exam for the Third Semester 2020-2021		
	Course Title: MA3125	Abstract Algebra and Topology	
	Date:14/1/2021	Mathematics &Comp. Science	Time Allowed:2H

Answer the following questions:

Question 1: Complete the following sentences with suitable notations (20 Points)

No.	Sentence
1	In any topological space, a subset N is said to be a .... of the point p if there exists an open set U such that $p \in U \subseteq N$.
2	A ring having a multiplicative identity element is called ....
3	Let X be any non-empty set the collection of all subsets of X is called the .... topology on the set X.
4	The topology $T = \{X, \varphi\}$ on $X = \{0,1\}$ is called the .... topology on X.
5	A ring for which multiplication binary operation is abelian is called .... ring.
6	If R is a ring with zero element $z \in R$. An element $a \neq z$ of R is called .... If there exists an element $b \neq z$ of R such that $a.b = z$ or $b.a = z$.
7	Let (X, τ) be a topological space. A subset S of X is said to be a .... set in (X, τ) if its complement in X, is open in (X, τ).
8	A ring R is called .... if it is commutative, has unity and without zero divisors.
9	In a topological space, the interior of the complement of any subset is called the .... of this set.
10	A ring of at least two elements is called skew field if ....

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Examiners:	Prof. Dr. Amgad Salem Salama

Question 2: Choose the correct answer (40 Marks)

1)	$\tau = \{X, \varphi, \{a\}, \{b\}, \{a,b\}, \{a,c\}\}$ is not a topology on $X = \{a,b,c,d\}$ because		
a) $\{a,b,c\} \nsubseteq \tau$	b) $\{a\} \cup \{b\} \notin \tau$	c) $\{a,b,c\} \notin \tau$	d) $\{a,b\} \cap \{a,c\} \notin \tau$

2)	In any topological space (X,τ) the set $\{p: \forall G \in \tau, p \in G, (G - \{p\}) \cap A \neq \varphi\}$ is called		
a) closure of A	b) limit points of A	c) interior of A	d) exterior of A

3)	In any topological space (X,τ) the set $\overline{A} \cap \overline{(X - A)}$ is called		
a) boundary of A	b) interior of A	c) closure of A	d) exterior of A

4)	In any topological space (X,τ) the closure of any subset $A \subseteq X$ equal		
a) $\overline{A} \cap A^o$	b) $A^b \cap A^o$	c) $A^b \cup A^o$	d) $\overline{A} - A^o$

5)	.... is the biggest open set contained in the subset A.		
a) $\overline{A}$	b) A^b	c) A^{ex}	d) A^o

6)	.... is the smallest closed set containing the subset A.		
a) $\overline{A}$	b) A^o	c) A^b	d) A^{ex}

7)	The neighborhood system for any point $p \in X$ is equal $N_p = \{X\}$; in the case that the topological space (X,τ) is .... space.		
a) closed	b) indiscrete	c) discrete	d) dense

8)	The subfamily $\beta = \{X, \{a,b\}\}$ is **NOT** a base for the topology $\tau = \{X, \varphi, \{a,b\}, \{c,d\}\}$ on $X = \{a,b,c,d\}$ because		
a) $\{a,b\} \in \tau$ but it not be a union of members of β.	b) $\{c,d\} \in \tau$ and it a union of members of β.	c) $\{c,d\} \in \tau$ but it not be a union of members of β.	d) $\{a,b\} \in \tau$ and it a members of β.

9)	The set $M = \{r + s\sqrt{17}: r,s \in Z\}$, with addition and multiplication of R is integral domain that have		
a) zero divisors	b) no zero divisors	c) no zeros	d) no inverse

10)	An element $a \in R$ of a ring R is a divisor of an element $b \in R$ if there exists an element $c \in R$ such that		
a) $a \mid b.c$	b) $c = a.b$	c) $a = b.c$	d) $b = a.c$

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11)	In the usual topology the largest open set contained in $[1,2] \cup \{4,5,6\}$ is …..		
a) (1,2]	**b)** (1,2] U {4,5,6}	**c)** (1,2)U{4,5,6}	**d)** (1,2)

12)	In topological spaces, the arbitrary intersection of open sets is ……		
a) always an open set	**b)** always a closed set	**c)** always a singleton set	**d)** not always an open set

13)	In the usual topology, an open set can always be written as …..		
a) an arbitrary union of open intervals	**b)** an arbitrary intersection of open intervals	**c)** a finite union of open intervals	**d)** a finite intersection of closed intervals

14)	In the ring (R,+, o) such that $a \ o \ b = a + \sqrt{2}b - 2$, the identity of this ring is equal …………….		
a) $\sqrt{2}$	**b)** $2+\sqrt{2}$	**c)** $1+\sqrt{2}$	**d)** $1/\sqrt{2}$

15)	The identity element for the binary operation * defined by $a * b = ab/5$, where a, b are the elements of a set of non-zero rational numbers, is …….		
a) $5/ab$	**b)** 0	**c)** 5	**d)** $1/5$

16)	The set $S = \{1, i, -i, -1\}$ with multiplication operation is ………………		
a) semigroup	**b)** subgroup	**c)** monoid	**d)** abelian group

17)	In the ring (R,+, o) the element $u \in R$ is the multiplicative identity of R if for any $a \in R$, …………………		
a) $a+u=a$	**b)** $a \ o \ u = u$	**c)** $u \ o \ a = a$	**d)** $u+a=a$

18)	A ring (R, *, +) is commutative if for any $,y \in R$, ………………..		
a) $x*y=y*x$	**b)** $x*y=y+x$	**c)** $x+y=y*x$	**d)** $x+y=y+x$

19)	In the ring $(P(X), \Delta, \cap)$ the identity element is …………………		
a) X	**b)** $\emptyset$	**c)** $P(X)$	**d)** $A \subset X$

20)	In the ring (R,+, o) such that $a \ o \ b = a + \sqrt{2}b - 2$, the multiplicative inverse of $a \in R$ is …………………		
a) $\sqrt{2}$	**b)** $2+\sqrt{2}-a$	**c)** $1+\sqrt{2}-a/\sqrt{2}$	**d)** $a/\sqrt{2}+\sqrt{2}$

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Examiners:	**Prof. Dr. Amgad Salem Salama**

Question 3: (20 Points)

a) Consider the function $f: X \to Y$ from X to Y and suppose τ is a topology on Y. Prove that $\tau^* = \{G \subseteq X: G = f^{-1}(U), U \in \tau\}$ is a topology on X.

b) In any topological space (X, τ) prove that $(A \cup B)' = A' \cup B'$, for any $A, B \subseteq X$.

c) Consider the topology $\tau = \{X, \varphi, \{a\}, \{b\}, \{a,b\}, \{a,b,c\}\}$ on $X = \{a,b,c,d,e\}$, Find $A^0, \overline{A}, A^{ex}, A^b, A'$ for the subset $A = \{a,d,e\}$.

d) Prove that the collection $\beta \subseteq P(X)$ is a base of a topology on X iff i) $X = \cup\{B: B \in \beta\}$ and ii) $\forall A, B \in \beta \Rightarrow A \cap B = \cup\{B_i: B_i \in \beta\}$.

Question 4: (20 Points)

a) Prove that if a ring R has a unity, then it is unique.

b) Prove that if the multiplicative inverse of an element of a ring R with unity exists, then it is unique.

c) Prove that the algebraic system $(P(X), \Delta, \cap)$ is a Boolean ring where Δ, is the symmetric difference of sets.

d) Prove that the set $S = \{x + y\sqrt[3]{3} + z\sqrt[3]{9}: x, y, z \in \mathbb{Q}\}$, is a ring with respect to addition and multiplication on $\mathcal{R}$.

End Exam
With my best wishes

Examiners:	Prof. Dr. Amgad Salem Salama

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS	
	EXAMINATION FOR PROSPECTIVE STUDENTS (3^{RD} YEAR) STUDENTS OFMATHEMATICS	
	COURSE TITLE:SPECIAL RELATIVITY	COURSE CODE:MA3111
DATE:95/1/2020	TERM:FIRST | TOTAL ASSESSMENT MARKS:150	TIME ALLOWED: 2HOURS

[1] (a) Define *inertial frame* and give two example one for inertial system and anther for no inertial system with prove.

(b) Explain Michleson-Morley experiment and drive the results it.

[2] (a) Drive Lorantz transformation equations. And find the general formula it in a vector form.

(b) Prove that in the two system S and $\acute{S}$ if $\square = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2} - \frac{1}{c^2}\frac{\partial^2}{\partial t^2}$ then $\acute{\square}\Phi = \square\Phi$ by use Lorantz transformation equations.

[3] Apply Lorantz transformation equations for if the velocity components for a moving point P in S and $\acute{S}$ are given by $(u_x + u_y + u_z)$ and $(\acute{u}_x + \acute{u}_y + \acute{u}_z)$ find the relation between it.

[4] We have two events whose

$S_{12}^2 = c^2(t_2 - t_1)^2 - (x_2 - x_1)^2 - (y_2 - y_1)^2 - (z_2 - z_1)^2,$

prove that if $S_{12}^2 > 0$ the interval is time-like and if $S_{12}^2 < 0$ the interval is space-like.

EXAMINERS	DR./MOHAMED ABDOU KHALIFA	DR/
	DR/	DR/

With my best wishes

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR PROSPECTIVE STUDENTS (3^{RD} YEAR) STUDENTS OF MATHEMATICES

COURSE TITLE: Abstract Algebra 1		COURSE CODE: MA 3107	
DATE: 4/3/2021	FIRST TERM	TOTAL ASSESSMENT MARKS 150	TIME ALLOWED: 2 HOUR

Answer the following questions:

Question 1 (40 = 4 × 10)

1- Let H be a subgroups of a group G. Prove that aH = H iff a ∈ H.

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

3- If H is a normal subgroup of a group G_1 and f is a homomorphism of a group G into a group G_1, then verify that $f^{-1}(H)$ is a normal subgroup of a group G.

4- Give an example to construct a quotient group ${}^{G}/_{N}$, for a normal subgroup N of G.

Question 2 (40 = 10 + 20 + 10)

1- Describe the external direct product of a family of groups and give an example.

2- Define the internal direct product of a group by two ways, verify that such two ways are equivalent.

3- Find two normal subgroups H, K of the group $G = \{a, b: a^2 = b^2 = (ab)^2 = 1\}$ such that $G = H \otimes K$.

Question 3(40 = 4× 10)

(a) Let $f: G \to G_1$ be a homomorphism of a group G into a group G_1. Prove

(1) $[f(a)]^{-1} = f(a^{-1}), \forall a \in G$ (2) $f(G)$ is a subgroup of G_1.

(3) $Ker\, f \lhd G$.

(b) State and prove the third isomorphism Theorem of groups.

Question 4 (30)

Discuss: There is a one to one correspondence between normal subgroups of a group G and congruence relations on G. Clarify your answer, whenever $G = \{a, b: a^2 = b^2 = (ab)^2 = 1\}$.

EXAMINERS	DR./ S. EL-ASSAR	DR./ ABD EL-MOHSEN BADAWY

With our best wishes

	Tanta University Faculty of Science Department of Mathematics		
	Final term exam for the First semester 2020-2021		
	Course title:	Operations Research (1)	**Course code:** MA3103
1969	**Date:** 11/3/2021	Total Marks: 150	**Time allowed:** 2 Hours

Answer all the following questions:

First question: (40 Marks)

(a) For Linear Programming define the following:

"convex set, convex function, extreme point, feasible solution, optimal solution" .

(b) Examine the convexity to the set: $S = \{(x_1, x_2) : 4x_1 + 3x_2 \le 6,\ x_1 + x_2 \ge 1\}$

(c) Prove that the intersection of two convex sets S_1, S_2 in R^n is convex set.

Second question: (35 Marks)

(a) Solve graphically the following LPP:

$$\max z = 5x_1 + 4x_2 \quad s.t. \quad 4x_1 + x_2 \le 40,\ 2x_1 + 3x_2 \le 90,\ x_1, x_2 \ge 0$$

(b) By Simplex method solve the following LPP:

$$\max z = 2x_1 + 2x_2 + x_3$$

$$s.t. \quad 2x_1 + 3x_2 + x_3 \le 300;\ x_1 + x_2 + 3x_3 \le 300;\ x_1 + 3x_2 + x_3 \le 240;\ x_1, x_2, x_3 \ge 0$$

Third question: (35 Marks)

(a) Write the dual of

$\min z = x_2 + 3x_3$ s.t $2x_1 + x_2 \le 3,\ x_1 + 2x_2 + 6x_3 \ge 5,\ -x_1 + x_2 + 2x_3 = 2, x_1, x_2, x_3 \ge 0$.

(b) Determine the basic solutions of the following system:

$$2x_1 - x_2 + 2x_3 = 3,\quad x_1 + 2x_2 = 4$$

Fourth question: (40 Marks)

(a) Explain the Transportation problem?.

(b) By using North West Corner Rule find an initial basic feasible solution for the following transportation problem:

	d_1	d_2	d_3	d_4	
S_1	2	2	2	1	3
S_2	10	8	5	4	7
S_3	7	6	3	4	5
	4	3	4	4	

Examiners:	Prof. S. Ammar	Dr. N. El-Kholy

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS	
	EXAMINATION FOR PROSPECTIVE STUDENTS (THIRD MATH. & COMP. SCI.)	
	COURSE TITLE: NUMERICAL ANALYSIS (FIRST TERM)	COURSE CODE: MA 3103

DATE: 19/1/2021	MAYO 2020 - 2021	TERM: FIRST	TOTAL ASSESSMENT MARKS: 150	TIME ALLOWED: 2 HOURS

Answer the following questions:

1. **By the Bisection method, find a real root for the nonlinear equation:** $f(x) = x^3 - x + 1 = 0$. **(22 M)**
2. **Find** $f(x)$ *and* $f(4.5)$ **from the data:** $f(1) = -6,\ f(2) = -1,\ f(3) = 16,\ f(4) = 51$ *and* $f(5) = 110$. **(20 M)**
3. **Prove that:** $\Delta^{n+1} f(x) = 0, \quad f(x)$ **is a polynomial of degree less than or equal.** **(20 M)**
4. **Prove that Jacobi formula converges for solving the following linear system, then find its approximate roots:**

$$10x_1 + 3x_2 - x_3 = 12,$$
$$4x_1 + 10x_2 - x_3 = 13,$$
$$-x_1 + 5x_2 + 10x_3 = 14.$$

(22 M)

5. **Find** $f'(x),\ f''(x)$ *and* $f'''(x)$ *at* $x = 0.5$, **from the data:** $f(1) = 2, f(0) = -1$ *and* $f(3) = 14$ **for the function** $f(x)$. **(22 M)**

6. **Evaluate the integral** $\int_0^2 \frac{1}{x+1} dx$, **using Trapezoidal rule, with** $h = 0.25$. **Then estimate the error. (22 M)**

7. **Solve, using Taylor's method, the initial value problem:** $y' = -xy^2,\ y(0) = 2$. **(22 M)**

EXAMINERS	PROF. DR/ A. A. HEMEDA	PROF. DR/ A. R. ELNAMORY
	DR/	DR/

With my best wishes

	Tanta University Faculty Of Science Department of Mathematics		
	Final Term Exam For The First Semester 2020/2021		
	Programme Title: Computer Science		Level: Three
	Course Title: Boolean Algebra And Mathematical Logic		Course Code: MA3113
	Total Assignment Marks: 150 Marks	Date: 18/3/2021	Time Allowed: 2 Hours

(Note: Exam has Two Pages).

Answer the following questions:

Question 1: (40 Marks)

a- Test the validity of the following arguments using the truth table test:

$$\begin{array}{c} p \to q \\ q \to r \\ \hline \therefore p \to r. \end{array}$$

(20 Marks)

b- Test the validity for the following:

$$\begin{array}{c} \forall x(p(x) \to q(x)) \\ \exists x(p(x) \to \neg r(x)) \\ \hline \therefore \exists x(q(x) \wedge \neg r(x)) \end{array}$$

(20 Marks)

Question 2: (35 Marks)

a- Translate into logic:

i. Both p and either q or r.

ii. If p then q or r.

iii. For all x, if x is an integer, then x is either positive or negative.

iv. Some real numbers are integers.

v. At least two children are hungry.

(15 Marks)

b- Define a structure U for a given first-order language, consider the structure $U = (N; \leq, S, 0)$ and let $s: V \to N$ be the function $s(v_i) = i - 1$.

i. Compute $\bar{s}(fffv_1)$.

ii. Is $\vDash_U pfv_1c[s]$?

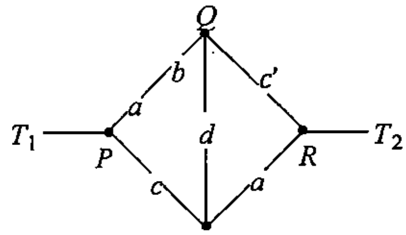
(20 Marks)

Question 3: (40 Marks)

a- Let $\mathcal{B} = (B; +, \cdot)$ be a Boolean Algebra. Show that: $ab + \bar{a}c + bc = ab + \bar{a}c,\ a, b, c \in B$. **(10 Marks)**

b- The function $F = (x' + y' + z')(x' + y + z')(x + y + z')(x + y + z)$ is in CNF. Write F in DNF, then construct the table of this function. **(15 Marks)**

c- Find the Boolean function which represents the following circuits. Simplify if possible.



(15 Marks)

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Question 4: (35 Marks)

a- Define a Boolean ring. If R is a Boolean ring, show that R must be:

i. Of characteristic 2 (i.e. $2a = 0, \forall a \in R$).

ii. Commutative.

(20 Marks)

b- Let $\mathcal{B} = (B; \vee, \wedge, ', 0, 1)$ be a Boolean algebra. Prove that if I is an ideal of B, then I is an ideal of $\bar{B}$ (the corresponding Boolean ring). **(15 Marks)**

With My Best Wishes.

Examiners	**Prof. Dr. Tahany El-Sheikh**	

	Mathematics Department, Faculty of Science , Tanta University	
	Branch: Math. Dept.	Sub-branch: General Math.
	Examination for Third Year Students	Term: First
	Course Title Electromagnetic	Course Code: MA3105
	Date: January 2021	Time Allowed: 2 Hours

Answer the Following Questions:

Question One:

a) Explain the procedure of obtaining $\vec{E}$ due to the line charge, surface charge and volume charge.

b) State and prove the Gauss's law.

c) State and explain Biot-Savart law.

Question Two:

Find the electric potential $\emptyset(x, y)$ in a region with the following boundary conditions:

$$\emptyset = 0 \quad at\, y = 0, 0 \le x < \infty$$

$$\emptyset = 0 \quad at\, y = a, 0 \le x < \infty$$

$$\emptyset = 1 \quad at\, x = 0, 0 \le y < a$$

$$\emptyset = 0 \quad at\, x \to \infty, 0 \le y \le a$$

Question Three:

Find the electric field and the electric potential in the plane at a point $P(r, \theta)$ due to an electric dipole located at the origin.

Examiners:	د/ محمد مليجى شاهين

جامعة طنطا	المستوى: الثالث (ش. رياضيات)	دور يناير ٢٠٢١
كلية العلوم	المادة: تحليل حقيقي ١	الزمن: ساعتان

أجب عن الأسئلة التالية:

١) أ. عرف المجموعة Q واذكر ٥ خواص رياضية لها .

ب. أكمل: ...... = $||f||$ حيث $F[0,9] \ni f(x) = \sqrt{\frac{8}{(x+1)(x+9)}}$

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٢) أ. أكمل : ...... = $||f||$ حيث $F[1,3] \ni f(x) = \sqrt{\frac{18}{x(x^2+9)}}$

ب. عرف المجموعة: المحدودة A – المفتوحة B مع ذكر أمثلة لها.

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٣) اثبت أن $S = \{\frac{n}{n+2} : n \in N\}$ لها نقطة نهاية وتحقق نظرية ف - بو.

هل S مجموعة (محدودة - تامة – مغلقة – قابلة للعد)؟ ولماذا؟

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٤) أ. اثبت أن المجموعة R متصلة - مفتوحة - كثيفة .

ب. اذكر متتابعة كوشى من أعداد نسبية تقاربية إلى $\sqrt{2}$ مع توضيح الإجابة.

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٥) أ. اثبت أن $I_n = \left[\frac{-1}{n} , \frac{1}{n}\right]$ فترات متداخلة وهل تتحقق خاصية الفترات لها ؟

ب. عين التغير الكلي $\overset{3}{\underset{0}{V}} f$ حيث $f(x) = \begin{cases} 3x^2 , 0 \le x \le 1 \\ x+2 , 1 < x \le 3 \end{cases}$

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