	Mathematics Department , Faculty of Science ,Tanta University	
	Branch: Math. Dept.	Sub-branch : Mathematics
	Examination for : Level three	Term: first Term 2017-2018
	Course Title: Algebra (1)	Course Code: MA3107
	Date: 24/12/ 2017	Total Mark: 150 Time Allowed: 2 Hours

**Question 3 (30 marks):**

a) **Mach each** sentence from column A with a suitable one in column B (6marks)

A	B
a) Use Cayley's Theorem	1) to find all types of abelian groups of order $p^2q^2$ , where $p$ and $q$ are prime numbers
b) Use 1 <sup>st</sup> Isomorphism Theorem	2) to find a permutation group isomorphic to the group $U(8)$ .
c) Use The Fundamental Theorem of finite abelian groups	3) to Prove that $\Gamma(G) \cong G/Z(G)$ , where $Z(G)$ is the center of a group $G$ and $\Gamma(G)$ is the set of all its inner automorphisms.

b) **State two theorems** of column A and then **use them to do the required task** in column B (24 marks)

**Question 4 (44 marks every item has 11 marks):**

a) **Classify all groups of order 6**

b) **Choose the correct answer**

i) The number of conjugacy classes of the dihedral group  $D_5$  is :

- (a) 4      (b) 5      (c) 6      (d) 7

ii) The derived group  $D'_n$  of the dihedral group  $D_n$  is generated by :

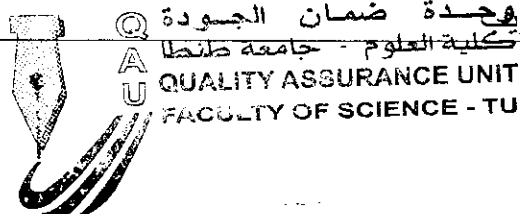
- (a)  $r^2$       (b)  $r$       (c)  $r^3$       (d)  $r^4$  where  $r$  is the rotation with angle  $2\pi/n$


iii) Every group of order 42 has a normal subgroup of order:

- (a) 2      (b) 7      (c) 3      (d) 6

*with our Best Wishes*

Examiners	أ.د/ سناء العصار د/ إيمان غرير
-----------	-----------------------------------



	Mathematics Department , Faculty of Science , Tanta University	
	Branch: Math. Dept.	Sub-branch : Mathematics
	Examination for : Level three	Term: first Term 2017-2018
	Course Title: Algebra (1)	Course Code: MA3107
	Date: 24/12/ 2017	Total Mark: 150
		Time Allowed: 2 Hours

**Answer the following questions:**

**Question 1 (36 marks every item has 12 marks):**

**Prove or disprove**

- i) the derived subgroup  $G'$  of a group  $G$  is the largest normal subgroup whose factor group  $G/G'$  is abelian
- ii) The number of conjugates of an element  $x$  of a group  $G$  equals the index of the centralizer of  $x$  in  $G$
- iii) Let  $H$  and  $K$  be normal subgroups of a group  $G$ : if  $K < H < G$ , then

$$(G/K)/(G/H) \cong H/K$$

**Question 2 (40 marks):**

a) Consider the permutation group  $S_4$ . Find the following :

conjugacy classes, the class equation, the derived subgroup, the center, and a normal series. (22 marks)

b) Complete the following (18 marks every item has 2 marks)

- i) If  $G$  is a simple group of order 168, then we have ..... elements of order 7.
- ii) If  $G$  is an abelian group, then the conjugate class of an element  $g \in G$  is....., the center of  $G$  equals....., the derived subgroup is ..... and the set of all its inner automorphisms equals.....
- iii) The largest possible order for cyclic subgroup of  $Z_4 \otimes Z_{12} \otimes Z_{40}$  is.....
- iv) A Sylow 5-subgroup of a group of order 250 has order.....
- v) A group of order 52 must have either ..... or ..... Sylow 2-subgroup.

← Please turn the page over



Tanta University  
Faculty of Science  
Department of Mathematics

Examination for :		<b>Level 3 – Mathematics 2017-2018</b>	
Course Title: Electro-Magnetostatic		Course Code: <b>MA3105</b>	
Time: 28/ 12/ 2017	Term: First	Total Assessment Marks: 150 M	Time Allowed: 2H

**Answer all the following questions:**

**First question: (35 Marks)**

- a.** State the units of the following quantities:  
magnetic flux - electric potential – capacitance – magnetic field - magnetic potential –  
permittivity and permeability of free space.
- b.** Consider a circular line charge in the  $xy$ -plane in which  $\lambda = k \sin \phi$ . Calculate the electric field on the  $z$ -axis.

**Second question: (40 Marks)**

- a.** Derive the work and energy in electrostatics for  $n$  charges, and also for volume charges distribution.
- b.** Discuss the method of image for a point charge  $Q$  is held a distance  $d$  above an infinite grounded conducting plane. Find  $Q_{mc}$  and the electric work.

**Third question: (35 Marks)**

Consider a sphere of radius  $a$  containing charge of constant density so that  $\rho = \text{constant}$  inside, while  $\rho = 0$  outside. Find the electric potential everywhere.

**Fourth question: (40 Marks)**

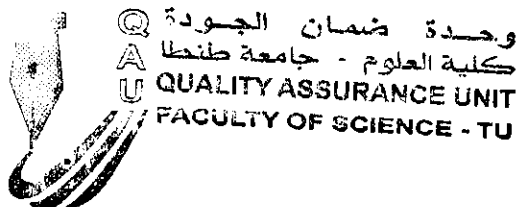
- a.** Compare between the Electrostatic and Magnetostatic.
- b.** Find the magnetic potential  $A$  and the magnetic induction  $B$  for a magnetic dipole.

With best wishes

Prof. Magdy Serwah

and

Dr. Khaled.M. Elmorabie.





TANTA UNIVERSITY  
FACULTY OF SCIENCE  
DEPARTMENT OF MATHEMATICS

Course Title: Mathematical Logic and Boolean algebra.	Third level students of Mathematics	Term: First 2017-2018 Course code MA3113
Date : 4 / 1 / 2018	Total marks: 1 0	Time allowed: 2 hrs.

**Answer the following questions:**

**Question 1 (25 marks)**

a- Show that neither of the following two formulas tautologically implies the other :

$$(A \leftrightarrow (B \leftrightarrow C)),$$

$$((A \wedge (B \wedge C)) \vee ((\neg A) \wedge ((\neg B) \wedge (\neg C))))). \quad (6 \text{ marks}).$$

b- Find a formula in disjunctive normal form (DNF) that is tautologically equivalent to  $(A \leftrightarrow B \leftrightarrow C)$ . (6 marks).

c- Complete the following (in first order languages):

(i) The terms are those expressions that can be built up from ..... and .....

(ii) An atomic formula is an expression of the form  $P t_1 t_2 t_3 \dots t_n$ , where P is ..... and  $t_1, t_2, \dots, t_n$  are .....

(iii) The set of wffs is the set of expressions that can be built up from the atomic formulas by .....

(iv) Let  $\alpha$  and  $\beta$  be two atomic formulas. The variable  $x$  occurs free in  $(\alpha \rightarrow \beta)$  iff ..... , while  $x$  occurs free in  $\forall v_i \alpha$  iff .....

(13 marks)

**Question 2 ( 25 marks )**

a- Suppose that C is generated from a set  $B = \{a, b, c\}$  by the binary operation f and unary operation g. List all elements of  $C_2$ . (11 marks)

b- Rewrite the following formulas in an unabbreviated way that explicitly lists each symbol in order : 1-  $\exists x Ax \wedge Bx$ . 2-  $\exists x (Ax \wedge Bx)$ . (7 marks).

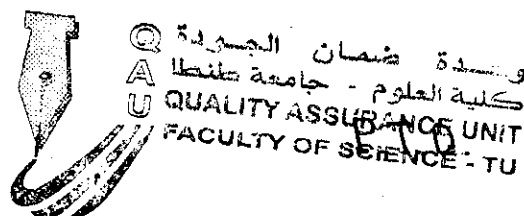
c- Assume that we have a language with the following parameters:

$\forall$ : for all things, N : is a number, I : is interesting,  $<$  : is less than, 0 : a constant symbol to denote zero .

(i) Translate into this language the English sentences:

(a) Zero is less than any number.

(b) Not all numbers are interesting.



(C)

MA3701

جامعة طنطا  
كلية العلوم  
المستوى: الثالث (ش. رياضيات)  
المادة: تحليل حقيقي  
دور يناير ٢٠١٨  
الزمن: ساعتان

أجب عن الأسئلة التالية:

(١) أ. عرف المجموعة  $R$  واذكر ٥ خواص رياضية لها .

ب. أكمل:  $\|f\| = \dots$  حيث  $f(x) = \sqrt{\frac{2}{(x+1)(x+3)}}$   $F[0,3] \ni$

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

ب. عرف المجموعة: المفتوحة - المغلقة - الكثيفة مع ذكر أمثلة لها .

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

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

(٤) أ. اثبت أن المجموعة  $I$  قابلة للعد - مغلقة في  $R$  .

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

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

ب. عين التغير الكلي  $f$   $V_0^3$  حيث  $f(x) = \begin{cases} 3x^2, & 0 \leq x \leq 1 \\ x+2, & 1 < x \leq 3 \end{cases}$

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



**TANTA UNIVERSITY - FACULTY OF SCIENCE  
DEPARTMENT OF MATHEMATICS**

**Final Term Exam for the First Semester 2017-2018**

<b>Course Title:</b>	Special Relativity	<b>Course Code:</b> MA3111
<b>Date:</b> 15-1-2018	<b>Total Mark:</b> 150 Marks	<b>Time Allowed:</b> 2 Hours

**Answer all the following questions:**

- 1) a- Find the Lorentz transformation of velocities?  
b-A rod of a proper length equal to 100 cm moves with a velocity  $0.8 C$  in a direction inclined at an angle  $60^\circ$  to its own length. Determine its moving length?
- 2) Frame  $\hat{S}$  has a speed  $v = 0.4C$  relative to  $S$ . Clocks are adjusted so that  $t = \hat{t} = 0$  at  $x = \hat{x} = 0$ . (a) An event occurs in  $S(x,t)$  when  $x = 60 m$ ,  $t = 3 \times 10^{-7} sec$ . Calculate the time for occurring the event and space in  $\hat{S}(\hat{x}, \hat{t})$ ? (b) If another event occurs at  $S(20m, 5 \times 10^{-7} sec)$ . What the time interval between the events as measured in  $\hat{S}$  ?
- 3) a- Derive the Lorentz transformation of mass?  
b-Show that a particle which travels at the speed of light must have zero rest mass?
- 4) a- Let  $T_{ijk}$  is a tensor. Show that  $T_{iik}$  is not tensor?  
b- prove that the Kronecker delta  $\delta_j^i$  is a mixed tensor of rank 2?  
c-  $A_{ij}$  is a skew symmetric tensor, verify that  
$$B_{ijk} = \frac{\partial A_{ij}}{\partial x^k} + \frac{\partial A_{jk}}{\partial x^i} + \frac{\partial A_{ki}}{\partial x^j}$$
 transform as tensor?
- 5) a-A contravariant tensor has components  $(x, xy, z^2)$  in cartesian coordinates. Find its covariant components in spherical coordinates  $(r, \theta, \varphi)$ ?  
b-  $A_{rs}^{\ell m}$  and  $B_{de}^{abc}$  are two tensors. Prove that their multiplication is a tensor and find also the number of possibility of times of inner product?  
c-prove that 
$$\frac{\partial}{\partial x^m} g^{pq} = -g^{pn} \Gamma_{mn}^q - g^{qn} \Gamma_{mn}^p$$

(Best wishes)

<b>Examiners:</b>	<b>1- Prof. Dr. Mohamed Omar Shaker    2- Dr. Afaf Mohamed Farag</b>
-------------------	----------------------------------------------------------------------

المادة : نظرية المعادلات التفاضلية  
الزمن : ثلاث ساعات

جامعة طنطا  
كلية العلوم  
قسم الرياضيات

اختبار طلاب كلية العلوم قسم الرياضيات

**Final Examination -First Semester 2017/2018**

**Answer The Following Questions**

**First question :**

1-Solve the following (I .V.P)

$$\frac{dy}{dx} - 2x = 2xy , y(0) = 0$$

2-- Define Laplace transform , and Find the following :

$$: (i)L\{2x^3 - 4x + 3 - 2e^{3x}\} \quad (ii)L\{2\sin 3x - 4\cos 5x\}$$

3- prove that the following system:

$$\frac{d^2y}{dx^2} + \lambda u(x) = 0 , \\ u(0) = 0 , u(\Pi) = 0$$

Is regular Sturm Liouville system

**Second question :**

1- Find the general solution of the following system:

$$\frac{dy}{dt} = \begin{bmatrix} 3 & 8 \\ 1 & 1 \end{bmatrix} y(t)$$

2-Solve the following (B .V. P)

$$\frac{d^2y}{dx^2} + y - x = 0 , 0 \leq x \leq \frac{\Pi}{2} \\ y(0) = 2 , y\left(\frac{\Pi}{2}\right) = 1$$

3-Solve the following Equations:

$$(i) y'' + 4y = 0 \quad y(0) = 1, y'(0) = 2 \quad \text{by using Laplace transform}$$

with the best wishes for success