Tanta University Faculty of Science Department of Mathematics			
Examination for :	Level Four – Mathematics		
Course Title: Electrodynamics		Course Code:	MA4218
Time: 15/ 6/ 2015	Term: Second	Total Assessment Marks: 150 M	Time Allowed: 2H

Answer the following questions:

First question: (35 Marks)

(a) Define the following expressions: Faraday's Law, TE wave, TEM wave, polarization of plane waves

(b) Suppose the electric field vector in free space is: $\underline{E} = 100 \cos\left(\omega t + \frac{4\pi}{3} x\right)\hat{\underline{z}}$. Find the magnetic field $\underline{B}$, the Poynting's vector $\underline{P}$, the frequency, the wave length, and the direction of propagation.

Second question: (40 Marks)

(a) Discuss the rectangular metal waveguides for TM-guided modes.

(b) State the difference between Lorentz force and Lorentz condition for antenna radiation.

Third question: (35 Marks)

(a) Define the Hertzian dipole with figures.

(b) Determine the Near-field and the Far-field radiation from a Hertzian dipole.

Fourth question: (40 Marks)

(a) Consider the interface between free space and a lossy material having $\sigma = 20$, $\varepsilon_r = 1$ and $\mu_r = 1$. A uniform plane wave with a magnitude of 100 V/m and frequency of 1 GHz is propagating in free space normal to the material surface. Compute the incident, reflected, and transmitted fields and the average power transmitted through an $5 - m^2$ area at the surface of the material.

(b) Deduce the reflection and transmission coefficient for an ideal transmission line, if the voltage is sinusoidal in time.

With best wishes
Prof. Dr. Ahmed Abo-Amber
Dr. K.M. El-Morabie

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
EXAMINATION FOR SENIORS (FOURTH YEAR) STUDENTS OF COMPUTER SCIENSE			
COURSE TITLE:	NEURAL NETWORKS		COURSE CODE: C4214
DATE: 13/6/2015	TERM: SECOND	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Question No 1: [Total marks: 40]

1. Compare between autoassociation and heteroassociation. (8 marks)
2. What are the two phases involved in associative memory operation? (2 marks)
3. Assume that you want to learn a perceptron to perform a binary NAND function on inputs x_1 and x_2. The training sample introduced to perceptron has the form $((x_0, x_1, x_2), z)$ where x_0, x_1, x_2 are inputs with input $x_0 = 1$ and z is the desired output. Let the threshold $t = 0.5$, Bias $b = 0$, and Learning rate $r = 0.1$. The training set consists of four samples: $\{((1,0,0),1), ((1,0,1),1), ((1,1,0),1), ((1,1,1),0)\}$. (30 marks)
   a. Apply the weight vector adapting algorithm to update the weight vector with initial weight vector $(w_0, w_1, w_2) = (0.7, -0.2, -0.1)$.
   [Hint: you can perform the computations in table]
   b. What are the solution vector, n_0 , and n_{max}?
   [Hint: n_0 is the iteration of perceptron convergence and n_{max} is the maximum iteration that the adaptation process must be terminated after it]

Question No 2: [Total marks: 40]

1. Define Rosenblatt's perceptron. What is its goal? What is its classification decision rule? What is the sufficient condition for perceptron? What are the components of perceptron? (10 marks)
2. Explain the two rules that the weight vector adapting algorithm of perceptron is based on. (10 marks)
3. State the fixed-increment convergence theorem for perceptron. (5 marks)
4. Explain in brief the four major processes that the algorithm responsible for the formation of self-organizing map precedes by them. (15 marks)

Question No 3: [Total marks: 20]

1. Choose the best answer for each of the following points: (10 marks)
   i. Principal goal of the self-organizing map (SOM) is:
      a. Transform an input pattern of arbitrary dimension into a one- or two-dimensional discrete map.
      b. Perform transformation adaptively in a topologically ordered fashion
      c. both a and b
      d. none of the above

   ii. Which of the following is true about self-organizing map?
      a. is type of ANN that is trained using unsupervised learning to produce map.
      b. consists of components called nodes or neurons.
      c. describes mapping from input space to map space.
      d. all of the above

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iii. Basic learning task that involves associating a new pattern with a stored pattern, is called:

a. pattern association
b. pattern recognition
c. pattern quantization
d. none of the above

iv. The set of patterns sharing common attributes is called:

a. pattern sampling
b. pattern quantization
c. pattern class
d. none of the above

v. Learning with teacher include:

a. supervised learning
b. reinforcement learning
c. both a and b
d. none of the above

2. Put (√) or (×) in end of each of the following sentences: (10 marks)

i. In self organization process the training precedes with labeled input data.

ii. Gaussian neighborhood function used in cooperative process in SOM algorithm is independent of the location of winning neuron.

iii. Neural network is said to be fully connected if every node in input layer is connected to every other node in all layers.

iv. The principle motivation for Kohonen's network model is the location of an output neuron in a topographic map corresponds to a particular domain or feature of data drawn from the input space.

v. The absence of feedback loops has a profound impact on the learning capability of the network and on its performance.

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End of examination
With our best wishes

EXAMINERS	DR. MOSAAD WAJEH HASSAN	DR. ABD EL-MONEM KOZAE
	[signature]	[signature]

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS			
	EXAMINATION FOR SENIORS STUDENTS OF MATHEMATICS (FOURTH YEAR)			
COURSE TITLE:	DIFFERENTIAL GEOMETRY (2)			COURSE CODE:MA4212
DATE:	10\6\ 2015	TERM: SECOND	TOTAL ASSESSMENT MARKS:100	TIME ALLOWED: 2 HOURS

Answer the following questions

Question 1 (25 Mark)

Let M be a surface, $p \in M$.

A. Define the Weingarten Map L, Prove that L is a linear transformation from T_pM to T_pM.(12.5)

B. Prove that if $L(x_k) = \sum_i L_k^i x_i$, then $L_k^l = \sum_i L_{ik} g^{il}$. (12.5)

Question 2 (25 Mark)

A. Prove that the differential $dN_p: T_pS \to T_pS$ of the Gauss map is a self- adjoint linear map.(12.5)

B. Prove that the angles are preserved by conformal maps. (12.5)

Question 3 (25 Mark)

A. Find the Gauss Curvature, the mean Curvature and the principle Curvatures for the plane. (12.5)

B. Prove that a surface is minimal if and only if $g_{11}L_{22} - 2g_{12}L_{12} + g_{22}L_{11} = 0$. (12.5)

Question 4 (25 Mark)

If the Riemannian curvature tensor with index (i, l, j, k) is given by

$R_{ijk}^l = \frac{\partial \Gamma_{ik}^l}{\partial u^j} - \frac{\partial \Gamma_{ij}^l}{\partial u^k} + \sum_p (\Gamma_{ik}^p \Gamma_{pj}^l - \Gamma_{ij}^p \Gamma_{pk}^l)$ for all $1 \le i, l, j, k \le 2$. Prove that

A. $R_{ijk}^l = L_{ik} L_j^l - L_{ij} L_k^l$ (Gauss's Equations) (12.5)

B. $\frac{\partial L_{ij}}{\partial u^k} - \frac{\partial L_{ik}}{\partial u^j} = \sum (\Gamma_{ik}^l L_{lj} - \Gamma_{ij}^l L_{lk})$ (Codazzi- Mainardi equation) (12.5)

EXAMINERS	PROF. ABDELAZIZ ELBAGORY	DR. MERVAT ELZAWY

Tanta UNIVERSITY
Faculty of Science
Department of Mathematics

EXAMINATION for (level 4) students OF Mathematical department			
Course Code: (MA 4202)			Course title: Algebra 2
Time ALLOWED: 2 hours	Total assessment Marks: 150	Term: 2nd	June 2015.

Answer the following :

1- a) Let r be a ring . define the following :
A subring - an ideal – a nilopotent element – a principal ideal domain – a prime ideal . (12 marks).

b) Show that the centre of a ring is a subring. Is it an ideal ? (10 marks).

c) Prove that every division ring is simple. (8 marks).

2- a) Show that the set Q ,

$Q = \{ \begin{bmatrix} a & b \\ -\bar{b} & \bar{a} \end{bmatrix} \mid a , b \in \mathcal{R} \}$ is a ring. Find the set of all units , Q^u. (20 marks).

b) Show that any ring R can be imbedded in a ring with unity. (15 marks).

3- a) Prove that every proper ideal of a commutative ring R with unity is contained in a maximal ideal. (20 marks).

b) If p∈ Z is a prime number, then prove that <p> is a maximal ideal . (10 marks).

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS	
	EXAMINATION FOR PROSPECTIVE STUDENTS (FOUR YEAR) STUDENTS OF MATHEMATICS	
	COURSE TITLE: FLUID MECHANICS(2)	COURSE CODE:MA4210

DATE:11	JUNE	TERM: SECOND	TOTAL ASSESSMENT MARKS:150	TIME ALLOWED: TWO HOURS

Question 1:

Prove that (i) $\cosh\theta = \cos i\theta$, $i\sinh\theta = \sin i\theta$ (ii) $\cosh i\theta = \cos\theta$, $\sinh i\theta = i\sin\theta$. Hence expand $\cosh\theta$ and $\sinh\theta$, in ascending power of θ.

Question 2:

A) The complex potential w for a certain flow is given by: $z = c\cos w$, sketch the flow net.

B) Prove that: $\dfrac{dw}{dz} = -(u - iv)$

Question 3:

State and prove theorem of Blasius.

Question 4:

If $z = \tan w$ prove that $\coth 2\psi = (x^2 + y^2 + 1)/2y$, $\cot 2\phi = (1 - x^2 - y^2)/2x$. Hence draw the stream lines and discuss possibility of existence of stagnation points and calculate the air speed at any point $|V| = \sqrt{x^2 + y^2}$.

XAMINERS	PROF. DR./ DR/	DR/ DR/

With my best wishes

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رياضيات

جامعة طنطا

كلية العلوم — الفرقة : - الرابعة (شعبة رياضيات)

قسم الرياضيات — دور يونيو ٢٠١٥ م

المادة :- م. ت. جزئية — الزمن:- ساعتات — MA(٤٢٠٦)

أجب عن الأسئلة التالية:-

(١) (a) Find the general solution of equation

$$xZ_{xy} + 2Z_y = y^2.$$

(b) Find the general and the complete solution of equation

$$xzZ_X + yzZ_Y + (x^2 + y^2) = 0.$$

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(٢) Solve the partial differential equation

$$xZ_{xx} + x^2 Z_{xy} - 6x^3 Z_{yy} = Z_x$$

By canonical form

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(٣)(*a*) Solve the partial differential equation

$$yZ_{xy} = -4Z_x$$

and find a particular solution for ; $Z(0, y) = e^{-3y}$, $Z(x,2) = x^2 + 3x + 1$

(b) Solve the boundary-value problem

$$u_x - 25u_y = 0 \quad u(0, y) = 9e^{-2y} + 6e^{-6y}.$$

By using Separation of variables

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(٤) (a) Find the general solution of

$$yZ_y - xZ_x = z$$

(b) Find the integral surface of

$$y^2 Z_y + z^2 = -x^2 Z_x$$

which passes the curve $2xy = x - y$, $z=1$

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(٥) (a) Solve the partial differential equation

$$Z_{xy} = 5x + 2y$$

and find the particular solution for ;

$$z(x,0) = x^2 \quad ; \quad z(1, y) = \sin y$$

(b) Solve the partial differential equation

$$u_{xx} - 9u_{yy} = 15e^{3x+y}$$

مع أطيب التمنيات بالنجاح

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رياضيات

جامعة طنطا
كلية العلوم — الفرقة : - الرابعة (شعبة رياضيات)
قسم الرياضيات — دور يونيو ٢٠١٥ م
المادة :- م. ت. جزئية — الزمن:- ساعتان — MA(٤٢٠٦)

أجب عن الأسئلة التالية:-

(١) (a) Find the general solution of equation

$$xZ_{xy} + 2Z_y = y^2.$$

(b) Find the general and the complete solution of equation

$$xzZ_X + yzZ_Y + (x^2 + y^2) = 0.$$

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(٢) Solve the partial differential equation

$$xZ_{xx} + x^2 Z_{xy} - 6x^3 Z_{yy} = Z_x$$

By canonical form

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and find a particular solution for ; $Z(0,y) = e^{-3y}$, $Z(x,2) = x^2 + 3x + 1$

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$$u_x - 25u_y = 0 \quad u(0,y) = 9e^{-2y} + 6e^{-6y}.$$

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مع أطيب التمنيات بالنجاح

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS
EXAMINATION FOR PROSPECTIVE STUDENTS (4TH YEAR)
STUDENTS OF MATHEMATICAL STATISTICS & COMPUTER SCIENCE

1969

COURSE TITLE: DIFFUSION PROCESSES & STATISTICAL DECISION THEORY		COURSE CODE: 24022	
DATE: 13-6-2013	JUNE, 2013	TERM: 2ND	TOTAL ASSESSMENT MARKS: 90	TIME ALLOWED: 3 HOURS

Answer the following questions:

(I) (a) Define: Stationary process, Markov process, Simple random walk, Brownian motion, Stopping time of Brownian motion. **(10 marks)**

(b) Consider a random process $X(t)$ defined by **(10 marks)**

$$X(t) = U\cos\omega t + V\sin\omega t, \quad -\infty < t < \infty.$$

where ω is constant and U and V are r.v.'s.

(i) Show that the condition $E(U) = E(V) = 0$ is necessary for $X(t)$ to be stationary.

(ii) Show that $X(t)$ is WSS if and only if U and V are uncorrelated with equal variance; that is, $E(UV) = 0$ and $E(U^2) = E(V^2) = \sigma^2$.

(II) (a) The transition probability matrix of a Markov chain $\{X_n\}$ with three states 1, 2 and 3 is,

$$P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$$ **(12 marks)**

and the initial distribution is $P^{(0)} = (0.7, 0.2, 0.1)$.

(i) Is the chain an irreducible? Explain. **(ii)** Find absorbing states.

(iii) Find $P\{X_3 = 2\}$.

(iv) Find $P\{X_4 = 1, X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2\}$.

(b) Is the Brownian motion with drift coefficient μ and diffusion coefficient $\sigma^2 > 0$ a limit of the random walk? Explain. **(8 marks)**

(III) (a) Find the probability density function for the Stopping time of the Brownian motion. **(11 marks)**

(b) Are the following statements true or false? Verify your answer **(9 marks)**

(i) The Oñ-dimensional unrestricted diffusions are Markov processes.

(ii) The process with stationary independent increments is stationary process.

(iii) The Brownian motion is non stationary process.

EXAMINERS	DR./ HALA ALI FERGANY	DR./ MOHAMED ABD ALLAH EL-HADIDY

With my best wishes

انظر اسئلة نظرية القرار الاحصائى

الورقة الثانية

	Tanta UNIVERSITY-FACULTY OF SCIENCE-DEPARTMENT OF Mathematics			
	EXAMINATION FOR (FORTH YEAR) STUDENTS OF Statistics			
1969	COURSE TITLE:	Decision Theory Examination		COURSE CODE:
DATE:	13-6- 2013	TERM: SECOND	TOTAL ASSESSMENT MARKS: 30	TIME ALLOWED:1 h .

Answer the following questions

1-a- Consider the following standard loss table:

	θ_1	θ_2
a_1	2	3
a_2	4	0
a_3	5	2
a_4	3	5

Determine the optimal action using the previous table, the table of regret and compare between the two solutions. (8 Marks)

-b- Define the admissible decision. Consider the following utilities table:

	θ_1	θ_2	θ_3
a_1	5	5	40
a_2	15	25	5
a_3	15	25	25

Determine an infeasible decision. (7 Marks)

2-a- Consider the following utility table:

	θ_o	θ_1
$a_1 Accept H_o$	9	3
a_2 RejecH$_o$	3	6

$P(\theta_o) = 0.3$, $P(z_1/\theta_o) = 0.6$, $P(z_1/\theta_1) = 0.4$. **Apply Bayes method for testing the following hypothesis:** $H_o : \theta = \theta_o$ **against** $H_1 : \theta = \theta_1$, **if the observation was** z_1. **(7 Marks)**

-b - Consider the prior distribution for state of nature θ **follows gamma distribution with two parameters** $\alpha = 4$, $\beta = 6$ **and the utility function is given by:** $U(a,\theta) = -(a-\theta)^2$.
Determine Bayes decision. (8 Marks)

DR.	DR. HALA FERGANY	EXAMINERS

مع أطيب الأماني بالتوفيق والنجاح

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS
	EXAMINATION FOR MATHEMATICS (FOUR YEAR) STUDENTS OF PHYSICS

	COURSE TITLE:	MTHEMATICS		COURSE CODE: 24035
DATE:	9/6/2013	TERM: SECOND	TOTAL ASSESSMENT MARKS: 90	TIME ALLOWED 3 HOURS

Solve the following questions (Each one has 22.5 Degree) :

1

1- Find Laplace transformation to each the following (22 Degree)

(i) (a) $3t^4 + 4e^{2t}$ (b) $\frac{1}{t^2} + 5\sin 2t$

(ii) (a) $L^{-1}\left(\frac{4s+3}{s^2+4}\right)$ (b) $L^{-1}\left(\frac{1}{s^2+2s}\right)$

2

1- (i) Prof that : If f(t) has period p>0, $f(t+P)=f(t)$, then (23 Degree)

$$L(f(t)) = \frac{\int_0^P e^{-st} f(t)dt}{1-e^{-st}}$$

(ii) Expand

$$f(x) = \begin{cases} 2-x, & 0<x<4 \\ x-6, & 4<x<8 \end{cases}$$

In a Fourier series of period 8.

3

2- For the D. E. $y' = x + y$, $y(0)=1$, $h = 0.1$ find y(0.5). By using (21 Degree)

(i) Taylar series method

(ii) Picard's method

(iii) Runge -kutta method

4

(i) Solve the System of D.E. (24 Degree)

$D^2x - 2x - 3y = e^{2t}$, $D^2y + 2y + x = 0$

Find the particular solution satisfying the conditions x=y=1, Dx=Dy=0 at t=0.

(ii) Solve the System of D.E.

$$(D+1)^2 x + 2Dy + 3Dz = 1,$$
$$-Dx - z = 0,$$
$$Dy + Dz - x = 0$$

Find the particular solution for which $x = z = 1$, y=0 when t=0.

EXAMINERS	PROF. DR. ELSAEED AMMAR	GOOD LOKE

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS		
	EXAMINATION FOR FORTH YEAR STUDENTS OF MATHEMATICS		
	COURSE TITLE:	Topology 2,	COURSE CODE:MA 2461
DATE:	6JUNE, 2013	TERM: SECOND — TOTAL ASSESSMENT MARKS;63	TIME ALLOWED: 3 HOURS

Answer the following questions:

1. Prove that:
   a) Every T_4- space is completely Hausdorff. (5 marks)
   b) If Y is a completely Hausdorff space and $f: X \to Y$ be a precontinuous injection and $\left(f^{-1}(V)\right)^{-0} \subset f^{-1}(\overline{V})$ for every open set $V \subset Y$, then X is Hausdorff. (4 marks)
   c) A regular T_0'- space is T_1'. (4 marks)

2. Show that:
   a) $T_3 \to T_2$. (5 marks)
   b) If X is a regular space, then the closures of two singletions either equal or disjoint. (4 marks)
   c) The property of being a T_1- space is hereditary. (4 marks)

3. a) Define: a compact space, , a sequentially compact space, and countable compact space. State the relation between them. (5 marks)
   b) If f is a bijective continuous mapping from a compact space X onto a Hausdorff space Y. Show that f is a homeomorphism. (4 marks)
   c) Give an example for a T_1- space but not Hausdorff. (4 marks)

4. a) Prove that: a T_0'- space which is T_1 is a T_1'- space. (4 marks)
   b) If A and B are non-empty separated subsets of a space X, prove that $A \cup B$ is disconnected. (4 marks)
   c) Let $\tau = \{X, \phi, \{a,b,c\}.\{c,d,e\}, \{c\}\}$ be a topology on $X = \{a,b,c,d,e\}$, prove that $A = \{a,d,e\} \subset X$ is disconnected. (4 marks)

5. a) Show that the property of being a Lindelöf space is topological. (4 marks)
   b) Show that a compact subset of a Hausdorff space is closed. (4 marks)
   c) Show that a mapping $f: X \to Y$ is precontinuous iff the inverse image of each closed set in Y is preclosed in X. (4 marks)

EXAMINERS	PROF. MOHAMED EZZAT ABD EL-MONSEF	DR.
	DR.	DR.

جامعة طنطا — امتحان نهاية الفصل الدراسي الثاني — المادة: هندسة تفاضلية

كلية العلوم — من العام الجامعي ٢٠١٢/٢٠١٣ — الفرقة: الرابعة رياضيات

قسم الرياضيات — الزمن: ٢ ساعات

Answer the following questions:

Q.1 a) Derive Frenet equations for a regular spac curve $\alpha(s)$.

b) Let $\alpha(s)$ and $\bar{\alpha}(s)$ be two unit speed curves having the same k and τ at corresponding points. Prove that α and $\bar{\alpha}$ are congruent.

Q.2 a) State and prove the isoperimetric inequality.

b) State without proof the Four-vertex theorem and apply it to the ellipse.

Q.3 a) Show that the first fundamental form matrix is non-singular.

b) State without proof the system of differential equations for geodesics and solve this system on the cylinder.

Q.4. a) On the surface of revolution show that all meridians are geodesics. Which circle of latitude is a geodesic? discuss.

b) Find the Weingarten map L for the sphere of unit radius. Hence find K and H.

Q.5 a) State without proof the implicit function theorem. Show that the ellipsoid is a surface.

b) For the graph of the function $f(u,v) = u^2 - 2v^2$ find K, H, k_1 and k_2 at $u = v = 0$. Find the Dupin indicatrix at the same point.

TANTA UNIVERSITY
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS

EXAMINATION FOR PROSPECTIVE STUDENTS (FOUR YEAR) STUDENTS OF MATHEMATICS

COURSE TITLE: FLUID MECHANICS(1)			COURSE CODE:MA4103	
DATE:11	JUAN	TERM: FIRST	TOTAL ASSESSMENT MARKS:150	TIME ALLOWED: TWO HOURS

Question 1

(i) -Discuss the Euler equations of dynamics fluid flow .

(ii)-At the point in an incompressible having spherical polar coordinates (r,θ,ψ) ,the velocity components are $[\frac{2M}{r^3}\cos\theta, \frac{M}{r^3}\sin\theta, 0]$ where M is constant. Show that velocity is of potential kind. Find the potential and the equations of the streamlines.

Question2

(a)-Show that the following velocity field is a possible case of irrotational flow of an incompressible fluid

$u = yzt \quad , \quad v = zxt \quad , \quad w = xyt$

(b)-Develop from first principles the polar form of the equation of continuity for two dimensional incompressible flow

$$\frac{\partial(v_r r)}{\partial r} + \frac{\partial v_\theta}{\partial\theta} = 0$$

If ,in a particular flow, $v_r = -\frac{\mu\cos\theta}{r^2}$,determine the value of v_θ and find the magnitude of the resulting velocity.

Question3

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

(b)- Prove that the Bernoulli's Equations for steady motion of fluid flow which is

$$\frac{1}{2}q^2 + \Omega + \int\frac{dp}{\rho} = c \ .$$

EXAMINERS	PROF. DR./	DR/
	DR/	DR/

With my best wishes