FINAL EXAMINATION
FIRST SEMESTER SESSION 2011/2012

COURSE CODE / NAME : SQQM2043 CALCULUS II
DATE : 18/01/2012 (WEDNESDAY)
TIME : 8:30 PM – 10:30 PM (2 HOURS)
VENUE : DSB K.T / WD

INSTRUCTION :

1. This exam paper contains ELEVEN (11) questions in TEN (10) printed pages, excluding the cover page.
2. Answer ALL QUESTIONS in the space provided.
3. You are NOT ALLOWED to remove the exam paper from the examination hall.

MATRIC NO : ________________________
( with word ) ________________________
( with number )

IDENTIFICATION CARD NO. :

LECTURER : ________________________

GROUP : ________ TABLE NO. : ________

DO NOT OPEN THIS EXAMINATION PAPER UNTIL INSTRUCTED

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QUESTION 1 ( 8 MARKS)

Let \( z = 1 + x^2 + y^2 \). Sketch the level curves when \( z = 1, 5 \) and \( 10 \). Hence sketch the surface.
QUESTION 2 (4 MARKS)

Find the limit if it exists, or show that the limit does not exist for the following functions:

a) \[ \lim_{(x,y) \to (4,2)} \frac{1}{\sqrt{3x-4y}}. \]  
   (1 mark)

b) \[ \lim_{(x,y) \to (0,0)} \frac{x^2y^2}{x^4+y^4}. \]  
   (3 marks)

QUESTION 3 (2 MARKS)

Find the first partial derivative if \( f(x,y) = 4x^3 - xy^2 + 3y - 7 \).
QUESTION 4 (5 MARKS)

Find the equation of the tangent plane to the surface \( z = \ln(x^2 + y^2) \), at the point \((1, 0, 0)\).

QUESTION 5 (6 MARKS)

A standard piece of printer paper has a perimeter of 39 inch. Find the dimensions of the paper that will give the most area. What is that area? Does standard 8\(\frac{1}{2}\) X 11 inch, paper have the maximum area?
QUESTION 6 (9 MARKS)

Let \( w = xy + yz + xz, \) \( x = u + v, \) \( y = u - v, \) and \( z = uv. \)

a) Express \( \frac{\partial w}{\partial u} \) and \( \frac{\partial w}{\partial v} \) as functions of \( u \) and \( v \) both by using the Chain Rule.

(7 marks)

b) Evaluate \( \frac{\partial w}{\partial u} \) and \( \frac{\partial w}{\partial v} \) at the point \( \left( \frac{1}{2}, 1 \right). \)

(2 marks)
QUESTION 7 (9 MARKS)

Evaluate the iterated integrals:

a) \( \int_{-1}^{1} \int_{0}^{3} (2x - 4y) \, dy \, dx \). (4 marks)

b) \( \int_{0}^{1} \int_{0}^{x} e^{x^2} \, dy \, dx \). (5 marks)
QUESTION 8 (7 MARKS)

For the following differential equation,

i) Classify it as ordinary differential equation or partial differential equation.

ii) Give the order of the differential equation.

iii) If it is ordinary differential equation, state whether it is linear or nonlinear.

iv) State the independent and dependent variable.

\[ ax^2 \frac{dy}{dx} + x \frac{dy}{dx} + xy = 0. \]

i) 

ii) 

iii) 

iv) 

\[ \frac{\partial N}{\partial t} = \frac{\partial^2 N}{\partial r^2} + \frac{1}{r} \frac{\partial N}{\partial r} + kN. \]

i) 

ii) 

iii) 

iv)
QUESTION 9 (7 MARKS)

Given an initial value problem

\[ 2x + \sin y + x \cos y \frac{dy}{dx} = 0 ; \quad y(1) = \frac{\pi}{2}. \]

i) Show that the differential equation is exact. (3 marks)

ii) Solve the initial value problem. (4 marks)
QUESTION 10 (7 MARKS)

A small town decides to conduct a fund raising drive for a futsal court whose cost is RM70,000. The initial amount in the fund is RM10,000. On the basis of past drives, it is determined that at \( t \) months after the beginning of the drive, the rate \( \frac{dx}{dt} \) at which money is contributed to such a fund is proportional to the difference between the desired goal of RM70,000 and total amount \( X \) in the fund at that time. After one month, a total of RM40,000 is in the fund.

How much will be in the fund after three months?
QUESTION II (16 MARKS)

Given a second order non-homogeneous differential equation

\[ y'' + 3y' + 2y = e^{-x}. \]

i) Find the homogeneous solution, \( y_h \). (3 marks)

ii) Solve the above problem using the undetermined coefficient method. (6 marks)
iii) Solve the same problem using the variation of parameter method.

(7 marks)

END OF QUESTIONS.