ELIZADE UNIVERSITY

ILARA-MOKIN

FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
1^{st} SEMESTER EXAMINATION
2017 / 2018 **ACADEMIC SESSION**

COURSE CODE: MTH 201

COURSE TITLE: Mathematical Methods I

COURSE LEADER(s): Dr. I. A. Olopade & Mrs. T. Akinwumi

DURATION: 2 Hours

HOD's SIGNATURE

INSTRUCTION:

Candidates should answer any **FOUR** Questions.

Students are warned that possession of any unauthorized materials in an examination is a serious offence.

1(a) Define the following:

(i) Composite function (ii) Periodic function (iii) Even and Odd functions (6 Marks)

(b) (i) Evaluate $\lim_{x \to 4} \frac{x^2-16}{x-4}$ (3 Marks)

(ii) When is a function said to be continuous? (3 Marks)

Hence investigate the continuity of this function

$f(x) = \frac{x^3-8}{x^2-4}$; $x \neq 2, f(2) = 3; x = 2$ (3Marks)

c) Verify the mean value theorem for $f(x) = 2x^2 - 7x + 20, a = 1, b = 6$ (5Marks)

2 a) Show that the equation $(2xy^2 + 3y\cos 3x)dx + (2x^2y + \sin 3x)dy = 0$ is exact.

(4Marks)

Hence find the equation $\Phi(x,y)$ which is the exact form of the equation. (7Marks)

b) Differentiate $y = \sin^2 6x^2$ (5Marks)

c) If $x^4y + 3 + 2y = xy^4 - 4x^2$ find y' (4Marks)

3(a) Expand the function $f(x) = \cos x$ about $x = \frac{\pi}{3}$ using Taylors expansion. (6Marks)

(b) If $f(x,y) = x^4y + e^{xy^3}$ find f_x, f_y, f_{xx}, f_{yy}, (8Marks)

c) Show that $f_{xy} = f_{yx}$ (6Marks)

4 a) Find the directional derivative of $U = 2xy - z^2$ at $Q(2,-1,1)$ (9marks)

in the direction towards $P\ (3,1,-1)$.

b (i) In what direction is Directional derivative a maximum . (2Marks)

(ii) What is the value of the maximum? (4Marks)

c) If $f(x,y) = x^2y^2$ with $x = \cos t$ and $= \sin t$, find $\frac{df}{dt}$ by using partial differentiation

(5Marks)

5 a) A rectangular box, open at the top, is to have a volume of 108 cubic feet. What must be the dimensions so that the total surface is a minimum? (7Marks)

b) Use Lagrange multipliers to find the maximum and minimum values of the function $f(x,y) = 3x + 4y$ subject to the constraint $x^2 + y^2 = 1$ (7Marks)

c) Evaluate $\int \frac{x^2+2}{x(x^2-9)} dx$ (6Marks)