## JOMO KENYATTA UNIVERSITY

**OF**

**AGRICULTURE AND TECHNOLOGY**

# University Examinations 2014/2015

**THIRDD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE**

**SMA 2371 : PARTIAL DIFFERENTIAL EQUATIONS**

**DATE: APRIL 2015 TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND**

**ANY OTHER TWO QUESTIONS.**

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**QUESTION ONE (30 MARKS)**

(a) Define a partial differential equation and give second order example.

[2 marks]

(b) Find the integral curves of the equations

= =  [6 marks]

(c) Eliminate the arbitrary constant from

z = a- b+ 4ab [4 marks]

(d) Find the general and complete solutions of the equation

zp - zq = y [5 marks]

(e) Show that the following wave equation is variable separable

- = 0 [3 marks]

(f) Verify that the equation

zydx – zxdy - dz = 0 is integrable hence solve it. [4 marks]

(g) Find the integral surface of the equation

(x-y)P + (y-x)q = z

through the curve xz = , y = 0 [6 marks]

**QUESTION TWO (20 MARKS)**

(a) Find the orthogonal trajectories on the conicoid z(x + y) = 4 of the conics in which it is cut by the system of planes x – y + z = k, where k is a parameter. [10 marks]

(b) Given that U = U(x,y,z) = ,

V = V(x,y,z) =  are the solutions of

= = 

Show that F(u,v) = 0 is a general solution of the Lagrange’s equation.

[10 marks]

**QUESTION THREE (20 MARKS)**

(a) Solve = C using the Laplace transforms given the boundary conditions t<0, u(x,t) = 0

t>0, u(o,t) = 4

x u(,t) = 0, t = 0 u(x,o) = 0 [10 marks]

(b) Find the surface which intersects the surfaces of the system

+ + =  and which passes through the circle xy = cz where c is a parameter. [10 marks]

**QUESTION FOUR (20 MARKS)**

(a) Solve the homogeneous differential equation

zydx + 2xzdy – 3xydz = 0 [8 marks]

(b) Form a first order partial differential equation + + = 

[3 marks]

(c) Solve the boundary value problem

5+ = 4u by method of separation of variables given that at

t = 0, u(x,t) = . [9 marks]