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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS**

**SEPTEMBER/OCTOBER 2015 EXAMINATION**

**SCHOOL OF SCIENCE AND TECHNOLOGY**

**COURSE CODE: MTH 422**

**COURSE TITLE: PARTIAL DIFFERENTIAL EQUATIONTOTALS: 70 MARKS**

**TIME: 3 HOURS**

**CREDIT UNIT: 3**

**INSTRUCTION:ANSWER ANY FIVE QUESTIONS**

1. (a) Using the Methods of Lagrange Multiplier find the general solution of

. 7 marks

(b) Derive the solution to the Cauchy problem

$u\_{tt}=a^{2}u\_{xx}+\cos(x, u\left(x,0\right)=\sin(x, u\_{t}\left(x,0\right)=1+x))$ 7marks

1. Solve the vibration of an elastic string governed by the one-dimensional wave equation.

 Where u(x,t) is the deflection of the string. Since the string is fixed at the ends x =0 and x = L, we have the two boundary conditions thus.

.i.e for all t.

The form of the motion of the string will depend on the initial deflection (deflection at t=0) and on trhe initial velocity (velocity at t=0). Denoting the initial deflection by f(x) and the initial velocity by g(x), the two initial conditions are

orwhen t=0. 14marks.

1. (a) Solve ,  6marks

(b) Identify the orders and Linearity of these equations.

i) 

ii) 

iii) 

iv)

 (2marks each i.e 2\*4=8marks)

1. (a) Consider the function 
2. Calculate  and  2marks
3. Use (a) to show that  2marks

(b) Consider the equation  with the following boundary conditions

,  and initial condition 

 Find the solution of the BVP. 10 marks

1. (a) State and prove Cauchy Kovalewasski theorem. 7marks

(b) Prove that  is the general solution of

 7marks

1. Determine the characteristic equations, the characteristic curve and the canonical form of  14marks
2. Given. Find:

(a).The initial element if 5marks

 (b).The characteristics stripe containing the initial elements 5marks

(c).The integral surface which contain the initial element. 4marks