NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
JANUARY/FEBRUARY 2013 EXAMINATION

COURSE CODE: MTH 422
COURSE TITLE : PARTIAL DIFFERENTIAL EQUATION
TIME ALLOWED: 3 HOURS
FOR WHOM: 400 LEVEL MATHEMATICS, COMPUTER AND MATHEMATICS AND B.ED MATHEMATICS STUDENTS.
INSTRUCTION: ANSWER FOUR FROM SEVEN QUESTIONS. EQUATION ONE IS COMPOUSORY.

1. Given $xp+yq=pq$

Find a. The initial element if $x=x_o,\ y=o$ and $z=x_o/2$ $z(x,o)=x/2$

5marks

b. The characteristics stripe containing the initial elements

5marks

c. The integral surface which contain the initial element.

4marks

2. State and Prove CAUCHY KOVALEWASKI Theorem.

14marks

3a. Find the general solution of

$$\left(Zx_i \quad Zy_i - 1\right) \qquad (A,B,C)$$

,

By method of langrage multiplier

7marks

.3b.. Derive the solution to the Cauchy problem

$u_{tt}=a^2u_{xx}+\cos x, u(x,0)=\sin x, u_t(x,0)=1+x$ 7marks

4. Prove that $u=F(xy)+xG\left(\frac{y}{x}\right)$ is the general solution of $x^2u_{xx}-y^2u_{yy}=0$

14marks

5. A) Determine the characteristic equation, the characteristic curve and the canonical form of

$$x^2u_{xx}+2xyu_{xy}+y^2u_{yy}+xyu_x+y^2u_y=0$$ **7marks**

5 b) Prove that the equation in 6a above can be solved

7marks

6.. By inspection, classify the following partial differential equations into the foolowing: non-linear, quasi-linear and linear. If linear, determine whether each is homogeneous or not

$$u_{xx}+u_{yy}-2u=x^2$$

$$u_x^2+\log u=¿2xy¿$$

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$$2u_{xx}-4u_{xy}+2u_{yy}+3u=0$$ **3.5marks each= 14marks**

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