(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2020/2021 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF MASTER OF SCIENCE IN APPLIED MATHEMATICS

COURSE CODE: **MAT 853**

COURSE TITLE: **PDE I**

DATE: 13/10/21 **TIME:** 9 AM -12 AM

INSTRUCTIONS TO CANDIDATES

Answer Any THREE Questions

TIME: 3 Hours

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QUESTION 1

(a) Solve the Laplace's equation, $U_{xx}+U_{yy}=0$ which satisfies the conditions, $U(0,y)=U(l,y)=U(x,0)=0$ and $U(x,a)=sin\frac{n\pi x}{l}$ [10mks]

(b) Use method of characteristics to solve, $3U_{xx}+10U_{xy}+3U_{yy}=0$ [10mks]

QUESTION 2

A rod of length l with insulated sides is initially at a uniform temperature u_0. Its ends are suddenly cooled at 0^0c and are kept at that temperature. Find the temperature function $U(x,t)$. [20mks]

QUESTION 3

Give the general solution of the two dimensional wave equation,

$U_{tt}=c^2(U_{xx}+U_{yy})$ [20mks]

QUESTION 4

Obtain the the solution of the equation $U_{xx}+U_{yy}=0$ which is periodic in x in $0\leq x\leq a$, $0\leq y\leq b$ and satisfies the boundary conditions

$u(0,y)=u(a,y)=0 \qquad 0\leq y\leq b$

$u(x,b)=0 \qquad 0\leq x\leq a$

$u(x,0)=x \qquad 0\leq x\leq a$ [20mks]

QUESTION 5

(a) Give D'Alembert's solution of the one dimensional wave equation,

$U_{tt}=c^2U_{xx}$. [7mks]

(b) Use the method of of separation of variables to solve the one dimensional wave equation, $\frac{\partial^2 y}{\partial t^2}=c^2\frac{\partial^2 y}{\partial x^2}$. [20mks]