(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2019/2020 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER

SPECIAL/ SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

MATHEMATICS

COURSE CODE: MAT 327

COURSE TITLE: METHODS I

DATE: 08/02/2021 **TIME:** 11 AM -1 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017 (SUP/SPE)

THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE
OF BACHELOR OF SCIENCE

MAIN CAMPUS

MAT 327: METHODS 1

INSTRUCTIONS
Attempt question **ONE** (30marks) and any other **TWO** questions (20mks each)
Observe further instructions on the answer booklet

Question 1: Compulsory (30 marks)

a). Define the following terms

i Sine series

ii Cosine series

iii Fourier series

(6mks)

b). Find the radius and interval of convergence of

$$\sum_{n=0}^{\infty} \frac{(-1)^n}{(n+1)9^n}(x-2)^{2n}$$

(6mks)

c). Define the term 'Laplace Transform' hence evaluate $L^{-}\{\frac{2s+3}{s(s+1)(s-2)}\}$ (8mks)

d). Find all the singular points of the differential equation and classify each point as either regular or irregular

$$x^2(x-3)^2y'' + 4x(x^2-x-6)y' + (x^2-x-2)y = 0$$

(6mks)

e). Classify the following PDE as either elliptic, parabolic or hyperbolic

.

$$2u_{xx} - 3u_{xy} + u_{yy} = 0$$

(4mks)

Question 2 (20mks)

a). Evaluate $\int_0^{\infty} \sqrt{x}e^{-x}dx$ (8mks)

b) Use the method of separation of variables to solve the following equation $u_x - 2u_t = u$ hence show that $u(x, 0) = 6e^{-3x}$ (12mks)

Question 3 (20mks)

Transform the following differential equation into Legendre equation by letting $x = \cos\theta$

$$\sin\theta\frac{d^2y}{d\theta^2} + \cos\theta\frac{dy}{d\theta} + n(n+1)y\sin\theta = 0$$

(20mks)

Question 4 (20mks)

By means of substitution $x = \frac{1}{4}t^2$, $y = tz$ transform the equation

$$x\frac{d^2y}{dx^2} + y = 0$$

to Bessel's equation of appropriate order. Hence find the solution which is finite for $x = 0$ and express the other solution in terms of Bessel function (20mks)

Question 5 (20mks)

a) Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\tan\theta}d\theta$ (10mks)

b) $\int_0^1 \left(\ln\frac{1}{x}\right)^{\frac{3}{2}} dx$ (10mks)