ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
1st SEMESTER EXAMINATIONS
2018 / 2019 **ACADEMIC SESSION**

COURSE CODE: MTH 325

COURSE TITLE: Mathematical Method II

DURATION: 2 Hours

HOD's SIGNATURE

INSTRUCTION:

1. YOU ARE TO ANSWER **FOUR** QUESTIONS FROM THE **SIX** QUESTIONS ON THE EXAMINATION PAPER.

Question One

1a) Explain the following terms

(i)	Transversality conditions	1 Mark
(ii)	Geodesic problem	1 Mark
(iii)	Variation principle	1 Mark
(iv)	Variation problem	1 Mark

1b) State fermat principle of optics — 2 Marks

1c) Find the curve which minimize $\int_a^b (y^2 + y'^2)\,dx$ — 9 Marks

Question Two

2a)i   Find the $L^{-1}\left(\dfrac{5s+8}{s^2+4}\right)$

3 Marks

(ii)   Find the Laplace transform $f(t)=\ell^{2t}+4t^3-2\sin3t$

3 Marks

(iii)   Find the $L^{-1}\left(\dfrac{3}{s-5}\right)$

2 Marks

2b)   Solve the differential equation $y''+5y'+6y=0$ $y(0)=2$, $y'(0)=3$ Using Laplace transform.

7 Marks

Question Three

3a)   Determine the extrema of the functional $I[y(x)]=\int_a^b f(x,y,y')dx$ subjected to the condition that the point $A(x_0,y_0)$ moves on $x^2+y^2=1$ and the other end $B(x_1,y_1)$ lies on a straight line $x+y=4$

10 Marks

3b)   Find the Laplace transform of $\sin at\ and\ \cos at$

5 Marks

Question Four

4a)   State the Hamilton principle and write the Lagrange equation

2 Marks

b)   A particle of mass 3kg moves on x y plane. The potential energy of the particle as a function is given by $V=36xy-48x^2$. The particle starts at time t=0 at the point with the position vector (10, 10).

(i)   Write the differential equations describing the motion

3 Marks

(ii)   Solve the equation to determine position of the particle as a function of time   3 Marks

(iii)   Find the velocity and acceleration as a function of time

3 Marks

4c)   State and prove the convolution theorem. Using the convolution theorem evaluate

$$H(s)=\frac{1}{(s+2)^2+(s^2+1)}$$

4 Marks