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 $L^{-1}\left(\frac{5s+8}{s^2+4}\right)$ **3 Marks**

(ii) Find the Laplace transform $f(t)=e^{2t}+4t^3-2\sin 3t$ **3 Marks**

(iii) Find the $L^{-1}\left(\frac{3}{s-5}\right)$ **2 Marks**

2b) Solve the differential equation $y''+5y'+6y=0 \quad y(0)=2, \quad y'(0)=3$ Using Laplace transform. **7 Marks**

Question Three

3a) Determine the extrema of the functional $I[y(x)]=\int_a^b f(x,y,y^1)dx$ 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**

Question Five

5a) Find the curve which gives the shortest distance between the two points on a plane

$I = \int_a^b \sqrt{(1+(y^1)^2)}\, dx$ **7 Marks**

5b) State the necessary and sufficient condition for Euler-Lagrange equation. Hence find the

$I[y(x)] = \int_a^b x(1+y^{1^2})^{\frac{1}{2}}\, dx$ integral curve of the Euler-Lagrange equation. **8 Marks**

Question Six

6a) Prove that the stationery function $\int_0^4 (xy^1 - (y^1)^2)\, dx \quad y(0) = 0, y(4) = 3$ is the parabola

$y = \frac{x^2}{4} - \frac{x}{4}$ **5 Marks**

6b) Find the curve which gives the shortest distance between the two points on a plane

$I = \int_{X_1}^{X_2} ((y^1)^2 + 4xy^1) dx$ **5 Marks**

6c Find the Laplace transform $f(t) = (t^3 + 1)^3$ **5 Marks**