



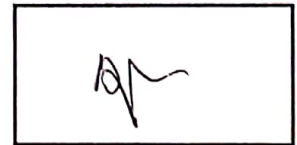
**ELIZADE UNIVERSITY,
ILARA-MOKIN,
ONDO STATE**

**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 $y''+5y'+6y=0$ $y(0)=2$, $y'(0)=3$ 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

Question Five

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

$$I = \int_a^b \sqrt{1 + (y')^2} dx \quad 7 \text{ Marks}$$

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

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

Marks

Question Six

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

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

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

$$I = \int_{x_1}^{x_2} ((y')^2 + 4xy') dx \quad 5 \text{ Marks}$$

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