MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR, FIRST SEMESTER EXAMINATIONS FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING

MATHEMATICS VIII

DATE: 6/12/2017 **TIME: 8.30-10.30 AM**

INSTRUCTIONS

Answer Question One and Any Other Two Questions

QUESTION ONE

a) Evaluate the Reinman sums

I. $\int_D \int (3x + 4y)\, \Delta x \Delta y \qquad \Delta x = \frac{1}{4}\ \Delta y = \frac{1}{4} \qquad D: 0 \leq x \leq 1 \ ; \ 0 \leq y \leq 1$

(6 marks)

II. $\int_D \int \frac{x}{y} \qquad \Delta x = \frac{1}{4}\ \Delta y = \frac{1}{4} \qquad D: 0 \leq x \leq 1 \ ; \ 0 \leq y \leq 1$

(6 marks)

b) Evaluate

I. $\int_{D_1} \int x^2 y\, dA \qquad D_1\ 0 \leq x \leq 1 \qquad 0 \leq y \leq 1$ (5 marks)

II. $\int_D \int (x^2 + y^2)\, dA \qquad D\ -2 \leq x \leq 2 \qquad -2 \leq y \leq 2$ (5 marks)

c) Show that

I. $\int_{a_1}^{a_2} \int_{b_1}^{b_2} f(x) dy\, dx \quad = \quad (b_2 - b_1) \int_{a_1}^{a_2} f(x)\, dx$ (4 marks)

II. Evaluate

$\int_0^1 \int_0^1 (4x + 2y) dy dx$ (4 marks)

QUESTION TWO

a) Find the volume of the solid bounded by the surface $t = 0 \;\; t = y - x^2 \quad y = 1$ (8 marks)

b) Evaluate the iterated integrals

I. $\int_0^3 \int_{y^2}^{3y} x^2 y \;\; dx \;\; dy$ (3 marks)

II. $\int_0^1 \int_0^1 xy(2y + 1) \; dy \; dx$ (3 marks)

III. $\int_{-1}^1 \int_0^2 \frac{y}{1+ x^2} \;\; dy \; dx$ (3 marks)

IV. $\int_0^1 \int_0^1 (x^2 y \; - \; 3xy^2 + 5) dy \; dx$ (3 marks)

QUESTION THREE

a) Evaluate

$\iint_E \; \int xy^2 z^3 \; dv \qquad E: 0 \leq x \leq 2 \qquad 0 \leq y \leq 1 \qquad 0 \leq z \leq 4$ (10 marks)

b) Find the mass and the center of the circle of a flat plate in the shape of a semi-circle of the radius one whose density is equal to the distance from the centre of the circle (10 marks)

QUESTION FOUR

Given the plane object $0 \leq x \leq 2 \quad 0 \leq y \leq 2x \;\; \rho(x, y) = x + y + 1$

Find

a) The mass

b) The center of mass

c) The moment of inertia about the origin (20 marks)