



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

SUPPLEMENTARY EXAMINATION

MATHEMATICS VI

DATE: 1/9/2017

TIME: 8:30 – 10:30 AM

INSTRUCTION TO CANDIDATES:

Answer question **ONE** and any other **TWO** questions.

Show all your working.

QUESTION ONE (COMPULSORY)(30 MARKS)

1. a) Evaluate

i) $I = \int_1^2 \int_2^4 (x + 2) dx dy$ (4 marks)

ii) $I = \int_1^3 \int_{-1}^1 \int_0^2 (3x - y - 2z) dx dy dz$ (6 marks)

b) Find the double Riemann sum for the following

i) $\sum D_2 \sum (x^2 + y^2) \Delta x \Delta y$ with in the region D_2 $-2 \leq x \leq 2$ $-2 \leq y \leq 2$
and $\Delta x = \frac{1}{2}$ and $\Delta y = \frac{1}{2}$ (4 marks)

ii) $\sum D_2 \sum x^2 y \Delta x \Delta y$ over D_2 $0 \leq x \leq 1$ $x^2 \leq y \leq \sqrt{x}$
and $\Delta x = \frac{1}{4}$ $\Delta y = \frac{1}{5}$ (6 marks)

- c) Evaluate $\int \int_E \int Y + Z \, dv$ where E is the region $0 \leq x \leq \frac{\pi}{2}$ $0 \leq y \leq \sin x$
 $0 \leq z \leq y \cos x$ (6 marks)
- d) Find the mass of an object in the unit cube $0 \leq x \leq 1$ $0 \leq y \leq 1$ $0 \leq z \leq 1$ with
the density $\rho(x, y, z) = x + y + z$ (4 marks)

QUESTION TWO (20 MARKS)

- a) Evaluate $I = \int_1^2 \int_0^3 x^2 y \, dx dy$ (6 marks)
- b) Determine $I = \int_1^2 \int_0^\pi (3 + \sin \theta) \, d\theta dr$ (6 marks)
- c) Find the volume bounded by the four planes $x = 0$ $y = 0$ $z = x + y$
 $z = 1 - x - y$ (8 marks)

QUESTION THREE (20 MARKS)

- a) Evaluate $I = \int_1^2 \int_0^3 \int_1^{3x} y \, dy dx dz$ (9 marks)
- b) Find the volume of the solid bounded by the planes $z = 2$, $x = 0$, $x = 2$, $y = 1$, $y = 4$ and
the surface $z = xy + y^2$ (11 marks)

QUESTION FOUR (20 MARKS)

- a) Use double integration to determine the area bounded by the curve
 $y = x^2$ and $y = 2x - x^2$ (10 marks)
- b) Let D be the region bounded by the curves $x = y^2$ $x = y = 2$
Evaluate the double integral $\iint_D xy \, dA$ (10 marks)

QUESTION FIVE

- a) Evaluate 10mks)
- i) $\int_0^1 \int_0^1 \int_0^1 3y^2 + 6z^2 \, dz dy dx$. (7 marks)
- ii) $\int_0^1 \int_0^1 \int_0^1 x^2 y z^3 \, dz dy dx$ (7 marks)
- b) An object has constant density and the shape of a tetrahedron with the vertices at the four
points $(0, 0, 0)$ $(1, 0, 0)$ $(0, 1, 0)$ $(0, 0, 1)$ find its center of mass. (6 marks)