



TECHNICAL UNIVERSITY OF MOMBASA
FACULTY OF APPLIED AND HEALTH SCIENCES
DEPARTMENT OF MATHEMATICS & PHYSICS
UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED PHYSICS (BTAP) AND BACHELOR OF TECHNOLOGY IN
RENEWABLE ENERGY (BTRE)
AMA 4216: CALCULUS FOR TECHNOLOGISTS II.

SPECIAL/ SUPPLIMENTARY EXAMINATIONS

SERIES: September 2018

TIME: 2 HOURS

DATE: September 2018

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of 5 questions. Attempt question ONE and any other TWO questions.

Do not write on the question paper.

Question ONE (30 mks) Compulsory

a).show that $\cosh x - \sinh x = e^{-x}$ (2marks)

b).Express in partial fractions $\frac{x^2+3x-10}{x^2-2x-3}$ and hence solve $\int \frac{x^2+3x-10}{x^2-2x-3} dx$ (6marks)

c) .Given that $\int_3^5 f(x)dx = 7$ and $\int_5^8 f(x) dx = -4$,

Find $4 \int_3^8 f(x)dx$ (3marks)

d).Express as a ratio $0. \dot{1}\dot{2}$ (4marks)

e).Evaluate

i). $\int \cos^3 x dx$ (3marks)

ii). $\int \cos^8 x \sin^5 x dx$ (5marks)

iii). $\int_0^{\frac{\pi}{2}} x^2 \cos x dx$ (5 marks)

f). Find the length of the curve $y^2 = x^3$ between $x = 0$ and $x = 4$ (4marks)

Question two (20mks)

The parametric equations of the equations of a curve are

$$X = \frac{t}{1+t} \quad Y = \frac{t^2}{1+t}$$

Find

- a) Its Cartesian equation **4mks**
- b) $\frac{dy}{dx}$ in terms of t **4mks**
- c) The coordinates of the point(s) where the gradient is -3 **4mks**
- d) The equation of the tangent at the point where t=2 **2mks**
- e) The equation of the normal at the point where t=2 **2mks**
- f) Evaluate $\int_0^{\pi/2} \sin 2x \cos x dx$ **4mks**

Question three (20mks)

a).Evaluate $\int \frac{1}{1+\sin x} dx$ (4marks)

b).Find the volume of the solid bounded above by the graph $f(x,y) = x^3y + 1$ and below by the triangle $R=[(0,1) \times (0,3)]$ (4marks)

c).Determine $\frac{d^2y}{dx^2}$ of the function at (1,2) $y^3 - xy^2 + x^2y + x^2 = 7$ (7marks)

d).Use the fourth McLaurin polynomial to approximate $\ln 1.1$ correct to 5 decimal places . (5marks)

Question four (20mks)

a). Determine the Centre of mass for the region bounded by

$y = x^3$ and $y = \sqrt{x}$. (4marks)

b).Evaluate $\int \sec x dx$ (4marks)

c). The region enclosed by the semi-circle $y = \sqrt{4 - x^2}$ and the x-axis is revolved around the x-axis. Determine the volume of the solid generated. (4marks)

d). Evaluate $\int_1^2 \int_3^4 (2x^2 + xy^3) dx dy$ (4marks)

e). evaluate $\int \frac{1}{x^{2/3} - x^{1/2}} dx$ (4marks)

Question five (20mks)

a).Evaluate

i) $\int \cos^5 x \, dx$ (4marks)

ii) $\int \sin^2 x \cos^6 x \, dx$ (4marks)

b). Find by reduction $\int \cos^8 x \, dx$ (6mks)

c). Given $\sin 45^\circ = 1/\sqrt{2}$ and $\cos 45^\circ = 1/\sqrt{2}$. Approximate $\sin 44^\circ$ by Taylor's series up to x^3 . (3marks)

d). Find the total derivative of $z = 3yx^3 + x^2y^2 + xy^3$ (3marks)