THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR BACHELOR OF SCIENCE IN INFORMATION & COMMUNICATION TECHNOLOGY (YR III, SEM I)

SMA 2102: CALCULUS II

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: FEBRUARY/MARCH 2012
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- Answer booklet

This paper consists of **FIVE** questions
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
This paper consist of **TWO** printed pages

QUESTION ONE (30 MARKS)

a) Find the derivative of the following

$$x^2 \tanh y = \ln y$$

i) (4 marks)

$$y = Coth(\cos x)$$

ii) (4 marks)

$$\tanh^2 x + \sec h^2 x = 1$$

b) Show that (4 marks)

c) Evaluate

$$\int \cos^4 x \, dx$$

i) (5 marks)

$$\int x^2 e^{2x} \, dx$$

ii) (4 marks)

d) Express $-2+2i$ in polar form (3 marks)

e) Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sqrt{1-Cos^2 t}\ dt$ (6 marks)

QUESTION TWO (20 MARKS)

a) Find the fifth root of i (6 marks)

b) i) Find the partial fractions for $\frac{6x^2+7x-25}{(x+2)(x-1)(x-3)}$ (5 marks)

Evaluate $\int \frac{6x^2+7x-25}{(x+2)(x-1)(x-3)}\ dx$

ii) Use the result in b) (i) above to evaluate (4 marks)

c) The area enclosed by the curve $y=3e^{\frac{x}{3}}$, the x-axis and ordinates $x=-1$ and $x=3$ is rotated 360° about the x-axis. Determine the volume generated. (5 marks)

QUESTION THREE (20 MARKS)

a) The arc of the parabola $y=x^2$ from $(1,1)$ to $(2,4)$ is rotated about the y- axis. Find the area of the resulting surface (8 marks)

b) Express $4x^2+4x+2$ in the form $a(u^2 \pm A^2)$ where a and A are real constants. Hence find

$\int \frac{dx}{4x^2+4x+2}$

(6 marks)

c) Evaluate $\int_2^3 \frac{x^3-2x^2-4x-4}{x^2+x-2}dx$ correct to 4significant figures (6 marks)

QUESTION FOUR (20 MARKS)

a) Find the area of the region bounded above by the parabola $y=2-x^2$ and below by the line $y=-x$ (4 marks)

b) Given that $\cosh x = \frac{17}{15}$. Find the value of

i) $\sinh x$ (3 marks)

ii) $\tanh x$ (2 marks)

$$\sqrt{2xy}\,\frac{dy}{dx}=1$$

c) Solve the following differential equation by separation of variables (5 marks)

$$i\left(\frac{1+3i}{1-2i}\right)^2$$

d) Evaluate (6 marks)

QUESTION FIVE (20 MARKS)

$$\frac{d}{dx}(\cosh x)=\sinh x$$

a) Show that (5 marks)

$$\int_1^{2.4} e^{-\frac{x^2}{3}}\,dx$$

b) Evaluate by mid-ordinate rule with 6 intervals to 4 significant figures (6 marks)

$$\int \frac{dx}{\sqrt{e^{2x}-1}}$$

c) Evaluate (4 marks)

$$y=\frac{4\sqrt{2}}{3}x^{\frac{3}{2}}-1$$

d) Find the length of the curve from $x=0$ to $x=1$ (5 marks)