THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

UNIVERSITY EXAMINATIONS

DEPARTMENT OF MATHEMATICS AND PHYSICS

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ELECTRICAL END ELECTONIC ENGINEERING/ MECHANICAL ENGINEERING/ CIVIL ENGINEERING/BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY:

FIRST YEAR SEMESTER II

SMA 2173: CALCULUS II

DATE: NOVEMBER/DECEMBER, 2011 TIME: 2 Hours

INSTRUCTIONS: Answer Question ONE and any other TWO Questions

QUESTION ONE (30 MARKS)

a) Find the derivative of the following

i) $y = \tanh^{-1} x$ (4 marks)

ii) $y = Coth(\tan x)$ (4 marks)

b) Show that $\tanh^2 x + \sec h^2 x = 1$ (4 marks)

c) Evaluate

i) $\int \frac{Cos\sqrt{x+1}}{\sqrt{x+1}}\, dx$ (5 marks)

ii) $\int Secx\, dx$ (5 marks)

d) Express $2x^2 - 6x + 4$ in the form $a(u^2 \pm A^2)$ where a and A are real constants. Hence find $\int \frac{(x+1)dx}{\sqrt{2x^2 - 6x + 4}}$ (5 marks)

e) Find the area of the region enclosed by the x-axis and one arc of the curve $y = Sinx$ (3 marks)

QUESTION TWO (20 MARKS)

a) Find the arc length for the curve $y = x^2 - \frac{1}{8}\ln x$ taking $P_\circ(1,1)$ as the starting point (6 marks)

b) i) Find the partial fractions for $\frac{8x^2 - 3x + 19}{(x^2+3)(x-1)}$ (5 marks)

(ii) Use the result in b) (i) above to evaluate $\int \frac{8x^2 - 3x + 19}{(x^2+3)(x-1)}dx$ (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) Find area of the surface generated by rotating the curve $x = \frac{1}{3}(y^2 + 2)^{\frac{3}{2}}$, $1 \le y \le 2$, about the x-axis (8 marks)

b) Solve for x in $2.6Cosh\ x + 5.1Sinh\ x = 8.78$ correct to 4 decimal places

(6 marks)

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

(6 marks)

QUESTION FOUR (20 MARKS)

a) Find the area of the region bounded on the right by the line $y = x - 2$, on the left by the parabola $x = y^2$, and below by the $x - axis$ (4 marks)

b) Given that $Sinh\ x = -\frac{3}{4}$. Find the value of

i) $Coshx$ (3 marks)

ii) $Tanhx$ (2 marks)

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

d) Sketch the graph $y = x^3 + 2x^2 - 5x - 6$ between $x = -3$ and $x = 2$ and determine the area enclosed by the curve and the x-axis (5 marks)

QUESTION FIVE (20 MARKS)

a) Evaluate $Coth 0.38$ correct to 3 decimal places (4 marks)

b) Calculate the error in approximating $\int_1^3 \frac{2}{\sqrt{x}} dx$ by trapezoidal rule with $n = 8$

(6 marks)

c) Evaluate $\int_0^{\frac{\pi}{3}} \sqrt{1 - \frac{1}{3} Sin^2\theta}\ d\theta$ correct to 3 decimal places using Simpson's rule with 6 intervals (4 marks)

d) Find the numerical value of $Sinh\ 2$ correct to 2 decimal places. (2 marks)

e) Evaluate $\int Sin3xCos5xdx$ (4 marks)