TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXA BACHELOR OF SCIENCE IN CIVIL ENGINEERING,MECHANICAL ENGINEERING,ELECTRICAL ENGINEERING , BSMD AND BTIT.

SMA 2102 /AMA 4105/SMA 2173: CALCULUS II

END OF SEMESTER EXAMINATION

SERIES:APRIL2016

TIME:2HOURS

DATE: Pick DateMay2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (30 MARKS)

a. A curve has parametric equation

$$x = 2t^3 + 1$$
$$y = 3t^2 - 1$$

Find the gradient to the normal to the curve at the point t=5. (5 marks)

b). Given that $\cosh x = \frac{17}{15}$. Determine,

i) $\sinh x$ (2 marks)

ii) $\tanh x$ (2 marks)

c.Determine $\int_2^3 \frac{dx}{3x+1}$ (4 marks)

d.Find the area of the region enclosed by $x = y^2 \; and \; y = x - 2$ (5 marks)

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

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

g.Use Trapezoidal rule to approximate $\int_1^2 \frac{1}{x} dx$ for n=5 (6 marks)

QUESTION TWO (20 MARKS)

a. Find the length of the asteroid $x = cos^3 t \;\; y = sin^3 t \;\; 0 \le t \le 2\pi$ (7 marks)

b. Find the horizontal and vertical asymptotes of the curve and sketch the curve $y = \frac{-8}{x^2-4}$ (5 marks)

c. Evaluate $\int \frac{log_2 x}{x} dx$ (3 marks)

d. Evaluate $\int \frac{2x^2-x+4}{x^3+4x} dx$ (5 marks)

QUESTION THREE (20 MARKS)

a. Evaluate

i). $\int x sin\ hx\ dx$ (4 marks)

ii). $\int x^2 e^{2x}\ dx$ (5marks)

c. Solve the ordinary differential equation $\frac{dy}{dx} = \frac{x(y^2+1)}{x+1}$ (5 marks)

d. Find the tangent and the normal to the curve $x^2 - xy + y^2 = 7$ at the point (-1,2).

(6 marks)

QUESTION FOUR (20 MARKS)

a. Use Simpson'srule to approximate the integral with n=10 $f(x) = \int_0^1 e^{x^2}\ dx$ (7 marks)

b. Evaluate the triple integral $\int_0^1 \int_0^{x^2} \int_{xy}^{x+y} xyzdzdydx$ (5 marks)

c. Evaluate $\int e^x \cos x dx$ (4 marks)

d. Verify the derivative $\frac{d}{dx} \cot h^{-1} x = \frac{1}{1-x^2}$. (4 marks)

QUESTION FIVE (20 MARKS)

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

(ii) Use the result in b) (i) above to evaluate $\int \dfrac{6x^2+7x-25}{(x+2)(x-1)(x-3)}\ dx$

(3h marks)

b. Evaluate $\int Secx\ dx$ (3 marks)

c. .Use mid ordinate rule to approximate $\int_0^2 \frac{x^2}{3} dx$ for n=5 (4 marks)

d .Find the Cartesian equation of the polar equation $rcos\left(\theta - \frac{\pi}{3}\right) = 3$. (5 marks)