TECHNICAL UNIVERSITY OF MOMBASA

UNIVERSITY EXAMINATIONS 2017/2018

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY, BACHELOR OF TECHNOLOGY IN MARINE ENGINEERING AND BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING

SMA 2173: CALCULUS II

SPECIAL/ SUPPLIMENTARY EXAMINATIONS

SERIES: SEPTEMBER 2018

DATE: JULY 2017 **DURATION:** 2 HOURS

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO

QUESTION ONE (30 MARKS)

(a.) The parametric equations of a curve are

$$x = \frac{t}{1+t}, y = \frac{t^2}{1+t}$$

Find

(a) its Cartesian equation **(4 marks)**

(b) $\frac{dy}{dx}$ in terms of t. **(6 marks)**

(c) the coordinates of the point(s) where the gradient is -3. **(6 marks)**

(d) the equation of the tangent at the point where t = 2. **(6 marks)**

(e) the equation of the normal at the point where t = 2. **(4 marks)**

(f) Evaluate $\int_0^{\pi/2} \sin 2x \cos x dx$ **(4 marks)**

QUESTION TWO (20 MARKS)

(a) If y = tan x, show that $\frac{d^2y}{dx^2} = 2\tan x + 2\tan^3 x$ **(3 marks)**

(b) Find the value of $\int_2^3 \frac{dx}{x^2 - 4x + 13}$ **(6 marks)**

(c) Evaluate $\int_0^{\pi/2} \sin^3 x dx$ **(5 marks)**

(d) Evaluate $\int_0^1 \frac{xdx}{\sqrt{(1-x^2)}}$ **(6 marks)**

QUESTION THREE (20 MARKS)

(a.) A function y of x is given by the following table:-

x	**0**	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**
y	**0.0000**	**0.0499**	**0.0995**	**0.1483**	**0.1960**	**0.2423**	**0.2867**

Find $\int_0^{0.6} ydx$ by

(i.) the trapezoidal rule **(7 marks)**

(ii.) the simpson's rule **(7 marks)**

(b.) Find $\int x\tan^{-1}x$ **(6 marks)**

QUESTION FOUR (20 MARKS)

(a.) Find $\int \frac{x^3}{x^2 + x - 20}$ by first resolving into partial fractions **(7 marks)**

(b) Show that $\frac{d(\tanh^2 x)}{dx} = 2\tanh x \sec h^2 x$ **(6 marks)**

(c) By making a suitable hyperbolic substitution, find

$$\int_0^1 \frac{1}{\sqrt{(1+9x^2)}} dx$$

(7 marks)

QUESTION FIVE (20 MARKS)

(a.) Find a suitable integrating factor and hence solve the differential equation

$$x\frac{dy}{dx}+3y=\frac{e^x}{x^2}$$

(7 marks)

(b.) Find the area enclosed by the curve y = sin x and the x-axis between x = 0 and x= 2π.

(7 marks)

(c.) Find the volume generated by the curve $y^2 = 4x$ between x = 0 and x = 4, is rotated about the x – axis. **(6 marks)**