TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

AMA2150: ENGINEERING MATHEMATICS I

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2017

TIME: 2HOURS

DATE: 9Sep2017

<u>**Instructions to Candidates**</u>
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

a) Calculate the diameter of a solid cylinder which has a height of 82.0 cm and a total area of 2.0 m^2

(10 marks)

b) Proof the following

i) $\sqrt{\frac{1-\sin x}{1+\sin x}} = \sec x - \tan x$

ii) $\frac{\tan x + \sec x}{\sec x \left(1 + \frac{\tan x}{\sec x}\right)} = 1$ (10 marks)

c) i) Transpose the formula $p = \frac{a^2 x + a^2 y}{r}$ to make a the subject

ii) Determine y in terms of x $5\log_a y - 2\log_a(x+4) = 2\log_a y + \log_a x$ (10 marks)

Question TWO

a) i) Expand $(2a + 3b)^5$ using Pascal triangle

   ii) Calculate the number of permutations for 10 distinct objects taken six at a time.   (10 marks

b) The radius of a cylinder is reduced by 4% and its height increased by 2%. Determine the appropriate percentage in its volume and curved surface area neglecting products of small quantities. (10 marks)

Question THREE

a) The law connecting friction F and load L for an experiment is given by $F = aL + b$ where a and b are constants. Given that F=5.6 and L=8.0 when F=4.4 and L=2.0, determine the
   i)   values of a and b
   ii)   value of F when L=6.5   (10 marks)
b) A cylinder with a varying circular section is 6 m long and has its cross-sectional areas measured from one end at interval of 1.0 m recorded as 49,62,79,102,152,191,240 cm^2. Determine the volume of the cylinder using
   i)   Trapezoidal
   ii)   Simpson and
   iii)   Mid-ordinate rule   (10 marks)

Question FOUR

a) Express $\dfrac{\sqrt{1+2x}}{\sqrt[3]{1-3x}}$ as a power series as far as the term in x^2 hence state the range of values of x for which the series is convergent   (10 marks)
b) i) Solve for x $2log_a x - log_a(x - 1) = log_a(x - 2)$

   ii) Make G the subject of the formula $T = 2\pi\sqrt{\dfrac{GJ}{IL}}$ (10 marks)

Question FIVE

a) Solve the following simultaneous equations graphically
   $2x + y = 3$
   $x = -2y$
   $3y = 4x + 11$ (15 marks)
b) Solve $2x = 1 - 8x^2$ using completing the square method   (5 marks)