TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

AMA2350: ENGINEERING MATHEMATIC V

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: 9 Dec 2016

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

a) A function f(t) is defined by $f(t) = \begin{cases} \frac{2t}{\pi}, & 0 \leq t \leq \frac{\pi}{2} \\ 2(1 - \frac{t}{\pi}), & \frac{\pi}{2} \leq t \leq \pi \end{cases}$

  i.   sketch the function for three periods
  ii.   determine the Fourier half-range sine series for the function   (10 marks)

b) The mean mass of 800 people is 64.7 kg and a standard deviation of 5.4 kg. If the masses are normally distributed, determine the number of people likely to have masses of

  i.   less than 54.4 kg
  ii.   more than 70 kg
  iii.   more than 62 kg   (10 marks)

c) Determine the Fourier half-range cosine series for the a function defined by $f(x) = x$ within the interval $0 \leq x \leq \pi$ (10 marks)

Question TWO

a) Given that $f(x) = \begin{cases} -\cos x, & -\pi \leq x \leq 0 \\ \cos x, & 0 \leq x \leq \pi \end{cases}$

     i.   sketch the function for three periods

     ii.   determine the Fourier series for the function   (10 marks)

b) The mean height of 500 people is 170cm and the standard deviation is 9cm. Assuming that the heights are normally distributed, determine the number of people likely to have heights

     i.   between 150 - 195cm

     ii.   less than 165cm

     iii.   more than 194cm   (10 marks)

Question THREE

a) The mean mass of active material in a batch of 100 tablets produced by a manufacturer is 5.00 g and the standard deviation of the masses is 0.036 g. Determine the number of tablets that have masses of

     i.   between 4.88 and 4.92 g

     ii.   between 4.92 and 5.04 g

     iii.   more than 5.04 g   (10 marks)

b) A periodic function is defined by $f(x) = \begin{cases} -k, & -\pi \leq x \leq 0 \\ k, & 0 \leq x \leq \pi \end{cases}$

     i.   sketch the function for three periods

     ii.   determine the Fourier series for the function

     iii.   deduce a numerical series for the function   (10 marks)

Question FOUR

a) A frequency distribution of the class mid-point values of the breaking loads for 275 similar fibres are as given below:

Load(KN)	17	19	21	23	25	27	29	31
Frequency	9	23	55	78	64	28	14	4

     i.   use normal probability paper to show that this distribution is approximately normally distributed

     ii.   determine the mean and standard deviation of the distribution from the graph and by calculation
                               (10 marks)

b) A function f(x) is defined by $f(x) = \begin{cases} -x, & -3 \leq x \leq 0 \\ x, & 0 \leq x \leq 3 \end{cases}$

     i.   sketch the function for three periods

     ii.   determine the Fourier series for the function   (10 marks)

Question FIVE

a) Determine the Fourier series for f(x) = 2x - 1 within the interval 0< x< 1 (10 marks)

b) The relationship between the voltage applied to an electrical circuit and the current flowing is as shown. Assuming a linear relationship, determine the equation of the regression correct to 4 significant figures

Current (mA)	2	4	6	8	10	12	14
Voltage	5	11	15	19	24	28	33

(10 marks)