FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

AMA2350: ENGINEERING MATHEMATICS V

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: 1 Aug 2016

<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) A function is defined by $f(x) = \begin{cases} 1 - x, & -\pi \leq x \leq 0 \\ 1 + x, & 0 \leq x \leq \pi \end{cases}$

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

 b) A production department has 35 similar milling machine with the breakdown
 on each averages 0.06 per week. Determine the probability of having number of
 breakdowns in a week;
   i.   only one
   ii. less than three   (10 marks)

 c) Determine the Fourier cosine sine series for the a function define by
   $f(x) = x \quad 0 \leq x \leq \pi$ (10 marks)

Question TWO

a) Given the function $f(x) = \begin{cases} -\sin x, & -\pi \le x \le 0 \\ \sin x, & 0 \le x \le \pi \end{cases}$

   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) An Electric firm manufactures light bulbs with a uniform distributed mean of 800 hours and a standard deviation of 40 hours. Determine the probability that a bulb

   i.   between 4.052 and 4.056 mm

   ii.   last for more than 880 hours

   iii. last between 770 hours and 830 hours

   iv. last between 700 hours and 920 hours   (10 marks)

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

   i.   sketch the function for two periods

   ii.   determine the Fourier series for the function

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

Question FOUR

a) The mean mass for 1500 gas cylinders is 6.5kg with a standard deviation of 0.5kg. Determine the probability that a sample of 60 cylinders chosen at random without replacement will have a combined mass

   i.   between 378 and 396kg

   ii.   more than 399kg   (10 marks)

b) A function f(x) is defined by $f(x) = \begin{cases} 0, & 0 \le x \le l \\ 5, & 0 \le x \le 2l \end{cases}$

   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 $0 \le x \le 1$ (10 marks)

b) A firm manufactures bulbs with a uniform distributed mean of 600 hours and a standard deviation of 50 hours. Determine the probability that a bulb

   i.   blows at 480 hours or below

   ii.   last for more than 680 hours

   iii. last between 570 hours and 630 hours

   iv. iv) last between 500 hours and 700 hours   (10 marks)