TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

DIPLOMA IN MEDICAL ENGINEERING

AMA 2350: ENGINEERING MATHEMATICS V

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: FEBRUARY 2015
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer Booklet*
- *Mathematical Table*
- *Scientific Calculator*

This paper consist of **FIVE** questions
Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Define the following:
- **(i)** Complement of a set **(2 marks)**
- **(ii)** Theoretical probability **(2 marks)**
- **(iii)** Sampling design **(2 marks)**
- **(iv)** Sampling design **(2 marks)**
- **(v)** Null hypothesis **(2 marks)**

b) In a competitive examination, 30 candidates are to be selected. In all 600 candidates appear in a written test, and 100 will be called for the interview.
- **(i)** What is the probability that a person will be called for the interview? **(2 marks)**
- **(ii)** Determine the probability of a person getting selected if he has been called for the interview? **(2 marks)**
- **(iii)** Probability that a person is called for the interview and is selected. **(3 marks)**

c) Given that:

$$A = \{1,3,7,9,11,13\}$$
$$B = \{5,9,13,17\}$$

Find: (i) $A \cap B$ **(3 marks)**

(ii) $A - B$ **(3 marks)**

d) (i) Define binomial distribution **(2 marks)**

(ii) Explain the importance of normal distribution **(5 marks)**

e) State Baye's Theorem **(2 marks)**

Question Two

A medical survey was conducted in order to establish the proportion of the population which was infected with cancer. The results indicated that 40% of the population were suffering from the disease. A sample of 6 people was later taken and examined for the disease. Find the probability that the following were observed.

- **a)** Only one person had the disease. **(4 marks)**
- **b)** Exactly two people had the disease **(4 marks)**
- **c)** At most two people had the disease **(4 marks)**
- **d)** At least two people had the disease **(4 marks)**
- **e)** Three or four people had the disease **(4 marks)**

Question Three

a) A firm is manufacturing 45,000 units of nuts. The probability of having a defective nut is 0.15. Calculate the following:

(i) The expected number of defective nuts **(5 marks)**

(ii) The variance and standard deviation of the defective nuts in daily consignment of 45,000 **(5 marks)**

b) The screws produced by a certain machine were checked by examining number of defectives in a sample of 12. The following table shows the distribution of the 128 samples according to the number of defective items they contained:

No. of defectives in a sample of 12	0	1	2	3	4	5	6	7
No. of samples	7	6	19	35	30	2 3	7	1

Fit a Binomial distribution and find the expected frequencies if the chance of machine being defective is ½. **(10 marks)**

Question Four

a) (i) How many numbers of two different digits can be formed with figures 1, 2, 3, 4, 5, 6? **(3 marks)**

(ii) In how many ways SIX persons can be chosen out of eight. **(3 marks)**

b) If the probability of meeting a building contract date is 0.8, the probability of good weather is 0.5 and the probability of meeting the date given good weather is 0.9, calculate the probability that there was good weather given that the contract was met. **(6 marks)**

c) The probability of rare disease striking a given population is 0.003. A sample of 10,000 was examined. Find the expected number suffering from the disease and hence determine the variance and the standard deviation for the above problem. **(8 marks)**

Question Five

a) What is Poisson distribution? State its characteristics. Give examples where it can be applied. **(8 marks)**

b) Customers arrive randomly at a department store at an average rate of 3.4 per minute. Assuming a Poisson distribution, calculate the probability that:

(i) No customers arrive in any particular minute **(4 marks)**

(ii) Exactly one customer arrives in any particular minute. **(4 marks)**

(iii) Two or more customers arrive in any particular minute **(4 marks)**