



**TECHNICAL UNIVERSITY OF MOMBASA**  
**Faculty of Applied & Health**  
**Sciences**

DEPARTMENT OF MATHEMATICS & PHYSISCS  
DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE)

AMA 2350: ENGINEERING MATHEMATICS V

**END OF SEMESTER EXAMINATION**

**SERIES: AUGUST 2014**

**TIME ALLOWED: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*

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) An experiment consists of rolling of pair of die. Event  $E_1$  is the event that a sum of 7 occurs. Event  $E_2$  is the event that an odd number occurs on the first dice.
- (i) Clearly show either by listing or otherwise Sample space  $S$ , Event  $E_1$  and Event  $E_2$ . **(6 marks)**
  - (ii) Find probability  $(E_1 \text{ and } E_2)$ ,  $(E_1 \text{ or } E_2)$  **(4 marks)**
- b) Two cards are drawn from a well shuffled ordinary deck of 52 cards. Find the probability that they are both diamonds if the first card is:
- (i) Replaced **(2 marks)**
  - (ii) Not replaced **(3 marks)**
- c) A die is tossed five times, an event  $E$  is that a six appears. Find the probability of obtaining a six twice. **(3 marks)**
- d) A coin is tossed 3 times. What is the probability of obtaining 3 heads. **(2 marks)**
- (i) Find the labourer's expected earnings. **(3 marks)**  
 $(x \geq 12)$
  - (ii) Find probability **(3 marks)**
- e) Suppose the earnings of a labourer, denoted by  $x$  are given by the following probability function

$X = x$	0	8	12	16	
$P(x = x)$	0.3	0.2	0.3	0.2	

- f) A continuous random variable  $x$ , having values only between 0 and 5 has a density function given by
- $$P(x) = \begin{cases} 0.2, & 0 < x < 5 \\ 0, & \text{otherwise} \end{cases}$$
- (i) Verify if it is a density function **(1 mark)**
  - (ii) Find  $\text{Pr}(2.5 < x < 4)$  **(3 marks)**

**Question Two**

- a) The following shows the results of a survey on the types of exercise taken by a group of 110 students. 65run, 48 swim, 60 cycle, 40 run and swim, 30 swim and cycle, 35 run and swim, 25 do all three.
- Draw a venn diagram to represent these data. **(8 marks)**
- b) Find the probability that a randomly selected students from the survey.
- (i) Takes none of these types of exercise **(3 marks)**
  - (ii) Swims but does not run **(3 marks)**
  - (iii) Takes at least two of these types of exercise **(3 marks)**

- c) A college offers a choice of 3 degree course, 4 diploma courses and 3 certificate courses. How many different courses are available? **(3 marks)**

### Question Three

A bag contains 6 red sweets and 3 black sweets. Two sweets are drawn at random:

- (i) With replacement  
(ii) Without replacement
- a) Draw a tree diagram to represent the probabilities in each case (in (i) and (ii) above) **(10 marks)**
- b) Determine probabilities in each case **(10 marks)**

### Question Four

- a) An assembly line contains 2,000 of a component which has a limited life. Records show that the life of the components is normally distributed with a mean of 900 hours and a standard deviation of 80 hours.
- (i) What proportion of components will fail before 1,000 hours **(5 marks)**  
(ii) What proportion will fail before 750 hours **(5 marks)**  
(iii) What proportion of components fail between 850 and 880 hours **(5 marks)**
- b) Let X be the random variable define as the number of dots observed on the upturned face of the fair die after a single toss. Find the expected value of x. **(5 marks)**

### Question Five

$$f(x) = \begin{cases} x & 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

Given that the random variable x has density function

- $\Pr\left(\frac{1}{2} < x < \frac{3}{4}\right)$
- c) Find (i) **(2 marks)**  
 $\Pr\left(-\frac{1}{4} < x < \frac{1}{2}\right)$   
(ii) **(2 marks)**
- d) The probability that a salesman makes a sale on a visit to a prospect is 0.3. What is probability in 2 visits of:
- (i) Making no sales **(3 marks)**  
(ii) Making 1 sale **(3 marks)**  
(iii) Making 2 sales **(3 marks)**
- e) Find:
- (i)  $E(x)$  **(2 marks)**  
(ii)  $E(x^2)$  **(2 marks)**  
(iii) Standard deviation **(3 marks)**

For the probability distribution shown in the table below.

X	8	12	16	20	24
P(X)	1/8	1/6	3/8	1/4	1/12