



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

DEPARTMENT OF MATHEMATICS & PHYSICS  
CERTIFICATE IN MECHANICAL ENGINEERING

AMA 1107: ENGINEERING MATHEMATICS II

**SPECIAL/SUPPLEMENTARY EXAMINATION**

**SERIES: OCTOBER 2013**

**TIME: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Tables*
- *Scientific Calculator*

This paper consist of **FIVE** questions in **TWO** sections **A & B**

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

**SECTION A (COMPULSORY)**

**Question One**

$$y = \frac{2}{1+x^2}$$

a) Using trapezoidal rule with 8 intervals determine the area covered by giving your answer to 3 decimal places. from  $x = 0$  to  $x = 1$ ,  
(8 marks)

b) Sketch the curve for  $\theta$  values between  $0^\circ$  and  $360^\circ$   
 $y = \sin \theta$

(i)

$$y = \cos \theta$$

(ii)

(4 marks)

c) Experimental values of the variables X and Y are as tabulated:

X	0.100	0.125	0.160	0.200	0.400
Y	0.050	0.064	0.085	0.111	0.286

$$\frac{1}{y} \quad \frac{1}{x}$$

Draw a graph of  $\frac{1}{y}$  against  $\frac{1}{x}$  hence express y in terms of x; (18 marks)  
**SECTION B (Answer any TWO questions from this section)**

**Question Two**

a) The table below shows experimental values of variables X and Y which are related by the equation:  
 $y = Ab^x$

where A and B are constant:

X	2	4	6	8	10
Y	9.8	19.4	37.4	74.0	144.4

By drawing a suitable straight line graph, determine the values of:

a) A

(12 marks)

b) b

(8 marks)

**Question Three**

a) Sketch the graph for  $y = \tan \theta$  for values of  $\theta$  ranging from  $0^\circ$  to  $360^\circ$  by tabulating  $y = \tan \theta$  at intervals of  $30^\circ$  (4 marks)

b) Solve for  $\theta$  values between  $0^\circ$  and  $360^\circ$ :  
 $1 + \cos \theta = 2 \sin^2 \theta$  (10 marks)

$\cos^2 \theta + \sin^2 \theta = 1$   
 c) By using a right angled triangle of base x; height = y and hypotenuse = r; show that (6 Marks)

#### Question Four

a) A square pyramid with the side 3cm, height 4cm and slant height 5cm. Determine:  
 (i) Its surface area  
 (ii) Its volume (6 marks)

b) Determine the radius of the sphere whose surface area is 500 given  $\pi = 3.14$  (4 marks)

c) Complete the given table of data about cylinder by finding the values of the unknown in terms of  $\pi$  where applicable:

Volume	$\pi$ 245
Base radius	2
Base Area	$\pi$ 49
Height	2
Total surface area	

(10 marks)

#### Question Five

a) Determine the area covered by the curve  $y = \frac{1}{\sqrt{x}}$ ; from  $x = 1$  to  $x = 3$  using trapezoidal rule having eight intervals. (10 marks)

b) Determine the area covered by the curve  $y = \frac{5}{\lambda}$  from  $x = 1$  to  $x = 3$  using Simpsons rule with eight intervals. (10 marks)