



TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Applied & Health
Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN:
BUILDING & CIVIL ENGINEERING
ELECTRICAL & ELECTRONIC ENGINEERING

AMA 2150: ENGINEERING MATHEMATICS I

END OF SEMESTER EXAMINATION

SERIES: APRIL 2015

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Table*

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)

- $\frac{11 - 3x}{x^2 + 2x - 3}$
- a) (i) Resolve into partial fractions. **(5 marks)**
 (ii) Solve,

$$\begin{aligned} 2x + y + 3z &= 12 \\ x + 3y + 2z &= 2 \\ x + 2y + 4z &= 12 \end{aligned}$$

(6 marks)

- (iii) Solve the equation:
 $\log x - 1 + \log(x + 1) = 2 \log(x + 2)$

(3 marks)

- b) (i) Two aircraft leave an airfield at the same time. One travels due to north at an average speed of 300km/h and the other due west at an average speed of 220km/h. Calculate their distance apart after 4 hours **(4 marks)**

- c) A pyramid has a rectangular base 3.60cm by 45.40cm., Determine:
 (i) Volume and,
 (ii) Total surface area, of the pyramid if each of its sloping edges is 15.0cm **(9 marks)**

$$1 - 2 \cos^2 x = \frac{\tan^2 x - 1}{\tan^2 x + 1}$$

- (iii) Prove that **(3 marks)**

Question Two

- a) Solve the equation:
 $\log(x - 1) + \log(x + 1) = 2 \log(x + 2)$ **(4 marks)**

$$\frac{\frac{1}{2} \log 16 - \frac{1}{3} \log 8}{\log 4}$$

- b) Evaluate: **(5 marks)**
 $2^{x-1} = 3^{2x-1}$

- c) Solve the equation correct to 4 s.f **(7 marks)**

$$\frac{\left(\frac{4}{3}\right)^3 \times \left(\frac{3}{5}\right)^2}{\left(\frac{2}{5}\right)^{-3}}$$

- d) Simplify **(4 marks)**

Question Three

$$\frac{4a^{2\frac{3}{2}} \times a^{-2}}{2a^{\frac{1}{4}}}$$

- a) (i) Simplify and evaluate expression when $a = 16$ **(5 marks)**
 (ii) Determine the volume and total surface area of a cone of radius 5cm and perpendicular height 12cm **(5 marks)**

- b) (i) Evaluate:

$$\log 5 - \frac{\log 125 + 1}{2 \log 25} \log 625$$

(5 marks)

- (ii) Factorize $x^3 - 7x - 6$ and use it to solve the cubic equation $x^3 - 7x - 6 = 0$ **(5 marks)**

Question Four

$$\cos A = \frac{15}{17}$$

- a) If find $\sin A$ and then A in fraction form **(8 marks)**

- b) Solve the triangle DEF and find its area given that $EF = 35m$, $DE = 25M$ and $\angle E = 64^\circ$ **(12 marks)**

Question Five

$$\left(\frac{1}{6}\right)^{-3x-2} = 36^{x+1}$$

- a) Solve **(2 marks)**

$$\begin{aligned} 10x - 3y &= 5 \\ -2x - 4y &= 7 \end{aligned}$$

- b) Solve **(5 marks)**

- c) Calculate the (i) lateral area
 (ii) Surface area
 (ii) Volume of the truncated square pyramid whose large base edge is 24, smaller base edge is 14cm and whose lateral edge is 13cm **(8 marks)**