TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND PHYSICS

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ARCHITECTURE,

DIPLOMA IN BUILDING AND CIVIL ENGINEERING,

DIPLOMA IN QUANTITY SURVEYING

DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING

AMA2150: ENGINEERING MATHEMATICS I

END OF SEMESTER EXAMINATION

TIME: 2 HOURS

DATE: DECEMBER 2016

Instructions to Candidates
You should have the following for this examination
-***Answer Booklet, examination pass and student ID***
This paper consists of FIVE questions. Attempt: QUESTION **ONE** in section A and any other **TWO** in section B
Do not write on the question paper.

Question One (Compulsory)

a) Define the following terms as used in mathematics (1mk)

(i) Sequence. (1mk)

(ii) The 4^{th} term of an arithmetic progression is 22 and the 7^{th} term is 40. Determine the first term, the common difference and hence the sum of the first 12 terms: (5 mks)

b) Simplify the following

i. j^{42} (1mk)

ii. j^{12} (1mk)

iii. j^{7} (1mk)

iv. j^{2} (1mk)

c) Obtain an expansion of $\cos 4\theta$ in terms of $\cos \theta$ (5mks)

d) Show that $e^{j\theta} = \cos \theta + j \sin \theta$ (5mks)

e) Solve for x in the following equation. $7(14.3^{x+5}) x\ 6.4^{2x} = 294$ (5mks)

f) Use laws of indices to simplify the following $\frac{6x^{-4} \times 2x^{3}}{8x^{-3}}$ (3mks)

g) Name the 2 parts that make a complex number (2mks)

Question Two

a) Solve for the unknown in the equation below

$\log_3 16 + 2\log_3 x = \log_3 64$ (3mks)

b) Transpose the formula below to make R the subject $\frac{R}{r} =$

c) Show that $\sin^2 x + \cos^2 x = 1$ and hence derive subsequent trigonometric identities. (8mks)

d) For the series below determine U_{10} and S_{10}

$2 + 8 + 14 + 20 + \ldots..$ (4mks)

Question Three

a) Given that $\log_a N = n$ and $\log_b N = m$.

Show that $\log_b N = \frac{\log_a N}{\log_a. b}$ and hence find $\log_5 96$ (6mrks)

b) Simplify the equation below

$E = (5X^2 Y^{-3/2} Z^{1/4})^2 X (4X^4 Y\ {}^2Z)^{-1/2}$ (4mks)

c) Find the 3 cube roots of $z = 5(\cos 225^0 + j \sin 225^0)$ (3mks)

d) Determine the following anti logarithms to the stated base

e) Antilog 3.2684 (base 10) (1mk)

f) Antilog 4.3157 (base 10) (1mk)

g) Antilog 2.8623 (base e) (1mk)

h) Antilog 2.4572 (base 6) (1mk)

i) Solve for the unknowns in the equation below $(a + b) + j(a-b) = 7 + j2$ (3mks)

Question Four

a) Express $e^{j\pi/}4$ in Cartesian forum (3mks)

b) Find an expansions for $\sin^4 \theta$ (5mks)

c) Show that the sum of n terms of an arithmetic series given by

$s_n = \frac{n}{2}(2a + (n - 1)d)$ (5mks)

Insert three arithmetic means below 12 and 26 (4mks)

d) Give any 3 laws of indices. (3mks)

Question Five

a) Express the following in form given in the brackets.

(i) $5 + j4$ (polar form) (3mks)

(i)3 300^0 (Cartesian form) (3mks)

b) Show that the following equation holds $\log_2 x + \log_3 x + \log_4 x = 7.079 \log_{10} x$ (3mks)

c) If the 5th term of the geometric progression is 162 and the 8th term is 4374, find the series. (5mks)

d) Find the sum of the series (4mks)

e) Express the following in log form:

i. f =

tum