TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN NAUTICAL SCIENCES

AMA2113 : MATHEMATICS 1

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 9 May 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 (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

a) Evaluate 7/6 of (3 1/2 - 2 1/4) + 5 1/8 ÷ 3/16 - 1/2 (3 marks)

b) Three people, P, Q and R contribute to a fund. P provides 3/5 of the total, Q provides 2/3 of the remainder, and R provides £8. Determine

(i) The total of the fund (3 marks)

(ii) The contributions of P and Q (2 marks)

c) Evaluate $\dfrac{4^{1.5}\times 8^{1/3}}{2^{2}\times 32^{-2/5}}$ (3marks)

d) (i) Resolve the acceleration vector of 17m/s2 at an angle of 120◦ to the horizontal into a horizontal and a vertical component and represent the components in a diagram (4marks)

(ii) A force of 4N is included at an angle of 45◦ to a second force of 7N, both forces acting at a point. Find the magnitude of the resultant of these two forces and the direction of the resultant with respect to the 7N force by both the 'triangle' and the 'parallelogram' methods (6 marks)

(iii) Calculate the resultant force of the two forces in ii above (5 marks)

e) Three numbers are in arithmetic progression. Their sum is 15 and their product is 80. Determine the three numbers (4 marks)

Question TWO

a) Solve triangle XYZ given $\angle X=90\circ$, $\angle Y=23\circ 17$ and YZ=20.0mm and determine its area (5 marks)

b) The angle of depression of a ship viewed at a particular instant from the top of a 75m vertical cliff is $30\circ$. Find the distance of the ship from the base of the cliff at this instant. The ship is sailing away from the cliff at constant speed and 1 minute later its angle of depression from the top of the cliff is $20\circ$. Determine the speed of the ship in km/h (6 marks)

c) Solve the equation $\cos^{-1}(-0.2348)=\alpha$ for angles of α between 0° and 360^{o} (4 marks)

Question THREE

The data given below refer to the gain of each of a batch of 40 transistors, expressed correct to the nearest whole number

81 83 87 74 76 89 82 84 86 76 77 71 86 85 87 88 84 81 80 81 73 89 82 79 81 79 78 80 85 77 84 78 83 79 80 83 82 79 80 77

a) Form a frequency distribution for these data having seven classes (3 marks)
b) Plot a histogram to represent the data (5 marks)
c) On the histogram, plot a frequency distribution polygon (2 marks)
d) Calculate the variance for the data (3 marks)
e) Calculate the standard deviation for the data (2 marks)

Question FOUR

a) Determine the angle, in degrees and minutes, subtended at the centre of a circle of diameter 42mm by an arc of length 36mm. Calculate also the area of the minor sector formed (5 marks)
b) State any five properties of a circle (5 marks)
c) An aircraft leaves airport P (50^{o} N,5^{o} W) and flies due west for 2400km to point Q, then 1500km due south to point R. Find the positions of points Q and R given that the radius of the earth is 6370km. (5 marks)

Question FIVE

a) Determine the inverse of $\begin{pmatrix} 3 & -2 \\ 7 & 4 \end{pmatrix}$ (3 marks)

b) Use matrices to solve the simultaneous equations: $3x+5y-7=0$ (6 marks)
$4x-3y-19=0$

c) If £100 is invested at compound interest of 8% per annum, determine
(i) the value after 10 years (4 marks)
(ii) the time, correct to the nearest year, it takes to reach more than £300 (2 marks)