Pwani University College

A Constituent College of Kenyatta University

UNIVERSITY EXAMINATIONS 2012/2013 ACADEMIC YEAR

1st YEAR EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE, BACHELOR OF EDUCATION SCIENCE AND BACHELOR OF ARTS

COURSE CODE/TITLE: SMA 103: ANALYTICAL GEOMETRY

END OF SEMESTER: I DURATION: 3 HOURS

DAY/TIME: WEDNESDAY 9.00 TO 12.00NOON DATE: 5.12.2012 (LTN)

INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO

QUESTION ONE (COMPULSORY) [40 MARKS]

a) A curve has the equation $x = \frac{\sqrt{144-16y^2}}{3}$. Find the equation of a tangent and the normal to this curve at $(2, \frac{3\sqrt{3}}{2})$ [10 marks]

b) A line L1 whose gradient is $\frac{3}{2}$ passes through the point of intersection of the lines L2 and L3 whose equations are y+2x =5 and 3x=10-4y respectively. Find the equation and the intercepts of L1 [5 marks]

c) Given the equation M-lc = kc^2 + z where k,l and z are constants, find an expression of the gradient of the normal to this curve. [4 marks]

d) A given curve has the equation $\frac{2x^2}{15+x-2y^2}+\frac{4y}{15+x-2y^2}=1$. Find the equation of the tangent and the normal at the point (3,0) [9 marks]

e) Find the coordinates (x,y,z) which satisfies the system of equation x+2y +z = 4, 2x-y-z = 0 and 2x-2y + z = 1 [4 marks]

f) Given that $A=\frac{2i^2-3i+4i^3}{2i^5-3i-2i^2}$ find i) $|A|$ and ii) $\arg A$ [8 marks]

QUESTION TWO [15 MARKS]

a) Define the terms positive and negative correlation. Use diagrams for illustrations.[4 marks]

b) Research has found out that as you increase your walking speed in (metres per second), speeds and you also increase the length of your step (in metres).The table below gives the average walking speeds and step lengths for several people. Approximate the best fitting line for the data using the least squares method [11 marks]

Speed	0.8	0.85	0.9	1.3	1.4	1.6	1.75	1.9	2.15	2.5	2.8
Step	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.05

3.1	3.3	3.35	3.4
1.25	1.15	1.2	1.2

QUESTION THREE [15 MARKS]

a) Show that the general equation of an ellipse with horizontal major axis is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ [8 marks]

b) Show that the area of an ellipse is given by $A=\pi ab$ [7 marks]

QUESTION FOUR [15 MARKS]

a) If θ and β are the roots of the equation $ax^2+bx+c=0$ find an expression in terms of a, b and c of

i) The sum of the roots of the equation

ii) The products of the roots of the equation [3marks]

b) Using the results in (a) above answer (i) and (ii) below

i) If the roots of the equation $4x^2 - 6x+1 = 0$ are θ and β, find the values of θ^3 and β^3 and find the equation whose roots are $(\theta+\frac{1}{\beta})$ and $(\beta+\frac{1}{\theta})$ [8 marks]

ii) If θ and β are the roots of the equation $ax^2+bx+c=0$ find the values of $(1-\theta^3)(1-\beta^3)$ [2 marks]

c) Write the polar form of the complex number $\frac{3-i^2+2i^5-2}{-2i^3+3i^2}$ [2 marks]