UNIVERSITY EXAMINATIONS: 2014/2015

ORDINARY EXAMINATION FOR THE BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

BIT 1110 MATHEMATICS FOR SCIENCE

DATE: APRIL, 2015 **TIME: 2 HOURS**

INSTRUCTIONS: Answer Question ONE and any other TWO

QUESTION ONE (30 MARKS)

a) i) Differentiate clearly *Rational* and *Irrational* numbers (2 marks)

ii). State whether the number $5+\sqrt{7}$ is rational or irrational. Justify your answer. (2 marks)

b) Express in standard form and rationalize $\frac{1+\cos 30^0}{1-\cos 30^0}$ (4 mark)

c) Simplify $\frac{36a^2b\times 9ab^2}{9a^2b}$ (3 marks)

d) Solve the equation $\log_3(x+2)+2\log_3 9=3$ (3 marks)

e) Use series to express the repeated decimal into a fraction $7.\overline{56}$ (5 marks)

f) If $f(x)=ax^4+bx^3-x^2+2x+3$ has a remainder 11 when divided by $(x-2)$ and has a Remainder 2 when divided by $(x+1)$.Find the values of a and b (6 marks)

g) The roots of the equation $2x^2+10x-5=0$ are α and β.Find an equation whose roots are $\frac{4}{\alpha}$ and $\frac{4}{\beta}$. (5 marks)

QUESTION TWO (20 MARKS

a) i) State the remainder theorem and factor theorem (2 marks)

ii. Given that $f(x)=3x^3-11x^2-19x-5$.Find the remainder when $f(x)$ is divided by $(x+1)$, using long division. Is $(x+1)$ a factor of $f(x)$? (5 marks)

ii) Solve the equation $3x^3-11x^2-19x-5=0$ (5 marks)

b) Given the function $f(x)=5x^2-12x+25$

i) Express $f(x)$ in standard form (5 marks)

ii) State the minimum value , vertex, and line of symmetry of $f(x)$ (3 marks)

QUESTION THREE (20 MARKS)

a) i) State the difference between a sequence and a series (2 marks)

ii) The 12^{th} term of an arithmetic progression is 32 and the 5^{th} term is 18.Find the 30^{th} term and the sum of the first 30 terms. (6 marks)

b) John was recently employed by a company with annual salary of Ksh 20,000. Salary scheme entails an annual salary increase of Ksh. 5,000 at the end of each year of service. Find

i) The salary earned by John during his 40^{th} year (3 marks)

ii) The total salary earned by John during 40 years of employment. (4 marks)

c) The roots of the equation $x^2-12x-8=0$ are α and β.Find the values of α^2-5 and β^2-5. (5 marks)

QUESTION FOUR (20 MARKS)

a) i) Define permutation and combinations of r objects from n objects (2 marks)

ii) In how many ways can the five letters word be formed from the letters of the word BESIOGU? (3 marks)

iii) In how many ways can a customer at the super market select 3 different types of soda from 30 available types, and 10 different packets of biscuits from 12 different available packets? (3 marks)

b) Find the binomial expansion for $(1+x)^{1/2}$ up to and including x^3.By substituting 0.08 for x in $(1+x)^{1/2}$ and its expansion, find $\sqrt{3}$ correct to 4 decimal place. (6 marks)

c) Solve the equation for values of θ from 0^0 to 360^0 inclusive

$4\cot^2\theta + 39 = 24\operatorname{cosec}\theta$ (6 marks)

QUESTION FIVE (20 MARKS)

a) Eliminate θ from the following equations

$x = a\sec\theta, y = b\tan\theta$ (4 marks)

b) If $\sin A = \frac{3}{5}, Sin B = \frac{5}{13}$, where A and B are acute angles, find the value of $\cos(A+B)$ without using tables or calculator. (5 marks)

c) Prove that $\cos 3A = 4\cos^3 A - 3\cos A$ (5 marks)

d) $\log_3 x - 4\log_x 5 + 3 = 0$ (6 marks)