INTERSECONDARY SCHOOLS EXAMINATION SERIES
ISESE
FORM SIX MONTHLY TEST AUGUST
ADVANCED MATHEMATICS 1

142/1

Time: 3 Hours

INSTRUCTIONS

1. This paper consists o**f ten (10)** questions

2. Answer **ALL** questions.

3. Each question carries **ten (10)** marks

4. All necessary working and answers of each question must be shown clearly

5. Mathematical tables and non-programmable calculators may be used

6. Cellular phones and any other unauthorized materials are not allowed in the examination room.

1. By using a non-Programmable calculator, evaluate the following "give your answers correct to six decimal places.

(a) $\frac{\mathrm{d}}{\mathrm{dx}}\left[\frac{\mathrm{e}^{\mathrm{x}}\sin\left(\mathrm{x}^2+2\mathrm{x}+1\right)}{(\mathrm{x}+1)^2\ln(2\mathrm{x})}\right]$ when $\mathrm{x}=1$

(b) $arg\left\{\frac{(2+i)\left(1-i\sqrt{3}\right)^4}{(3+4i)^2}\right\}$

(c) $\frac{e^{3.75}\ln\left[2+\frac{\sin\left(3\pi/4\right)}{0.456}\right]}{\cos 65.7}$

2.(a)(i) By using the definition of hyperbolic functions, Prove that

$$\mathrm{Sinh}\,(A+B)=\ \sinh A\cosh B+\ \cosh A\sinh B$$

(ii) Prove that $\cosh^2\mathrm{x}\sin^2\mathrm{x}-\ \sinh^2\mathrm{x}\cos^2\mathrm{x}=\ \frac{1}{2}\{1-\cosh 2\mathrm{x}\cos 2\mathrm{x}\}$

(b)(i) Prove that $\frac{d}{dx}\left[\tanh^{-1}\left\{\sqrt{\frac{\cosh x-1}{\cosh x-1}}\right\}\right]=\ 1/2$

(ii) By using hyperbolic substitution prove that $\int_1^2\frac{1}{(\mathrm{x}+1)\sqrt{\mathrm{x}^2-1}}\mathrm{dx}=\ \frac{1}{\sqrt{3}}$

3.(a) List four applications of Linear programming

(b) You are taking a test in which questions of type A are worth 15 points and type B are worth 20 points. It takes 27 minutes for each question of type A and 36 minutes for each question of type B. The total time available is 3 hours, and you cannot answer more than 6 questions. Assuming all your answers are correct and that at least one question of each type is answered; how many questions of each type should you answer in order to get the best score?

4.(a) Show that the mean $\overline{X}$ of a list of data X_i and corresponding frequency f_i is given by $\overline{X}=A+\frac{\sum f_i d_i}{\sum f_i}$ where A is the assumed mean and d_i is the deviation from the mean.

(b) The scores of 100 students at a certain Primary School are given below

Score(%)	97.5-102.5	92.5-97.5	87.5-92.5	82.5-87.5	77.5-82.5	72.5-77.5	67.5-72.5	62.5-67.5
Frequency	5	9	17	26	22	10	7	4

(i) Determine the mean and median score
(ii) Calculate the 70th percentile of the data

5.(a) By using laws of algebra of sets prove that:

(i) $A \cap B' = \emptyset \; if \; A \subset B$

(ii) $\left[A \cup \left(A' \cap B\right)\right] \cap [(A \cap B) \cup (A - B)] = A$

(b) In a class of 50 students, 30 are boys and 20 are girls. 12 students in the class like both sets and algebra and 5 of the boys like sets only. 2 girls like both sets and algebra and 25 of the boys like at least one topic. 32 students like algebra and 3 of the girls did not like any of the two topics;

(i) How many students like sets?
(ii) How many of the boys did not like any of the topics?

6.(a) The function f(x) and g(x) are defined by $f(x) = 2x^2+1$ and g(x)=3x-2,

(i) Find the function fog(x) and gof(x)
(ii) Determine $(gof)^{-1}(x)$ and sketch its graph

(b) Draw the graph of $h(x) = \frac{5x+1}{x-3}$ and state its domain and range

7.(a) State Taylor's theorem and use it to derive Newton's Raphson formula.

(b) Verify that the equation x^2 -2x-1=0 has a root lying between X= 2 and X=3 and then apply the secant formula (method) to solve the equation. Perform three iterations and give your answer correct to four decimal places.

(c) Evaluate $\int_0^1 \sqrt{x} \cos x \, dx$ to four decimal places by Simpson's rule. Make use of five ordinates.

8.(a) Show that the angle θ between the lines $y = mx_1 + C_1$ and $y = m_2x + C_2$ is given by

$$\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2}$$

(i) Find the acute angle between the lines 4x-3y-5=0 and 2x+y=1

(b)(i) Find the shortest distance from the point (6,8) to the line 4y+5x =12

(ii) Find the equation of the Circle Concentric with the circle $x^2 + y^2$-4x+6y-3=0 and tangent to the line 3x-4y+7=0

9.(a) Solve the following integral $\int \frac{2x-1}{x^2-8x+15} dx$

(b) Evaluate the following integral $\int_1^3 \frac{\ln x}{\sqrt{x}} dx$

(c) Evaluate the area bounded by the Curve x=2-y-y^2 and the y-axis

10.(a) If u and v are functions of x, prove that $\frac{d\left(\frac{u}{V}\right)}{dx} = \frac{V\frac{du}{dx} - u\frac{dv}{dx}}{V^2}$

(b) Find dy/dx if

(i) $y = log_3 (x^2 + 2x + 1)$

(ii) $y = \frac{cos\, 3x + cos\, x}{sin\, 3x - sin\, x}$

(d) Apply differentiation techniques to evaluate $\sqrt{627}$

KWA MAHITAJI YA

1. MONTHLY TEST ZA ADVANCE KWA MASOMO YOTE

2. SERIES ZA ADVANCE ZA KILA SOMO

3. SERIES ZA O'LEVEL ZA KILA SOMO

WASILIANA NASI KWA NAMBA 0624 254 757

N.B

PIA U.B.N COOPERATION KWA KUSHIRIKIANA NA ISESE TUNAWAKARIBISHA WAKUU WA SHULE NA WATAALUMA KUJIUNGA KATIKA GROUP LETU LA MONTHLY TEST AMBALO UTAPATA MITIHANI YA ADVANCE YA KILA MWEZI PAMOJA NA MARKING ZAKE KWA GHARAMA YA TSH 100,000 (KWA MIEZI MITATU) NA TSH 150,000 (KWA MIEZI SITA)

KARIBUNI SANA