UGANDA INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
END OF SEMESTER ONE EXAMINATIONS

ACADEMIC YEAR 2024/2025

DEPARTMENT: ICT

SEMESTER: ONE

PROGRAMME(S): HIGHER EDUCATION CERTIFICATE - ENGINEERING

YEAR OF STUDY: ONE

COURSE: FOUNDATIONAL MATHEMATICS

COURSE CODE : HECE111

DATE: THURSDAY 12TH, DECEMBER 2024

TIME: 2:00 PM – 5:00 PM

DURATION: 3 HOURS

INSTRUCTIONS:

(i) This paper contains two Sections: A (40 marks) & B (60 marks).

(ii) Attempt ALL questions in Section A, and ONLY THREE questions in Section B.

(iii) All questions in Section B carry equal marks.

(iv) Credit will be given for use of relevant examples and illustrations.

(v) Begin each number in Section B on a new page of the answer sheet.

(vi) DO NOT write on this question paper.

SECTION A (40 MARKS)

Attempt **ALL** the Questions in this Section.

1. Given that $\tan\alpha = \frac{15}{8}$, Find; a) $\sin\alpha$ b) $\cos\alpha$ c) $\frac{\sin\alpha+\cos\alpha}{\tan\alpha}$ **(4 Marks)**

2. The sum of the second term and fourth term of an A.P is 15, and the sum of fifth and sixth terms is 25. Find the first term and common difference. **(4 Marks)**

3. The twenty-first of an A.P is $5\frac{1}{2}$, and the sum of the first twenty-one terms is $94\frac{1}{2}$.
   Find the first term, **a** the common difference, **d** and the sum of the first thirty terms, n. **(4 Marks)**

4. Given that, $Cos\theta = \frac{-3}{9}$ for $0^0 \le \theta \le 180^0$;
   Find a) $3\cos\theta + 5\sin\theta$ b) $2\sin\theta - \cos\theta$ **(4 Marks)**

5. Evaluate; **(3 Marks @)**

a) $\frac{y}{5} + \frac{7}{20} = \frac{5-y}{4}$ b) $\frac{x}{4} - \frac{x+6}{5} = \frac{x+3}{2}$ c) $\frac{2}{a-3} = \frac{3}{2a+1}$

6. Define $\frac{dy}{dx}$; $4x^2 + 3y^2 = 14$ **(4 Marks)**

7. Given that $f(x) = x^2$ and $g(x) = (x-1)$; Determine $fg(-1)$ **(3 Marks)**

8. The number of letters delivered to the Twenty-Six houses on a street was as follows;

No of letters	No of houses
0 - 2	10
3 - 4	8
5 - 7	5
8 - 12	3

   Using assumed mean of 6. Find the actual mean of the houses according to the distribution of the numbers. **(4 Marks)**

9. Solve; $\int \frac{1}{(t+4)(t-1)}dt$ **(4 Marks)**

SECTION B [60 MARKS]

Attempt **ONLY THREE** questions in this section.

Question 1

a) Define, $\frac{dy}{dx}, \frac{d^2y}{dx^2}$; For $y = \frac{t}{t+3}$ and $x = \frac{t}{(2\,t-1)}$ **(6 Marks)**

b) Find the co-ordinates of the stationary points of the curve $2x^3 - 2x^2 - 6$; State the nature of the stationary points. **(5 Marks)**

c) A particle is moving in a straight line and its distance, S in meters from a fixed, pt in the line after, t seconds is given by the equation;

$$s = 12t - 15t^2 + 4t^3$$

Find the velocity and acceleration after 3 seconds. **(5 Marks)**

d) $y = (x+1)^2(x^2-1)$; Define $\frac{dy}{dx}$ **(4 Marks)**

Question 2

a) Solve the following: **(3 Marks @)**

$$\int_0^5 x^3\sqrt{(x^4+1)}dx \qquad \int_1^3 \frac{1}{(1+2x)}dx \qquad \int_1^3 (9+x)^2\,dx$$

b) Find the volume of the solids generated by rotating about the x-axis, each bonded by, $x + 2y - 12 = 0, x = 0, y = 0$ and $y = \sqrt{x}$, $y = 0, x = 2$ **(4 Marks)**

c) Solve the following using Partial Fractions;

$$\int \frac{4x+1}{x^2 - x - 2}$$ **(4 Marks)**

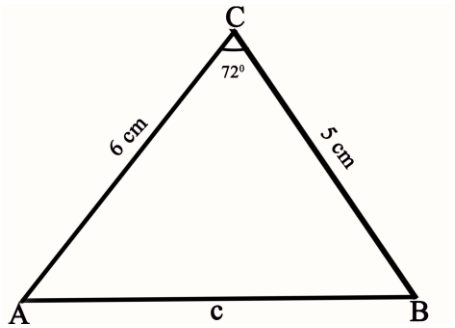
d) Find the volume of the area enclosed by: $y = 2x^2 + 1$ to the y-axis, y = 2, y = 5. **(3 Marks)**

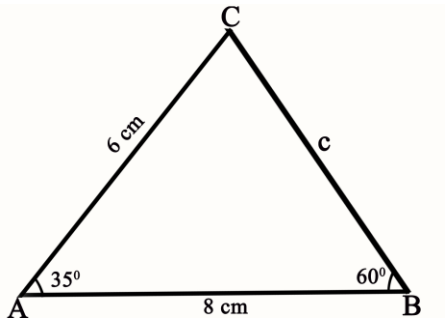
Question 3

a) Given that, $\sin\theta = \frac{-3}{4}$ for $0^0 \le \theta \le 290^0$;

$7\tan\theta + 2\cos\theta$ and $3\tan\theta - \cos\theta$ **(5 Marks)**

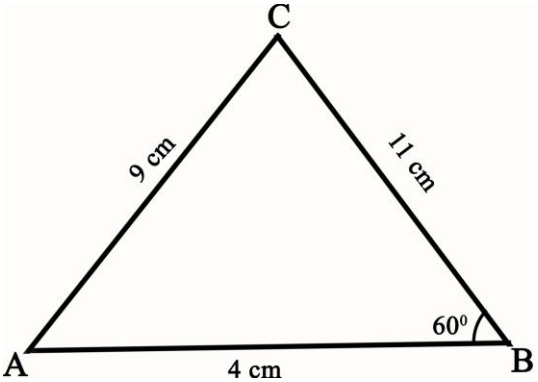
b) In the triangles below, determine the length of the side, AB, c?





(6 Marks)

c) Consider the triangle below and determine its Area, A; **(3 Marks)**



d) Find their equivalent; **(2 Marks @)**

$\frac{Sin120 + Sin240}{\tan 120 + \tan 280}$ $\frac{\cos -120 + \cos 300}{\tan 260 + \tan -100}$ $\frac{Sin-45 + Sin135}{Cos-30 + Cos-135}$

Question 4

a) Andre has more money than Bob. If Andre gave Bob 2,000 Ugx, they would have the same amount. While if Bob gave Andre 2,200 Ugx, Andre would then have twice as much as Bob. How much does each one actually have? **(7 Marks)**

b) Solve the equation;

$$x + y = 1$$

$$x^2 - xy + y^2 = 7$$ **(8 Marks)**

c) 1000 tickets were sold. Adult tickets cost 850 Ugx, children's cost 450 Ugx, and a total of 10,000 Ugx was collected. How many tickets of each kind were sold? **(5 Marks)**

Question 5

a) Shown below are marks obtained by 50 students in a certain S1 mathematics exam;

25	30	29	60	72	59	40	40	62	70
40	39	62	65	40	59	39	43	80	21
58	29	19	25	30	32	56	59	40	55
69	90	81	50	31	45	60	20	51	49
31	30	56	58	50	50	50	60	40	70

Construct a grouped frequency table having class intervals of 10 marks starting with 15 – 24 class **(4 Marks)**

b) Determine the Mean? **(3 Marks)**

c) Using Assumed Mean of 51.3, Find the Actual Mean? **(5 Marks)**

d) Variance? **(4 Marks)**

e) Determine the Standard Deviation? **(2 Marks)**

f) 8^{th} Decil **(2 Marks)**