INFORMATION AND COMMUNICATIONS UNIVERSITY

SCHOOL OF ENGINEERING
DEPARTMENT OF INFORMATION COMMUNICATION & TECHNOLOGY

ICE0122: HIGHER MATHEMATICS 2

END OF SEMESTER EXAMINATION

JUNE 2023

Time allowed: 3 HOURS plus 5minutes reading time:

Instructions to Candidates:

1. **Check that you have the correct examination paper in front of you.**
2. **Answer all questions in SECTION A and ANY OTHER TWO (2) questions from SECTION B.**
3. **All questions must be answered in the answer booklet only.**
4. **Write down the number of questions that you have answered on the cover of the examination answer booklet.**
5. **Non-Programmable Electronic Calculators are allowed**
6. **No books, files or other mechanical / electronic aids are permitted.**
7. **There shall be no form of communication between students during the examination. Any students caught doing this will be disqualified.**
8. **Write down your PARTICULARS clearly on the examination answer booklet.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

SECTION A: Compulsory (AP & GP)

QUESTION 1

a) The income of a person is K30, 000, in the first year and he receives an increase of K1, 000 to his income per year for the next 19 years. Find the total amount, he received in 20 years. **[8 Marks]**

b) At the end of each year the value of a certain machine has depreciated by 20% of its value at the beginning of that year. If its initial value was $1250, find the value at the end of 5 years. **[8 Marks]**

c) A person has 2 parents, 4 grandparents, 8 great grandparents, and so on. Find the number of his ancestors during the ten generations preceding his own. **[9 Marks]**

[Total 25 Marks]

QUESTION 2

a) *i) Find* $\frac{dy}{dx}$, *given that* $y = x^2Secx + 3Cosx$

ii) Find $\frac{dy}{dx}$, *given that* $y = x^2Secx3Cos3x$

iii)Find $\frac{dy}{dx}$, *given that* $y = \frac{\cos x}{1-\sin x}$ **[3*5 Marks]**

b)

Find the integral of i) $\int \frac{9x^2}{x^3-4}$ ii) $\int_1^9 \left(\frac{2x^2+x^2\sqrt{x}-1}{x^2}\right)dx$ **[2*5 Marks]**

[Total 25 Marks]

SECTION B

QUESTION 3

a) *Show that* $(x+1)$*is a factor of* $2x^3 - 9x^2 + 3x + 14$ **[5 Marks]**

b) ***If*** $3x^2 + 2x^2y^2 - \frac{5}{4}y^2 = 0$, ***evaluate***, $\frac{dy}{dx}$ *when* $x = \frac{1}{2}$ *and* $y = 1$ **[10 Marks]**

c) Solve for x in $2^{(2x+1)} - 15(2^x) - 8 = 0$ **[10 Marks]**

[Total 25 Marks]

QUESTION 4

a)

i) Show that $(x+3)$*is a factor of* $x^3 - 3x^2 - 10x + 24$ **[6 Marks]**

ii) *Hence factorise* $x^3 - 3x^2 - 10x + 24$ fully **[7 Marks]**

b) Find the area bounded by the curve $y = 3 + 2x - x^2$ and the x = axis **[7 Marks]**

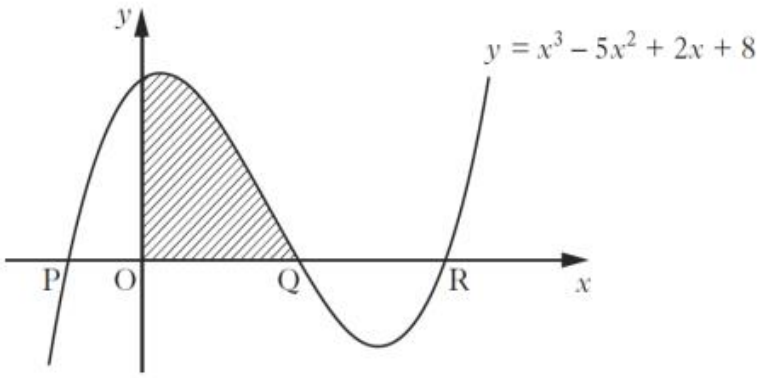
c) *find the derivative of i)* $y = 6cos^3 x$ **[5 Marks]**

[Total 25 Marks]

QUESTION 5

a) *find the derivatives of* $i)\ y = 6tan^3 x \quad ii)\ y = \sin(2x+3)$ **[10 Marks]**

b) The diagram shows the curve with equation $y = x^3 - 5x^2 + 2x + 8$.



The curve crosses the x-axis at P, Q and R. **[15 Marks]**

Determine the shaded area.

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END OF EXAMINATION PAPER

Key:

product rule.

$$\frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$$

$f(x)$	$f'(x)$
$\sin ax$	$a\cos ax$
$\cos ax$	$-a\sin ax$

quotient rule.

$$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

$f(x)$	$\int f(x)dx$
$\sin ax$	$-\frac{1}{a}\cos ax + c$
$\cos ax$	$\frac{1}{a}\sin ax + c$