



INFORMATION AND COMMUNICATIONS UNIVERSITY

**SCHOOL OF ENGINEERING
DEPARTMENT OF INFORMATION COMMUNICATION & TECHNOLOGY**

ICE0122: HIGHER MATHEMATICS 2

END OF SEMESTER EXAMINATION

JUNE 2024

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

SECTION A: Compulsory (AP & GP)

QUESTION 1

a) In a G.P., the 2nd term is 16 and the 5th term is 2. Find the 10th term. [6 Marks]

b) An arithmetic progression has 3 as its first term. Also, the sum of the first 8 terms is twice the sum of the first 5 terms. Find the common difference. [9 Marks]

c) A rabbit has 2 parents, 4 grandparents, 8 great grandparents, and so on. Find the number of its ancestors during the six generations preceding its own. [10 Marks]

[Total 25 Marks]

QUESTION 2

a) i) Find $\frac{dy}{dx}$, given that $y = \cos(2x^3 + 5)$. [2 Marks]

ii) Find $\frac{dy}{dx}$, given that $y = (3x^2 + 5x)^2$. [3 Marks]

iii) Find $\frac{dy}{dx}$, given that $y = \cos x \ln 2x^2$. [5 Marks]

iv) Find $\frac{dy}{dx}$, given that $y = \sec(x)$. [5 Marks]

b)

Evaluate the integrals: i) $\int_3^2 \left(\frac{4y^2-8y}{y}\right) dy$ ii) $\int_0^{\pi/2} (5 \cos(t) - 5 \sin(t)) dt$ [10 Marks]

[Total 25 Marks]

SECTION B: Answer any TWO (2) questions

QUESTION 3

a) Find the intergral of $\int \frac{(10x-20)}{x^2-4x+5} dx$ [5 Marks]

b) If $x^2y^2 + xy^2 = 4x$, evaluate, $\frac{dy}{dx}$ when $x = 1$ and $y = 1$ [7 Marks]

c) i) Given that $y = x^{3x}$ Where ($x > 0$) . Find dy/dx . [7 Marks]

ii) Given that $y = \tan^4 x$, Find $\frac{dy}{dx}$. [6 Marks]

[Total 25 Marks]

QUESTION 4

a)

Evaluate the integral: i) $\int \tan x dx$ ii) $\int_1^2 (3x) dx$ [8 Marks]

b) Determine the area of the region bounded $y = 2x^2 + 10$ and $y = 4x + 16$. [8 Marks]

Evaluate the integral: $\int_0^1 \left(\frac{4x - 6\sqrt[3]{x^2}}{1}\right) dx$

c)

[9 Marks]
[Total 25 Marks]

QUESTION 5

a)

Evaluate $\frac{dy}{dx}$ when $x = -1$, given that $y = (x + 2)^x$ [10 Marks]

b)

The volume of liquid in a tank is given by: $v = \int_{t_1}^{t_2} (qt) dt$

Determine the volume of the chemical, given $q = (5 - 0.05t + 0.003t^2)m^3/s$, $t_1 = 0$ and $t_2 = 16s$. [15 Marks]

[Total 25 Marks]

END OF EXAMINATION PAPER

Key:

product rule.

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

quotient rule.

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

SAMPLE PAPER