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CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE	:	FKD 22302
SUBJECT TITLE	:	MATHEMATICS FOR TECHNOLOGISTS 3
LEVEL	:	DIPLOMA
TIME / DURATION	:	(2 HOURS)
DATE	:	

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. Please write your answers on the answer booklet provided.
4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
5. This question paper consists of TWO (2) sections. Section A and B. Answer all questions in Section A. For Section B, answer two (2) questions only.
6. Answer all questions in English.
7. Fomula is appended.

THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 30 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

If $z = \dfrac{xy}{x+y}$, prove that $x^2 z_x - y^2 z_y = 0.$

(6 marks)

Question 2

Evaluate $\int_0^3 \int_0^{\sqrt{9-x^2}} \int_0^x yz \, dy \, dz dx.$

(6 marks)

Question 3

If position vectors, $\overrightarrow{OP}, \overrightarrow{OQ}, \overrightarrow{OR}$, are defined by

$$\overrightarrow{OP} = \underset{\sim}{i} + 2\underset{\sim}{k}, \quad \overrightarrow{OQ} = 3\underset{\sim}{i} - \underset{\sim}{j} + 6\underset{\sim}{k}, \quad \overrightarrow{OR} = 5\underset{\sim}{i} + 2\underset{\sim}{j} + 4\underset{\sim}{k},$$

determine:

(a) the vector $\overrightarrow{PQ}$, (1.5 marks)

(b) the vector $\overrightarrow{PR}$, (1.5 marks)

(c) the vector product $\overrightarrow{PQ} \times \overrightarrow{PR}$. (2 marks)

Question 4

An experiment can result in one or both events A and B with the probabilities shown below:

	A	A^c
B	0.44	0.14
B^c	0.02	0.40

Find the following probabilities:

(a) P(A) (2 marks)

(b) P(B) (2 marks)

(c) P(A U B) (2 marks)

Question 5

You are given n = 10 measurements: 3, 2, 5, 6, 4, 4, 3, 5, 6, 7.

(a) Calculate the mean. (2 marks)

(b) Find the median. (2 marks)

(c) Determine the mode. (2 marks)

SECTION B (Total: 20 marks)

INSTRUCTION: Answer only TWO questions.

Please use the answer booklet provided.

Question 1

Verify that the function $u = \dfrac{1}{\sqrt{x^2 + y^2 + z^2}}$ is a solution of the three dimensional Laplace equation $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} + \dfrac{\partial^2 u}{\partial z^2} = 0.$

(10 marks)

Question 2

Evaluate the given double integral $\int_0^3 \int_0^1 x\left(x^2 + y\right)^{\frac{1}{2}} \, dxdy.$

(10 marks)

Question 3

Given three points in a plane **A, B** and **C** with coordinates (9, 7, -1), (3, -11, 5) and (5, -5, -1) respectively.

(a) Determine $\overrightarrow{BA}$ and $\overrightarrow{BC}$.

(2 marks)

(b) Determine **COS** $\angle ABC$.

(3 marks)

(c) Determine a unit vector which is perpendicular to a plane containing the points A, B and C.

(5 marks)

Question 4

In a colour preference experiment, eight balls are kept in a box. The balls are of the same size but different in colour. There are 2 red balls and 6 green balls. A student is asked to choose two balls at random without replacement. Calculate the following probabilities:

(a) The first choice is red. (1 mark)

(b) The first choice is green. (1 mark)

(c) The second choice is red. (1 mark)

(d) The second choice is green. (1 mark)

(e) The first choice is red and the second choice is green. (2 marks)

(f) The first choice is green and the second choice is red. (2 marks)

(g) The choice includes a red and a green balls. (2 marks)

Question 5

Given a frequency distribution as follows:

Class Interval	Class Boundary	Frequency	Cumulative Frequency
	9.5 – 19.5		0
	19.5 – 29.5		1
	29.5 – 39.5		7
	39.5 – 49.5		16
	49.5 – 59.5		47
	59.5 – 69.5		89
	69.5 – 79.5		121
	79.5 – 89.5		138
	89.5 – 99.5		148
	99.5 – 109.5		150

Table 1

(a) Copy and complete **Table 1** in the answer booklet.

(5 marks)

(b) For this part of question, use the provided graph paper.
Draw an ogive for the data.

(3 marks)

(c) Based on the ogive, estimate the frequency for the data between 45 and 85.

(2 marks)

END OF QUESTION

Table of Differentiation

Trigonometric Functions - GENERALFORM
$\frac{d}{dx}(\sin f(x)) = \cos f(x) \times f'(x)$
$\frac{d}{dx}(\cos f(x)) = -\sin f(x) \times f'(x)$
$\frac{d}{dx}(\tan f(x)) = \sec^2 f(x) \times f'(x)$
$\frac{d}{dx}(\csc f(x)) = -\csc f(x)\cot f(x) \times f'(x)$
$\frac{d}{dx}(\sec f(x)) = \sec f(x)\tan f(x) \times f'(x)$
$\frac{d}{dx}(\cot f(x)) = -\csc^2 f(x) \times f'(x)$

Exponential Function - GENERALFORM
$\frac{d}{dx}\left(e^{f(x)}\right) = e^{f(x)} \times f'(x)$

Logarithmic Function - GENERALFORM
$\frac{d}{dx}(\ln f(x)) = \frac{f'(x)}{f(x)}$

Table of Integration

Trigonometric Functions - GENERALFORM Where : $f(x)=ax+b$
$\int \cos f(x)\,dx = \frac{\sin f(x)}{f'(x)} + C$
$\int \sin f(x)\,dx = \frac{-\cos f(x)}{f'(x)} + C$
$\int \sec^2 f(x)\,dx = \frac{\tan f(x)}{f'(x)} + C$
$\int \sec f(x)\tan f(x)\,dx = \frac{\sec f(x)}{f'(x)} + C$
$\int \csc f(x)\cot f(x)\,dx = \frac{-\csc f(x)}{f'(x)} + C$
$\int \csc^2 f(x)\,dx = \frac{-\cot f(x)}{f'(x)} + C$

Exponential Function - GENERALFORM Where : $f(x)=ax+b$
$\int e^{f(x)}\,dx = \frac{e^{f(x)}}{f'(x)} + C$

Logarithmic Function - GENERALFORM Where : $f(x)=ax+b$
$\int \frac{1}{f(x)}\,dx = \frac{\ln\lvert f(x)\rvert}{f'(x)} + C$