



**UNIVERSITI KUALA LUMPUR
Malaysia France Institute**

**FINAL EXAMINATION
JULY 2010 SESSION**

SUBJECT CODE : FKD 22302
SUBJECT TITLE : MATHEMATICS FOR TECHNOLOGISTS 3
LEVEL : DIPLOMA
TIME / DURATION : 4.00pm – 6.00pm
(2 HOURS)
DATE : 09 NOVEMBER 2010

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. Please write your answers on the answer booklet provided.
3. Answer should be written in blue or black ink except for sketching, graphic and illustration.
4. 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.
5. Answer all questions in English.
7. Formula is appended.

THERE ARE 5 PAGES OF QUESTIONS AND 2 PAGES OF APPENDIX, EXCLUDING THIS PAGE.

SECTION A (Total: 30 marks)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

A three-dimensional Laplace equation is given as $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} + \frac{\partial^2 f}{\partial z^2} = 0$. Show that

$f(x, y, z) = 2z^2 - 3(x^2 + y^2)z$ satisfies the Laplace equation.

(6 marks)

Question 2

Evaluate I .

$$I = \int_1^2 \int_0^\pi (3 + \sin \theta) d\theta dr$$

(6 marks)

Question 3

Given that A(3, 5, -10), B(-1, -8, 0), C(7, -2, -3) and D(2, 3, 11).

(a) Find \overrightarrow{AB} and \overrightarrow{CD} in terms of $ai + bj + ck$.

(3 marks)

(b) The length of line \overline{AB}

(1.5 marks)

(c) Show that \overrightarrow{AB} and \overrightarrow{CD} is not perpendicular.

(1.5 marks)

Question 4

The following data represents the number of ball bearings sold by a company in 14 consecutive days.

157	133	189	215	208	139	152
167	202	197	124	239	191	169

- (a) Find the mean of this data set. (2 marks)
- (b) Find the median of the data given. (4 marks)

Question 5

Let the sets A, B, C and D be defined as follows:

$$A = \{1, 2, 3, 4, 5, 6\}$$

$$B = \{2, 4, 6, 8\}$$

$$C = \{1, 3, 5, 7\}$$

$$D = \{1, 2, 3\}$$

Find

- (a) $n(A \cap B) = 2, 4$ (2 marks)
- (b) $n(A \cup C) = 1, 2, 3, 4, 5, 6, 7$ (2 marks)
- (c) Consider event B and C . Are they mutually exclusive events?
(Hint: Find the intersection of B and C) (2 marks)

SECTION B (Total: 20 marks)

INSTRUCTION: Answer only TWO questions.

Please use the answer booklet provided.

Question 1

Given $z(x, y) = \ln(2x + 5y)$. Show that the mixed partial derivatives, $\frac{\partial^2 z}{\partial x \partial y}$ and $\frac{\partial^2 z}{\partial y \partial x}$ are equal.

(10 marks)

Question 2

Evaluate the given double integral $\int_0^3 \int_0^1 x(x^2 + y)^{\frac{1}{2}} dx dy$.

(10 marks)

Question 3

If $a = 2i - j - k$, $b = i + j - k$ and $c = -3i - 2j + 5k$. Find

a) $3a + 2b - c$

(3 marks)

b) $a \times b$

(3 marks)

c) Show that $3a \times 2b = 6(a \times b)$

(4 marks)

Question 4

The yearly rainfall (in centimeter²) for a 30-year period is as follows:

42.3	31.7	36.3	37.0	29.5	38.4
34.3	47.6	43.6	41.5	32.4	34.7
43.2	36.8	28.3	32.8	30.7	29.3
35.7	31.2	35.7	41.3	36.2	46.5
35.2	43.0	45.2	43.2	41.3	35.3

- (a) Construct a frequency distribution table for this data by using class width 3 and the first lower class limit is 28. (Hint: Class intervals, class boundaries, frequency must be included)

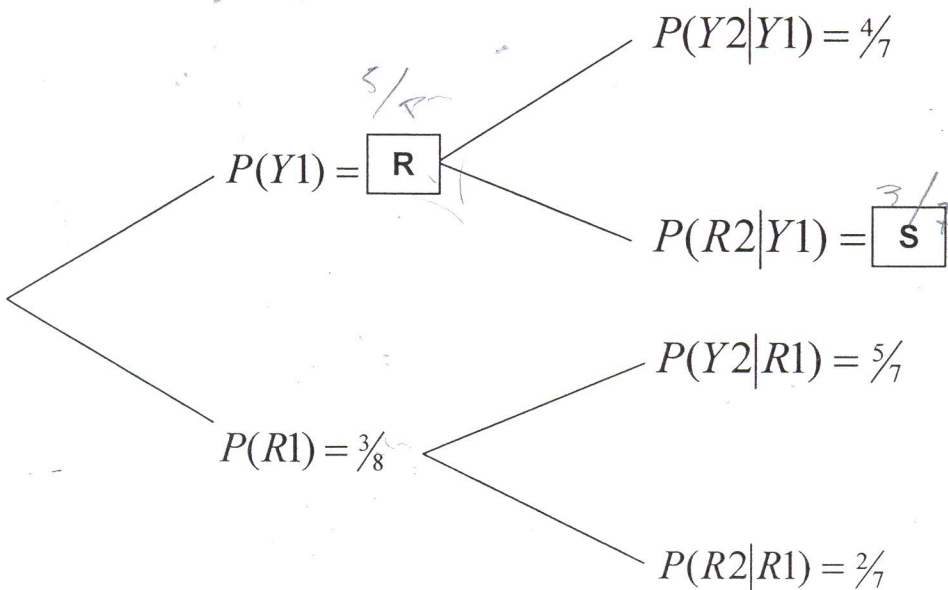
(5 marks)

- (b) On the same scale, draw a histogram and the frequency polygon for these data.

(5 marks)

Question 5

- (a) Consider the tree diagram below. What is the suitable value for **R** and **S**?



(2 marks)

(b) A and B are two events such that $P(A) = 0.4$, $P(B|A) = 0.7$ and $P(A' \cap B) = 0.3$.

Find

(i) $P(A \cap B)$

(2 marks)

(ii) $P(B)$

(2 marks)

(iii) $P(A \cup B)$

(2 marks)

(iv) $P(A|B)$

(2 marks)

$$P(A' \cap B) = 0.3$$

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
$\frac{d}{dx}(e^{f(x)}) = e^{f(x)} \times f'(x)$
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 : $f(x) = ax + b$
$\int \frac{1}{f(x)} dx = \frac{\ln f(x) }{f'(x)} + C$