UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2009/2010

SUBJECT	:	MATHEMATICS I
CODE	:	DSM 1913
COURSE	:	1 DEE / DET / DDM / DDT / 1 DFA / DFT
DATE	:	NOVEMBER 2009
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER ALL QUESTIONS IN **PART A** AND **THREE (3)** QUESTIONS IN **PART B.**

THIS EXAMINATION PAPER CONSISTS OF 7 PAGES

PART A

Q1 (a) A study of air pollution in a chemical based industrial area for a year period, gives the amount of sulfur dioxide (mg/L) in the air as in **Table Q1(a)**.

Table Q1(a): Amount of Sulfur Dioxide

Sulfur Dioxide (mg/L)	**Frequency**
5.0 – 9.0	3
10.0 – 14.0	10
15.0 – 19.0	14
20.0 – 24.0	25
25.0 – 29.0	17
30.0 – 34.0	9
35.0 – 39.0	2

From the data in **Table Q1(a)**, determine the
(i) mean.
(ii) median.
(iii) mode.
(iv) standard deviation.

(13 marks)

(b) A public library employee in a small town reported the number of books borrowed each day over 10 days period as

18 14 12 16 23 14 17 16 20 10

Determine the
(i) range.
(ii) mean.
(iii) standard deviation.
(iv) variance.

(7 marks)

Q2 (a) A fair die is thrown. Find the probability that the number obtained is a prime number or less than 5.

(4 marks)

(b) A box contains a sum of two different colours of tennis balls: 21 green and 17 yellow. Three balls are picked together without looking.

(i) Construct a tree diagram to show the event.

(ii) Calculate the probability to get at least 2 green tennis balls.

(10 marks)

(c) The probability of a student arrives on time for mathematics class is $P(\mathrm{M}) = 0.97$ and the probability he/she arrives on time for chemistry class is $P(\mathrm{C}) = 0.93$. The probability for the student arrives on time during mathematics and chemistry class is $P(\mathrm{M} \cap \mathrm{C}) = 0.89$. Determine the probability that the student

(i) arrives on time for mathematics class, given that he/she arrives on time for chemistry class.

(ii) arrives on time for chemistry class, given that he/she arrives on time for mathematics class.

(6 marks)

PART B

Q3 (a) Solve the given equations.

(i) $5^{2x+1} - 6(5^x) + 1 = 0$

(ii) $\log_x y + \log_y x = \dfrac{5}{2}$

$xy = 64$

(12 marks)

(b) Decompose $\dfrac{2x^2 + 7x + 2}{x(x-1)^2}$ into a partial fraction.

(8 marks)

Q4 (a) Given $f(x) = 7x^2 + 3x - 27$. If $f(x) = 0$, by using secant method, find its root, x, between the interval of [1, 2]. Iterate until $|f(x_i)| < \varepsilon = 0.001$.

(10 marks)

(b) (i) By using Binomial series, expand $\left(\dfrac{1-2x}{1+x}\right)^{\frac{1}{3}}$ until the term of x^3.

(ii) Find $\dfrac{1}{\sqrt[3]{4}}$ by substituting $x = \dfrac{1}{3}$ in (i).

(10 marks)

Q5 (a) Find $\sec\theta$ if $\tan\theta = \dfrac{2}{3}$ and θ is in quadrant III.

(4 marks)

(b) Without using calculator, evaluate $\cos 285°$. Simplify your answer in radical form.

(6 marks)

(c) Given $f(x) = \dfrac{(x-1)}{3}$ and $g(x) = \sqrt{x+3}$, find

(i) $(f \circ g)(6)$.

(ii) $(g \circ f)(6)$.

(5 marks)

(d) The cost C, in thousand of dollars of producing q kg of a chemical is given by $C = f(q) = 100 + 0.2q$. Find

(i) $f^{-1}(200)$.

(ii) $f^{-1}(C)$.

(5 marks)

Q6 (a) Given the raw data for the height of students (in cm) in one of DSM1913 class as in the **Table Q6(a)**.

Table Q6(a): Height of Students

175	178	175	166	166	178	170
175	160	163	166	175	170	163
175	175	163	170	178	166	164
178	163	176	176	178	166	175

(i) Construct a frequency distribution for the ungroup data.
(ii) Determine the mean, mode and median of the data.

(10 marks)

(b) A medical specialist claimed that 70% of H1N1 victims died because of pneumonia and that 25% of the victims suffer "Influenza Light Illness (ILI)". If ILI involved, there is a 55% chance that pneumonia is also involved. Otherwise, the probability is only 12%. If a man who had H1N1 died because of pneumonia, what is the probability that he was also had ILI?

(10 marks)

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Formulae

Arithmetic Sequences	Geometric Sequences	Binomial Theorem
(i) $u_n = a + (n-1)d$ (ii) $d = u_n - u_{n-1}$ (iii) $S_n = \frac{n}{2}(a + u_n)$ (iv) $S_n = \frac{n}{2}[2a + (n-1)d]$	(i) $u_n = ar^{n-1}$ (ii) $r = \frac{u_n}{u_{n-1}}$ (iii) $S_n = \frac{a(1-r^n)}{1-r}$ if $r < 1$ (iv) $S_n = \frac{a(r^n - 1)}{r-1}$ if $r > 1$ (v) $S_\infty = \frac{a}{1-r}$	For any positive integer n $(x+y)^n$ $= \binom{n}{0}(x)^n(y)^0 + \binom{n}{1}(x)^{n-1}(y)^1$ $+ \ldots + \binom{n}{n}(x)^0(y)^n$ where : $\binom{n}{k} = \frac{n!}{k!(n-k)!}$
Binomial Theorem	**Statistics**	**Statistics**
$(1+b)^n = 1 + nb + \frac{n(n-1)!}{2!}b^2 + \frac{n(n-1)(n-2)!}{3!}b^3 + \ldots$ $\lvert b \rvert < 1$, n any real number	**Ungroup Data :** $\bar{x} = \frac{\sum x}{n}$ $\bar{x} = \frac{\sum fx}{\sum f}$ (with frequency table) $m = \begin{cases} X_{\frac{n+1}{2}}, & n \ odd \\ \frac{X_{\frac{n}{2}} + X_{\frac{n+1}{2}}}{2}, & n \ even \end{cases}$ $\sigma = \sqrt{\frac{\sum x^2}{n} - (\bar{x})^2}$ $\sigma^2 = \frac{\sum x^2}{n} - (\bar{x})^2$	**Group Data :** $\bar{x} = \frac{\sum fx}{\sum f}$ $m = L_m + \left(\frac{\frac{\sum f}{2} - F}{f_m}\right)c$ $m_o = L_m + \left(\frac{d_1}{d_1 + d_2}\right)c$ $\sigma = \sqrt{\frac{\sum fx^2}{\sum f} - (\bar{x})^2}$ $\sigma^2 = \frac{\sum fx^2}{\sum f} - (\bar{x})^2$

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Probability	**Probability**	**Trigonometry**
(i) Mutually Not Exclusive $P(A\cup B)$ $=P(A)+P(B)-P(A\cap B)$ (ii) Mutually Exclusive Events $P(A\cup B)=P(A)+P(B)$ (iii) Independent Events $P(A\cap B)=P(A)\times P(B)$ (iv) Conditional Events $P(A\mid B)=\dfrac{P(A\cap B)}{P(B)}$	(v) Bayes Theorem For 3 events A, B and C : $P(A\mid X)=\dfrac{P(A\cap X)}{P(X)}$ $=\dfrac{P(A)\times P(X\mid A)}{\begin{bmatrix}P(A\cap X)+P(B\cap X)+\\P(C\cap X)\end{bmatrix}}$	(i) $\sin^2 x+\cos^2 x=1$ (ii) $\tan^2 x+1=\sec^2 x$ (iii) $1+\cot^2 x=\csc^2 x$ (iv) $\sin(\alpha\pm\beta)$ $=\sin\alpha\cos\beta\pm\cos\alpha\sin\beta$ (v) $\cos(\alpha\pm\beta)$ $=\cos\alpha\cos\beta\mp\sin\alpha\sin\beta$ (vi) $\tan(\alpha\pm\beta)=\dfrac{\tan\alpha\pm\tan\beta}{1\mp\tan\alpha\tan\beta}$