CONFIDENTIAL

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	STATISTICS
COURSE CODE	:	DAS 20502 / DSM 2932
PROGRAMME	:	2 DAE / 2 DAA / 2 DAM
EXAMINATION DATE	:	OCTOBER 2012
DURATION	:	2 HOURS
INSTRUCTIONS	:	ANSWER **ALL** QUESTIONS IN **PART A** AND **TWO (2)** QUESTIONS IN **PART B**

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

PART A

Q1 (a) A restaurant manager claims that the mean waiting time of all customers in his restaurant before being served is at most one minute. A researcher wants to test the manager's claim. He randomly interviewed 50 customers and found a mean waiting time of 1.2 minutes with a standard deviation of 30 seconds. Is the restaurant manager's claim valid at a 1% significance level?

(12 marks)

(b) A yogurt company claimed that its product contained 500 calories per pint (on the average). To test this claim, 24 one-pint containers were analyzed; giving mean is 507 calories inches and a variance of 441 calories inches. Test the claim at 1% level of significance.

(13 marks)

Q2 To reduce crime, the Mayor of Kuala Lumpur has budgeted with more money to put more police on shopping complex. The data for the number of police and number of reported crimes is shown in Table Q2 below:

Table Q2 : Number of reported crimes

Police, x	13	15	23	25	15	10	9	20
No.of reported crimes, y	8	9	12	18	8	6	5	10

(a) Find S_{xx}, S_{yy} , and S_{xy}.

(b) Find $\hat{\beta}_1$ and $\hat{\beta}_0$.

(c) Establish the regression equation for the data.

(d) Calculate the sample correlation coefficient, r and interpret your result.

(e) Estimate the number of reported crimes when there are 19 policemen.

(25 marks)

PART B

Q3 (a) The table Q3a below shows the age of SARS victims for the year 2008.

Table Q3(a) : Age of SARS victims

Age (Years)	Lower boundary	Class midpoint, x	Number of Victims , f	fx	x^2	fx^2	Cumulative frequency
0 – 9			7				
10 – 19			11				
20 – 29			27				
30 – 39			34				
40 – 49			12				
50 – 59			2				

Fill in the table and find below.

(i) Mean
(ii) Median
(iii) Mode
(iv) Variance

(13 marks)

(b) Out of 800 families with 5 children each, how many would you expect to have

(i) At least 3 boys
(ii) All girls
(iii) Either 2 or 3 boys
Assume equal probabilities for boys and girl.

(12 marks)

Q4 (a) Suppose that a random variable X has a discrete distribution with the following probability function

$$f(x)=\begin{cases} cx, & x=1,2,3,4,5 \\ 0, & \text{otherwise} \end{cases}$$

(i) Determine the value of c.
(ii) Find the probability distribution function of X.

(iii) Calculate the mean and variance of X.
(iv) Find $E(2X+4)$ and $Var(3X+7)$

(13 marks)

(b) If the diameters of ball bearings are normally distributed with mean 0.6140 in and standard deviation 0.0025 in, determine the percentage of the ball bearings with diameters

(i) Between 0.610 in and 0618 in inclusive
(ii) Greater than 0.617 in
(iii) Less than 0.608 in
(iv) Equal to 0.615 in

(12 marks)

Q5 (a) The amount of savings of all accounts at a local bank have a normal distribution with its mean equal to RM 10,455 and standard deviation equal to RM 5, 750. Find the probability that the mean amount of savings in a sample of 100 accounts selected from this bank will be

(i) between RM 9,800 and RM 11,800.

(ii) more than the population mean by at least RM 1,200.

(iii) less than the population by at least RM 900.

(13 marks)

(b) The mass, in grams, of a packet of chocolates of a particular brand, follows a normal distribution with mean μ. Ten packets of chocolates are chosen at random and their masses noted. The results, in grams, are

397.3, 399.6, 401.0, 392.9, 396.8, 400.0, 397.6, 392.1, 400.8, 400.6

These can be summarized as follows: $\sum x = 3978.8$, $\sum x^2 = 1583098.3$
Calculate a 95% confidence interval for μ.

(12 marks)

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Formula

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad s = \sqrt{\frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n-1}}$$

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} \qquad M = L_M + c\left[\frac{\frac{n}{2} - F}{f_m}\right] \qquad M_o = L_{M_o} + c\left[\frac{\Delta_a}{\Delta_a + \Delta_b}\right]$$

$$s^2 = \frac{1}{\sum f - 1}\left[\sum_{i=1}^{n} f_i x_i^{\,2} - \frac{\left(\sum f_i x_i\right)^2}{\sum f}\right]$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \qquad P(B \mid A) = \frac{P(B \cap A)}{P(A)}$$

$P(A) + P(A') = 1$

$P(A \cap B) = P(A).P(B)$

$P(A \cup B) = P(A) + P(B)$ mutually exclusive events

$P(A \cap B) = P(A).P(B \mid A)$ - multiplicative rule

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Formula

$$S_{xy}=\sum x_i y_i-\frac{\sum x_i \sum y_i}{n},\ S_{xx}=\sum x_i^2-\frac{\left(\sum x_i\right)^2}{n},\ S_{yy}=\sum y_i^2-\frac{\left(\sum y_i\right)^2}{n},$$

$$r=\frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}},\quad \hat{\beta}_1=\frac{S_{xy}}{S_{xx}},\quad \hat{\beta}_0=\bar{y}-\hat{\beta}_1\bar{x},$$

$$Z=\frac{\bar{x}-\mu}{\sigma/\sqrt{n}},\qquad Z=\frac{\bar{x}-\mu}{s/\sqrt{n}},\qquad T=\frac{\bar{x}-\mu}{s/\sqrt{n}}$$

$$\sum_{i=-\infty}^{\infty} p(x_i)=1,\qquad E(X)=\sum_{\forall x} xp(x),\qquad Var(X)=E(X^2)-[E(X)]^2,$$

$$P(x)=\binom{n}{x}\cdot p^x\cdot(1-p)^{n-x}\quad x=0,1,\ldots,n,\qquad P(X=r)=\frac{e^{-\mu}\cdot\mu^r}{r!}\quad r=0,1,\ldots,\infty,$$

$$X\sim N(\mu,\sigma^2),\ Z\sim N(0,1)\text{ and }Z=\frac{X-\mu}{\sigma},$$

$$\bar{X}\sim N\left(\mu,\frac{\sigma^2}{n}\right),\ Z=\frac{\bar{X}-\mu}{\sigma/\sqrt{n}}\sim N(0,1)$$

$$\bar{x}-z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)<\mu<\bar{x}+z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$$

$$\bar{x}-z_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)<\mu<\bar{x}+z_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$$

$$\bar{x}-t_{\alpha/2,\,v}\left(\frac{s}{\sqrt{n}}\right)<\mu<\bar{x}+t_{\alpha/2,\,v}\left(\frac{s}{\sqrt{n}}\right),\ v=n-1.$$