Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESI 2013/2014

COURSE NAME	:	STATISTICS FOR MANAGEMENT
COURSE CODE	:	BSM 1823
PROGRAMME	:	3 BPA
EXAMINATION DATE	:	DECEMBER 2013/JANUARY 2014
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER ALL QUESTIONS

THIS EXAMINATION PAPER CONSISTS OF **SEVEN (7)** PAGE

Q1 (a) In a high school graduating class of 100 students, 54 studied mathematics, 69 studied history, and 35 studied both mathematics and history. If one of these students is selected at random, find the probability that;

(i) the student took mathematics or history.

(3 marks)

(ii) the student did not take either of these subjects.

(3 marks)

(iii) the student took history but not mathematics.

(3 marks)

(b) The following contingency cross-classifies medical school faculty by the characteristics gender and rank.

Rank	Gender		Total
	Male (G_1)	Female (G_2)	
Professor (R_1)	20,224	3,294	23,518
Associate Professor (R_2)	16,332	5,400	21,732
Assistant Professor (R_3)	25,888	14,491	40,379
Instructor (R_4)	5,775	5,185	10,960
Other (R_5)	881	923	1,804
Total	69,100	29,293	98,393

(i) Find $P(R_3)$.

(3 marks)

(ii) Find $P(R_3 \backslash G_1)$.

(3 marks)

(iii) Are events G_1 and R_3 independent? Explain your answer.

(5 marks)

(iv) For a medical school faculty member, is the event that the person is female independent of the event that the person is an Associate Professor? Explain your answer.

(5 marks)

Q2 (a) According to the Yearly Report at certain country, there is roughly an 80% chance that a person of age 20 years will be alive at age 65 years. Suppose that three people of age 20 years are selected at random. Find the probability that the number alive at age 65 years will be:

(i) exactly one.

(2 marks)

(ii) at most two.

(3 marks)

(iii) at least one.

(3 marks)

(b) The probability that the person of age 25 years will be alive at age 70 years is 0.80. Suppose that 500 people of age 25 years are selected at random. Determine the probability that:

(i) exactly 400 of them will alive at age 70.

(4 marks)

(ii) between 375 and 425 of them, inclusive, will be alive at age 70.

(4 marks)

(c) As reported by certain agency, the average living space for single-family detached home is 1742 sq. ft. Assume a standard deviation of 568 sq.ft.

(i) For a sample of 25 single family detached homes, determine the mean and standard deviation of the variable, $\bar{x}$.

(4 marks)

(ii) Find the probability that the average living space is between 1600 sq. ft and 1750 sq. ft.

(5 marks)

Q3 (a) According to Communication Industry Forecast and Report, the average person watched 4.55 hours of television per day in 2010. A random sample of 20 people gave the following number of hours of television watched per day for year 2011.

1.0	4.6	5.4	3.7	5.2	6.9	5.5	9.0	2.5	3.9
1.7	6.1	1.9	7.6	9.1	2.4	4.7	4.1	6.2	3.7

(Note: $\bar{x} = 4.760$ hours and s = 2.297 hours)

(i) Construct the 98% confidence interval for average person watched television per day. Interpret your results.

(6 marks)

(ii) Construct the 98% confidence interval for variance person watched television per day. Interpret your results.

(6 marks)

(iii) At the 5% significance level, do the data provide sufficient evidence to conclude that the amount of television watched per day year 2011by the average person differed from that in 2010?

(6 marks)

(b) Independent random samples of 126 playa with cropland and 98 playa with wetland in certain places yielded the following summary statistics for the number of native species.

Cropland			Wetland		
$\bar{x}_1$	=	14.06	$\bar{x}_2$	=	15.36
s_1	=	4.83	s_2	=	4.95
n_1	=	126	n_2	=	98

At the 5% significance level, do the data provide sufficient evidence to conclude that the difference exist in the mean number of native species in the two regions?

(7 marks)

Q4 Following are the data on percentage of investments in certain product (x) and tax efficiency (y) for 10 insurance portfolio.

x	3.1	3.2	3.7	4.3	4.0	5.5	6.7	7.4	7.4	10.6
y	98.1	94.7	92.0	89.8	87.5	85.0	82.0	77.8	72.1	53.5

(a) Sketch the graph to show the relationship between percentage of investments in certain product (x) and tax efficiency (y).

(3 marks)

(b) Find the regression equation for the data points and interpret your results.

(8 marks)

(c) Predict the tax efficiency of a mutual fund portfolio with 5.0 of its investments in certain product.

(2 marks)

(d) Compute the coefficient of correlation and interpret the results.

(5 marks)

(e) Compute the coefficient of determination and interpret the results.

(3 marks)

(f) State how useful the regression equation appears to be for making predictions.

(4 marks)

- END OF QUESTION -

FINAL EXAMINATION

SEMESTER / SESSION: SEM I / 2013/2014 COURSE: 3 BPA

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Formulae

Random variables:

$$\sum_{i=-\infty}^{\infty} P(x_i) = 1, \quad E(X) = \sum_{\forall x} x \cdot P(x), \quad E(X^2) = \sum_{\forall x} x^2 \cdot P(x), \quad \int_{-\infty}^{\infty} f(x)\, dx = 1,$$

$$E(X) = \int_{-\infty}^{\infty} x \cdot P(x)\, dx, \quad E(X^2) = \int_{-\infty}^{\infty} x^2 \cdot P(x)\, dx,$$

$$Var(X) = E(X^2) - [E(X)]^2.$$

Special Probability Distributions :

$$P(x = r) = {}^nC_r \cdot p^r \cdot q^{n-r},\ r = 0, 1, \mathrm{K}, n,\ X \sim B(n, p),$$

$$P(X = r) = \frac{e^{-\mu} \cdot \mu^r}{r!},\ r = 0, 1, \ldots, \infty,\ X \sim P_0(\mu),\ Z = \frac{X - \mu}{\sigma},\ Z \sim N(0, 1),$$

$$X \sim N(\mu, \sigma^2).$$

Sampling Distributions :

$$\overline{X} \sim N(\mu, \sigma^2/n),\ Z = \frac{\overline{X} - \mu}{\sigma/\sqrt{n}} \sim N(0, 1),\ T = \frac{\overline{x} - \mu}{s/\sqrt{n}},\ \overline{X}_1 - \overline{X}_2 \sim N\left(\mu_1 - \mu_2, \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right).$$

Estimations :

$$n = \left(\frac{Z_{\alpha/2} \cdot \sigma}{E}\right)^2,\ \left(\bar{x}_1 - \bar{x}_2\right) - Z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + Z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}},$$

$$\left(\bar{x}_1 - \bar{x}_2\right) - Z_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + Z_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}},$$

$$\left(\bar{x}_1 - \bar{x}_2\right) - t_{\alpha/2,v} \cdot S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + t_{\alpha/2,v} \cdot S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

where Pooled estimate of variance, $S_p^2 = \dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$ with $v = n_1 + n_2 - 2$,

$$\left(\bar{x}_1 - \bar{x}_2\right) - t_{\alpha/2,v}\sqrt{\frac{1}{n}\left(s_1^2 + s_2^2\right)} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + t_{\alpha/2,v}\sqrt{\frac{1}{n}\left(s_1^2 + s_2^2\right)} \text{ with } v = 2(n-1),$$

$$\left(\bar{x}_1 - \bar{x}_2\right) - t_{\alpha/2,v}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + t_{\alpha/2,v}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \text{ with}$$

$$v = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}},\quad \frac{(n-1) \cdot s^2}{\chi^2_{\alpha/2,v}} < \sigma^2 < \frac{(n-1) \cdot s^2}{\chi^2_{1-\alpha/2,v}} \text{ with } v = n - 1,$$

$$\frac{s_1^2}{s_2^2} \cdot \frac{1}{f_{\alpha/2}(v_1, v_2)} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{s_1^2}{s_2^2} \cdot f_{\alpha/2}(v_2, v_1) \text{ with } v_1 = n_1 - 1 \text{ and } v_2 = n_2 - 1.$$

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Hypothesis Testing:

$$Z=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}},\quad T=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{S_p\cdot\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}\ \text{with } v=n_1+n_2-2,$$

$$Z=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}},\quad T=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{1}{n}\left(s_1^2+s_2^2\right)}},\quad S_p^2=\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}$$

$$T=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}\ \text{with}\ v=\frac{\left(\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1-1}+\frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2-1}}\ ;\ \chi^2=\frac{(n-1)s^2}{\sigma^2}$$

Simple Linear Regressions :

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

$$\bar{y}=\frac{\sum y}{n},\ \hat{\beta}_1=\frac{S_{xy}}{S_{xx}},\ \hat{\beta}_0=\bar{y}-\hat{\beta}_1\bar{x},\ \hat{y}=\hat{\beta}_0+\hat{\beta}_1x,\ r=\frac{S_{xy}}{\sqrt{S_{xx}\cdot S_{yy}}},$$

$$SSE=S_{yy}-\hat{\beta}_1S_{xy},\ MSE=\frac{SSE}{n-2},\ T=\frac{\hat{\beta}_1-\beta_1^*}{\sqrt{\frac{MSE}{S_{xx}}}}\sim t_{n-2},\ T=\frac{\hat{\beta}_0-\beta_0^*}{\sqrt{MSE\left(\frac{1}{n}+\frac{\bar{x}^2}{S_{xx}}\right)}}\sim t_{n-2}$$

$$w_1+w_2=\frac{(n_1+n_2)(n_1+n_2+1)}{2};\ u_1=w_1-\frac{n_1(n_1+1)}{2};\ u_2=w_2-\frac{n_1(n_1+1)}{2}$$

$$h=\frac{12}{n(n+1)}\sum_{i=1}^{k}\frac{r_i^2}{n_i}-3(n+1);\ r_s=1-6\sum\frac{d_i^2}{n(n^2-1)}$$