CONFIDENTIAL QQP 3013

UNIVERSITI UTARA MALAYSIA

FINAL EXAMINATION
FIRST SEMESTER SESSION 2008/2009

CODE/SUBJECT NAME : QQP 3013 / TEKNIK PEMBUATAN KEPUTUSAN III
DATE : 14 NOVEMBER 2008
TIME : 9.00 – 11.30 A.M (2 ½ HOUR)
VENUE : DTSO

INSTRUCTIONS:
1. This book script contains SIX (6) questions in TWELVE (12) printed pages, excluding the cover page.
2. List of formulae and Statistical Table are provided on pages 11 and 12.
3. Answer ALL questions in the space provided.

MATRIC NO : _____________________________ (in words ) _____________________________ (in digits)
I/C NO : ____________________________________________________________
NAME OF LECTURER : ______________________________________________________
GROUP : ________ TABLE NO: ______

DO NOT OPEN THIS SCRIPT UNTIL YOU ARE TOLD TO DO SO

CONFIDENTIAL
QUESTION 1 (10 MARKS)

a. Fill in the blanks below with appropriate terms.

i. When the ____________ criterion is used, the maximum of the maximum payoffs is observed.

ii. When the ____________ criterion is used, the maximum of the minimum payoffs is observed.

iii. ____________ is the difference between the payoff from the best decision and all other decision payoffs.

(3 marks)

b. Jean Clark is the manager of the Midtown Saveway Grocery Store. She now needs to replenish her supply of strawberries. Her regular supplier can provide as many cases as she wants. However, because these strawberries already are very ripe, she will need to sell them tomorrow and then discard any that remain unsold. Jean estimates that she will be able to sell 10, 11, 12 or 13 cases tomorrow. She can purchase the strawberries $3 per case and sell them for $8 per case. Jean now needs to decide how many cases to purchase. Jean has checked the store’s record on daily sales of strawberries. On this basis, she estimates that the prior probabilities are 0.2, 0.4, 0.3 and 0.1 for being able to sell 10, 11, 12 and 13 cases of strawberries tomorrow.

i. Construct a payoff table for this decision situation (where value in the table is the profit) and determine the amount of cases that should be ordered, based on expected value.

(7 marks)
QUESTION 2 (12 MARKS)

a. For the following two-person, zero-sum game, answer the following question.

<table>
<thead>
<tr>
<th>Player X</th>
<th>Player Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Y1</td>
</tr>
<tr>
<td>X1</td>
<td>4</td>
</tr>
<tr>
<td>X2</td>
<td>3</td>
</tr>
<tr>
<td>X3</td>
<td>8</td>
</tr>
</tbody>
</table>

i. Are there any dominated strategies? If so, eliminate any dominated strategy(ies) and find the value of the game. Determine the optimal strategies for each player.

(5 marks)

ii. Is this a pure or a mixed strategy game? Explain.

(2 marks)

b. Shoe Town and Fancy Foot are both vying for more share of the market. If Shoe Town does no advertising, it will not lose any share of the market if Fancy Foot does nothing. It will lose 2% of the market if Fancy Foot invests $10,000 in advertising, and it will lose 5% of the market if Fancy Foot invests $20,000 in advertising. On the other hand, if Shoe Town invests $15,000 in advertising, it will gain 3% of the market if Fancy Foot does nothing; it will gain 1% of the market if Fancy Foot invests $10,000 in advertising; and it will lose 1% if fancy Foot invests $20,000 in advertising. Develop the payoff table for this problem.

(2 marks)
c. Fill in the blanks below with appropriate terms.

i. Utility assessment assigns the worst outcome a utility of ____________, and the best outcome, a utility of ____________.

ii. When you are ________________, the utility values are equal.

(3 marks)

QUESTION 3 (21 MARKS)

a. The operations manager of the booking services department of Hometown Bank is concerned about a number of wrong customer account numbers recorded by Hometown personnel. Each week a random sample of 2500 deposits is taken, and the number of incorrect account numbers is recorded. The results for the past 12 weeks are shown in the following table.

<table>
<thead>
<tr>
<th>Sample number</th>
<th>Wrong account number</th>
<th>Sample number</th>
<th>Wrong account number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>19</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>19</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

i. Set up 99.7% control charts for the proportion of wrong account number recorded. (6 marks)
ii. Does this process appear to be in control? Plot the control chart and explain.

(8 marks)
b. The Jitra Police Branch monitors accidents at the intersection of Routes Cempaka and Kenanga. Accidents at the intersection have averaged three per month.

i. Which type of control chart should be used? Construct a 99.7% control chart.

(5 marks)

ii. Last month seven accidents occurred at the intersection. Is this sufficient evidence to justify a claim that something has changed at the intersection? Explain.

(2 marks)

QUESTION 4 (19 MARKS)

A bank manager at Country Bank has compiled the following table of transition probabilities for the customers’ use of various bank offices: main office, east branch office and south bank office.

<table>
<thead>
<tr>
<th>This period</th>
<th>Next period</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main</td>
<td>East</td>
<td>South</td>
<td></td>
</tr>
<tr>
<td>Main</td>
<td>0.60</td>
<td>0.10</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>East</td>
<td>0.20</td>
<td>0.70</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>0.25</td>
<td>0.15</td>
<td>0.60</td>
<td></td>
</tr>
</tbody>
</table>

a. Which office tends to have the highest “loyalty”? Why?

(2 marks)
b. What proportion of customers who banked at the Main office this time can be expected to bank at the East office two periods later? Solve using a tree diagram.

(4 marks)

c. Redo question 4 part (b) above using matrix multiplication.

(5 marks)
d. Determine the steady-state probabilities for this problem. (8 marks)
QUESTION 5 (7 MARKS)

Professor Green gives two-month computer programming courses during the summer term. Students must pass a number of exams to pass the course, and each student is given three chances to take the exams. The following states describe the possible situations that could occur:

1. state 1: pass all of the exams and pass the course
2. state 2: do not pass all of the exams by the third attempt and flunk the course
3. state 3: fail an exam in the first attempt
4. state 4: fail an exam in the second attempt

After observing several classes, Professor Green was able to obtain the following matrix of transition probabilities:

\[
P = \begin{pmatrix}
1 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 \\
0.6 & 0 & 0.1 & 0.3 \\
0.3 & 0.3 & 0.2 & 0.2
\end{pmatrix}
\]

At the present time there are 50 students who did not pass all exams on the first attempt, and there are 30 students who did not pass all remaining exams on the second attempt. How many students in these two groups will pass the course and how many will fail the course?
QUESTION 6 (11 MARKS)

a. Fill in the blanks below with appropriate terms.

i. In using dynamic programming to solve a shortest route problem, the entering nodes would be called ________

ii. In dynamic programming terminology, a period or logical subproblem is called ________

(2 marks)

b. i. Leslie Bessler must travel from her hometown to Denver to see her friend Austin. Given the roadmap below, what route(s) will minimize the distance that she travels?

(8 marks)
ii. The road between node 6 and node 9 is no longer in service due to construction. What is the shortest route given this situation?

(1 mark)

END OF QUESTIONS
FORMULAE

1. DECISION ANALYSIS

\[ P(A | B) = \frac{P(A \cap B)}{P(B)} \]

\[ P(A | C) = \frac{P(C | A)P(A)}{P(C | A)P(A) + P(C | B)P(B)} \]

\[ P(A) = P(A | B) \cdot P(B) + P(A | B') \cdot P(B') \]

2. QUALITY CONTROL

\[ \hat{\sigma} = \frac{\bar{R}}{d_2} \]

- **X-CHART**
  \[ UCL_{\bar{x}} = \bar{x} + z\sigma_{\bar{x}} \]
  \[ LCL_{\bar{x}} = \bar{x} - z\sigma_{\bar{x}} \]
  \[ UCL_{\bar{x}} = \bar{x} + A_2\bar{R} \]
  \[ LCL_{\bar{x}} = \bar{x} - A_2\bar{R} \]

- **C-CHART**
  \[ UCL_c = \bar{c} + z\sqrt{\bar{c}} \]
  \[ LCL_c = \bar{c} - z\sqrt{\bar{c}} \]

- **P-CHART**
  \[ UCL_p = \bar{p} + Z\sqrt{\frac{\bar{p}(1-\bar{p})}{n}} \]
  \[ LCL_p = \bar{p} - Z\sqrt{\frac{\bar{p}(1-\bar{p})}{n}} \]

- **R-CHART**
  \[ UCL_R = D_4 \bar{R} \]
  \[ LCL_R = D_3 \bar{R} \]
3. MARKOV ANALYSIS
   - Transition Matrix

\[
\begin{bmatrix}
P(I) & N(I)
\end{bmatrix} = \begin{bmatrix}
1.0 & 0.0
\end{bmatrix}
\]

- The Debt Example

\[
T = \begin{bmatrix}
I & 0 \\
R & Q
\end{bmatrix}
\]

\[
F = (I - Q)^{-1}
\]

\[F \times R\]

### Table Factors for Control Chart Limits

<table>
<thead>
<tr>
<th>Sample Size, n</th>
<th>Mean Factor, A2</th>
<th>Upper Range, D4</th>
<th>Lower Range, D3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1.880</td>
<td>3.268</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>1.023</td>
<td>2.574</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0.729</td>
<td>2.282</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0.577</td>
<td>2.115</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>0.483</td>
<td>2.004</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>0.419</td>
<td>1.924</td>
<td>0.076</td>
</tr>
<tr>
<td>8</td>
<td>0.373</td>
<td>1.864</td>
<td>0.136</td>
</tr>
<tr>
<td>9</td>
<td>0.337</td>
<td>1.816</td>
<td>0.184</td>
</tr>
<tr>
<td>10</td>
<td>0.308</td>
<td>1.777</td>
<td>0.223</td>
</tr>
<tr>
<td>11</td>
<td>0.285</td>
<td>1.744</td>
<td>0.256</td>
</tr>
<tr>
<td>12</td>
<td>0.266</td>
<td>1.717</td>
<td>0.283</td>
</tr>
<tr>
<td>13</td>
<td>0.249</td>
<td>1.693</td>
<td>0.307</td>
</tr>
<tr>
<td>14</td>
<td>0.235</td>
<td>1.672</td>
<td>0.328</td>
</tr>
<tr>
<td>15</td>
<td>0.223</td>
<td>1.653</td>
<td>0.347</td>
</tr>
</tbody>
</table>