Sri Lanka Institute of Information Technology

Master of Science Degree in IT/IS/IM

Final Examination
Year 2, Semester 1 (2010)

Research Methodology (551)

Duration: 3 Hours

Sunday, 14th November 2010
(Time: 1.00 p.m. – 4.00 p.m.)

Instruction to Candidates:
♦ This paper has 4 questions. Answer all questions.
♦ This is NOT an open book examination.
♦ Total marks: 100 (Represents 60% of the final grade).
♦ Candidates are allowed to use calculators.
♦ This paper contains 7 pages with the cover page.
Question 1 (25 marks)

a) Explain the differences between the following: (4 marks)

   (i) Fundamental research (also known as basic/pure research)
   (ii) Applied research
   (iii) Case Studies
   (iv) Action Research

b) Name and explain briefly the eight (8) characteristics of scientific research. (4 marks)

c) Discuss the importance of Literature Survey with respect to a research project. (6 marks)

d) What are the key aspects of a research proposal? (5 marks)

e) Explain how the structure of a thesis should be and then discuss the key aspects of writing each component of the structure you mentioned. (6 marks)
Question 2 (30 Marks)

a) What is a hypothesis? (1 mark)

b) Define and explain the following using examples: (6 marks)
   (i) If-Then hypothesis
   (ii) Directional hypothesis
   (iii) Non-directional hypothesis

c) What is meant by a Theoretical Framework? (4 marks)

d) Define and explain the following types of variables with respect to a theoretical framework: (4 marks)
   (i) Independent variable
   (ii) Dependant variable
   (iii) Moderating variable
   (iv) Intervening variable

e) With the establishment of private universities, there were reports of industries complaining of reduced quality of graduates they employ. According to them, four important factors seem to have contributed to this are: enrolling students who have marginally passed the G.C.E(A/L) examination, minimal English language training given to the students, inadequate qualifications of the lecturers in these universities and the students’ attitude of aiming to merely get a ‘qualification’ without trying to understand the concepts taught. The management of one such university is interested in knowing whether these factors are indeed contributing to the reduced quality of graduates it produces as claimed by the industry, and if so, to what extent.

Given the above situation, do the following:

   (i) Define the research problem. (2 marks)

   (ii) Evolve a theoretical framework forming the relationship between independent and dependant variables and explain the same using a schematic diagram. (4 marks)

   (iii) Refine your theoretical framework model and the schematic diagram in (ii) above to include an intervening variable. (3 marks)

   (iv) Refine your theoretical framework model and the schematic diagram in (ii) above to include a moderating variable. (3 marks)

   (v) Develop at least three hypotheses. (3 marks)
Question 3

(20 Marks)

a) Briefly explain the terms: (6 marks)

(i) Causal study
(ii) Correlation study
(iii) Researcher Interference

b) What does it mean by Operationalization? (3 marks)

c) The following describes some facts related to the concept of achievement motivation in an organization.

- They would be driven by work: that is they would be working almost round the clock in order to derive the satisfaction of having achieved and accomplished.

- Many of them would generally be in no mood to relax and direct their attention to other than work related activity.

- Because they want always to be achieving and accomplishing they would prefer to work on their own rather than with others.

- With mind and heart set on accomplishment and achievement, they would rather engage in challenging jobs rather than easy ones. However, they would not want to take on excessively challenging jobs because the expectation and probability of accomplishment and achievement in such jobs would not be very high.

- They would be yearning to know how they are progressing in their jobs as they go along. That is they would like to get frequent feedback in direct and subtle ways from their supervisors, colleagues and on occasions even their subordinates to know how they are progressing.

Considering the facts given above on the concept of achievement motivation,

(i) Explain how you would operationally define the concept of achievement motivation. You are required to state how you would design any questionnaires required during the process. (8 marks)

(ii) Define and explain any three of the different types of scales you may use when designing the questionnaires. (3 marks)
Question 4  (25 marks)

a) Briefly explain the difference between the null hypothesis and the alternate hypothesis. (2 marks)

b) Discuss the need for sampling. (2 marks)

c) Explain the following terms with respect to sampling: (2 marks)

   (i) Population
   (ii) Element
   (iii) Population frame
   (iv) Subject

d) What do you understand by the term normality of distributions? (2 marks)

e) Explain briefly the following: (3 marks)

   (i) Simple random sampling
   (ii) Systematic sampling
   (iii) Stratified random sampling

f) “A trade-off between confidence and precision is often necessary when making statistical inference”. Explain this statement. (2 marks)

g) Manager of a Sri Lankan private bank wants to be 95% confident that the expected monthly withdrawals in the bank will be within a confidence interval of ± Rs. 500. A study of a sample of clients done recently indicates that the average withdrawals made by the clients have a standard deviation of Rs.3,500. Based on these facts, answer the following: (You may make use of the student $t$-distribution provided on the last page of this exam paper to answer the following.)

   (i) What would be the sample size needed in this case? (3 marks)

   (ii) If the bank has only 185 clients how would you decide on the sample size? (3 marks)

   (iii) If the bank manager now wants to be 99% confident that the expected monthly withdrawals will be within the interval of ± Rs. 500, what would be the:

      a. Theoretical sample size required? (3 marks)
      b. Practical sample size required? (3 marks)
Some useful statistical formulae

Population mean:

\[ \mu = \bar{X} \pm K \cdot S_{\bar{X}} \]

Standard error:

\[ S_{\bar{X}} = \frac{S}{\sqrt{n}} \]

Correction formula for the Standard Error:

\[ S_{\bar{X}} = \frac{S}{\sqrt{n}} \times \frac{\sqrt{N-n}}{\sqrt{N-1}} \]

where

- \( \mu \) = Population mean
- \( \bar{X} \) = Sample mean
- \( K \) = \( t \)-statistic for the level of confidence desired
- \( S_{\bar{X}} \) = Standard error
- \( S \) = Sample standard deviation
- \( n \) = Sample size
- \( N \) = Total number of elements in the population
### Table II
Upper Percentage Points of the $t$ Distribution

<table>
<thead>
<tr>
<th>$v$</th>
<th>$Q = 0.4$</th>
<th>0.25</th>
<th>0.1</th>
<th>0.05</th>
<th>0.025</th>
<th>0.01</th>
<th>0.005</th>
<th>0.001</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.325</td>
<td>1.000</td>
<td>3.078</td>
<td>6.314</td>
<td>12.706</td>
<td>31.821</td>
<td>63.657</td>
<td>318.31</td>
</tr>
<tr>
<td>2</td>
<td>0.289</td>
<td>0.816</td>
<td>1.886</td>
<td>2.920</td>
<td>4.303</td>
<td>6.965</td>
<td>9.295</td>
<td>22.326</td>
</tr>
<tr>
<td>3</td>
<td>0.277</td>
<td>0.765</td>
<td>1.638</td>
<td>2.353</td>
<td>3.182</td>
<td>4.541</td>
<td>5.841</td>
<td>10.213</td>
</tr>
<tr>
<td>4</td>
<td>0.271</td>
<td>0.741</td>
<td>1.533</td>
<td>2.132</td>
<td>2.776</td>
<td>3.747</td>
<td>4.604</td>
<td>7.173</td>
</tr>
<tr>
<td>5</td>
<td>0.267</td>
<td>0.727</td>
<td>1.476</td>
<td>2.015</td>
<td>2.571</td>
<td>3.365</td>
<td>4.032</td>
<td>5.893</td>
</tr>
<tr>
<td>6</td>
<td>0.265</td>
<td>0.718</td>
<td>1.440</td>
<td>1.943</td>
<td>2.447</td>
<td>3.143</td>
<td>3.707</td>
<td>5.208</td>
</tr>
<tr>
<td>7</td>
<td>0.263</td>
<td>0.711</td>
<td>1.415</td>
<td>1.895</td>
<td>2.365</td>
<td>2.998</td>
<td>3.499</td>
<td>4.785</td>
</tr>
<tr>
<td>8</td>
<td>0.262</td>
<td>0.706</td>
<td>1.397</td>
<td>1.860</td>
<td>2.306</td>
<td>2.896</td>
<td>3.355</td>
<td>4.501</td>
</tr>
<tr>
<td>9</td>
<td>0.261</td>
<td>0.703</td>
<td>1.383</td>
<td>1.833</td>
<td>2.262</td>
<td>2.821</td>
<td>3.250</td>
<td>4.297</td>
</tr>
<tr>
<td>10</td>
<td>0.260</td>
<td>0.700</td>
<td>1.372</td>
<td>1.812</td>
<td>2.228</td>
<td>2.764</td>
<td>3.169</td>
<td>4.144</td>
</tr>
<tr>
<td>11</td>
<td>0.260</td>
<td>0.697</td>
<td>1.363</td>
<td>1.796</td>
<td>2.201</td>
<td>2.718</td>
<td>3.106</td>
<td>4.025</td>
</tr>
<tr>
<td>12</td>
<td>0.259</td>
<td>0.695</td>
<td>1.356</td>
<td>1.782</td>
<td>2.179</td>
<td>2.681</td>
<td>3.055</td>
<td>3.930</td>
</tr>
<tr>
<td>13</td>
<td>0.259</td>
<td>0.694</td>
<td>1.350</td>
<td>1.771</td>
<td>2.160</td>
<td>2.650</td>
<td>3.012</td>
<td>3.852</td>
</tr>
<tr>
<td>14</td>
<td>0.258</td>
<td>0.692</td>
<td>1.345</td>
<td>1.761</td>
<td>2.145</td>
<td>2.624</td>
<td>2.977</td>
<td>3.787</td>
</tr>
<tr>
<td>15</td>
<td>0.258</td>
<td>0.691</td>
<td>1.341</td>
<td>1.753</td>
<td>2.131</td>
<td>2.602</td>
<td>2.947</td>
<td>3.733</td>
</tr>
<tr>
<td>16</td>
<td>0.258</td>
<td>0.690</td>
<td>1.337</td>
<td>1.746</td>
<td>2.120</td>
<td>2.583</td>
<td>2.921</td>
<td>3.686</td>
</tr>
<tr>
<td>17</td>
<td>0.257</td>
<td>0.689</td>
<td>1.333</td>
<td>1.740</td>
<td>2.110</td>
<td>2.567</td>
<td>2.898</td>
<td>3.646</td>
</tr>
<tr>
<td>18</td>
<td>0.257</td>
<td>0.688</td>
<td>1.330</td>
<td>1.734</td>
<td>2.101</td>
<td>2.552</td>
<td>2.878</td>
<td>3.610</td>
</tr>
<tr>
<td>19</td>
<td>0.257</td>
<td>0.688</td>
<td>1.328</td>
<td>1.729</td>
<td>2.093</td>
<td>2.539</td>
<td>2.861</td>
<td>3.579</td>
</tr>
<tr>
<td>20</td>
<td>0.257</td>
<td>0.687</td>
<td>1.325</td>
<td>1.725</td>
<td>2.086</td>
<td>2.528</td>
<td>2.845</td>
<td>3.552</td>
</tr>
<tr>
<td>21</td>
<td>0.257</td>
<td>0.686</td>
<td>1.323</td>
<td>1.721</td>
<td>2.080</td>
<td>2.518</td>
<td>2.831</td>
<td>3.527</td>
</tr>
<tr>
<td>22</td>
<td>0.256</td>
<td>0.686</td>
<td>1.321</td>
<td>1.717</td>
<td>2.074</td>
<td>2.508</td>
<td>2.819</td>
<td>3.505</td>
</tr>
<tr>
<td>23</td>
<td>0.256</td>
<td>0.685</td>
<td>1.319</td>
<td>1.714</td>
<td>2.069</td>
<td>2.500</td>
<td>2.807</td>
<td>3.485</td>
</tr>
<tr>
<td>24</td>
<td>0.256</td>
<td>0.685</td>
<td>1.318</td>
<td>1.711</td>
<td>2.064</td>
<td>2.492</td>
<td>2.797</td>
<td>3.467</td>
</tr>
<tr>
<td>25</td>
<td>0.256</td>
<td>0.684</td>
<td>1.316</td>
<td>1.708</td>
<td>2.060</td>
<td>2.485</td>
<td>2.787</td>
<td>3.450</td>
</tr>
<tr>
<td>26</td>
<td>0.256</td>
<td>0.684</td>
<td>1.315</td>
<td>1.706</td>
<td>2.056</td>
<td>2.479</td>
<td>2.779</td>
<td>3.435</td>
</tr>
<tr>
<td>27</td>
<td>0.256</td>
<td>0.684</td>
<td>1.314</td>
<td>1.703</td>
<td>2.052</td>
<td>2.473</td>
<td>2.771</td>
<td>3.421</td>
</tr>
<tr>
<td>28</td>
<td>0.256</td>
<td>0.683</td>
<td>1.313</td>
<td>1.701</td>
<td>2.048</td>
<td>2.467</td>
<td>2.763</td>
<td>3.408</td>
</tr>
<tr>
<td>29</td>
<td>0.256</td>
<td>0.683</td>
<td>1.311</td>
<td>1.699</td>
<td>2.045</td>
<td>2.462</td>
<td>2.756</td>
<td>3.396</td>
</tr>
<tr>
<td>30</td>
<td>0.256</td>
<td>0.683</td>
<td>1.310</td>
<td>1.697</td>
<td>2.042</td>
<td>2.457</td>
<td>2.750</td>
<td>3.385</td>
</tr>
<tr>
<td>40</td>
<td>0.255</td>
<td>0.681</td>
<td>1.303</td>
<td>1.684</td>
<td>2.021</td>
<td>2.423</td>
<td>2.704</td>
<td>3.307</td>
</tr>
<tr>
<td>60</td>
<td>0.254</td>
<td>0.679</td>
<td>1.296</td>
<td>1.671</td>
<td>2.000</td>
<td>2.390</td>
<td>2.660</td>
<td>3.232</td>
</tr>
<tr>
<td>120</td>
<td>0.254</td>
<td>0.677</td>
<td>1.289</td>
<td>1.659</td>
<td>1.980</td>
<td>2.358</td>
<td>2.617</td>
<td>3.160</td>
</tr>
<tr>
<td>$\infty$</td>
<td>0.253</td>
<td>0.674</td>
<td>1.282</td>
<td>1.645</td>
<td>1.960</td>
<td>2.326</td>
<td>2.576</td>
<td>3.090</td>
</tr>
</tbody>
</table>

This table is condensed from Table 12 of the *Biometrika Tables for Statisticians*, Vol. 1 (1st ed.), edited by E. S. Pearson and H. O. Hartley. Reproduced with the kind permission of E. S. Pearson and the trustees of *Biometrika.*