UNIVERSITY OF KWAZULU-NATAL PIETERMARITZBURG
SCHOOL OF MANAGEMENT

EXAMINATIONS: JUNE 2011

COURSE AND CODE: MANAGEMENT SCIENCE 101 (BBAP1MSP1)

INFORMATION & INSTRUCTIONS:

DURATION: THREE (3) HOURS TOTAL MARKS: 200

INTERNAL EXAMINER: PROFESSOR T NICHOLA

EXTERNAL EXAMINER: DR I KASEERAM

NB:
STUDENTS ARE REQUESTED IN THEIR OWN INTEREST TO WRITE LEGIBLY AND IN INK.

INSTRUCTIONS TO CANDIDATES:

1. This paper consists of 14 PAGES, including 3 pages of formulae and 2 pages of statistical tables. Please ensure that you have them all.
2. Answer all questions. Where applicable show your solutions steps clearly.
3. Marks awarded for each question are given in parenthesis.
4. You may use non-programmable calculators
5. Please hand the question paper along with your answer booklet(s).

THIS EXAM CONSISTS OF TWO SECTIONS:

Section A: Multiple Choice Questions (75 MARKS)
- Answer on the separate electronic MCQ answer sheet provided, using an HB pencil only.

Section B: Written section (125 MARKS)
SECTION A: MULTIPLE CHOICE QUESTIONS

Answer questions 1-4 on the basis of the information provided below:

The weights of randomly selected rugby players on the Varsity B Team in Kgs. are as follows:

65 98 65 62 79 59  74 90 72 101 56
70 62 66 80 94 79 63 73 71 85 88

You are required to organise the data in a frequency table.

1) Using Sturge’s rule \(2^{k\geq n}\) determine the number of classes to use.
   a. 6  b. 10  c. 5  d. 4  e. none of the above

2) What is the range of the data set
   a. 60  b. 55  c. 30  d. 45  e. none of the above

3) Of the following choices which is the most appropriate class width for the data.
   a. 15  b. 5  c. 10  d. 8  e. none of the above

4) Of the following choices which is the most appropriate as the lower limit for the first class?
   a. 55  b. 45  c. 30  d. 60  e. none of the above

Answer questions 5 – 9 on the basis of the following information.

Consider the following random variables

\(X_1\) is the number of students in at UKZN
\(X_2\) is the age of football players on the UKZN team.
\(X_3\) is the opinion of students of the service at Standard Bank on a scale of 1 to 5 (1=poor 5=excellent)
\(X_4\) is the preference of Pick and Pay customers of coffee brands.

5) Which of the above random variables is/are continuous?
   a) \(X_1, X_3\) and \(X_4\)  b) \(X_1\) and \(X_2\)  c) \(X_1\) and \(X_3\)
   d) Only \(X_2\)  e) all are continuous

6) Which of the above random variables is/are ratio scaled?
   a) Only \(X_1\)  b) \(X_1\) and \(X_2\)  c) \(X_1, X_2\) and \(X_4\)
   d) \(X_1, X_3\) and \(X_4\)  e) none of the above

7) Which of the above random variables is/are nominal scaled?
   a) \(X_1, X_2\) and \(X_3\)  b) \(X_1\) and \(X_2\)  c) Only \(X_4\)
   d) Only \(X_1\)  e) none of the above
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8) Which of the above random variables is/are discrete?  
   a) Only $X_1$  
   b) $X_1$ and $X_2$  
   c) $X_1$ and $X_3$  
   d) $X_1$, $X_3$ and $X_4$  
   e) none of the above

9) Which of the above random variables is /are interval scaled?  
   a) Only $X_1$  
   b) $X_1$ and $X_3$  
   c) only $X_3$  
   d) $X_1$, $X_3$ and $X_4$  
   e) none of the above

Answer questions 10 to 13 on the basis of the following information:

The marks of 11 students in a Management Science test are as follows:

59 63 85 80 41 58 60 48 59 74 67

10) The mean mark is (to the nearest whole number):  
   a. 59  
   b. 61  
   c. 63  
   d. 68  
   e. none of the above

11) The median mark is  
   a. 60  
   b. 58  
   c. 59  
   d. 63  
   e. none of the above

12) The modal mark is  
   a. 60  
   b. 58  
   c. 60  
   d. 59  
   e. none of the above

13) The standard deviation of the marks is (round off to two decimal places):  
   a. 14.45  
   b. 16.71  
   c. 12.98  
   d. 15.32  
   e. none of the above

14) Suppose the interest rates charged on home loans in a country called Zania for the last four years were: 14.5%, 12.5%, 11% and 10.5%. What is the average interest rate charged over the last four years? (correct to two decimal places).
   a. 12,03%  
   b. 11,08%  
   c. 13,03%  
   d. 12,13%  
   e. none of the above

Answer question 15 – 19 on the basis of the information summarised in the table below:

| Age Profile of Third Year Students in Supply Chain Management | Age | 
| --- | --- | --- |
| Gender | Under 21 | 21 – 30 | Over 30 |
| Male | 10 | 6 | 7 |
| Female | 8 | 5 | 0 |

In questions 15 – 19 assume the person that fits the profile is selected at random and calculate the probability (round off your answers to two decimal places).
15) A female student 30 years old or younger.
   a. 0.65   b. 0.36   c. 0.21   d. 0.44   e. none of the above

16) A student (male or female) at least 21 years old.
   a. 0.50   b. 0.81   c. 0.32   d. 0.04   e. none of the above

17) A male student or a student 21-30 years old.
   a. 0.60   b. 0.32   c. 0.50   d. 0.53   e. none of the above

18) A male student given that he is under 21.
   a. 0.44   b. 0.38   c. 0.25   d. 0.64   e. none of the above

19) Suppose you conduct two consecutive random draws; what is the probability that on both
draws you will pick a male student?
   a. 0.65   b. 0.32   c. 0.41   d. 0.54   e. none of the above

20) The branch of statistics that deals with the collection, organisation, display and
    summarising of data is:
   a. descriptive statistics   b. inferential statistics   c. sample
   d. frequency table   e. none of the above

21) A representative fraction of a population that is studied to make inferences about a population is
called:
   a. census   b. population   c. sample   d. inferential statistics
   e. none of the above

22) The number of times a data value occurs in a distribution is called
   a. class limit   b. frequency   c. cumulative frequency
   d. ogive   e. none of the above

23) Which of the following is true for a negatively skewed distribution?
   a. mode = median = mean   b. mode < median < mean
   c. mean < median < mode   d. median < mode < mean   e. none of the above
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Answer questions 24 - 25 on the basis of the following information:

The weight of randomly selected rugby players follows the normal distribution with a mean of 90 Kgs. and a standard deviation of 20 Kgs.

24) If a player from the sample is picked at random what is the probability that he weighs more than 100 Kg.?
   a. 0.6915         b. 0.1915         c. 0.3665         d. 0.3085     e. none of the above

25) What is the cut-off weight to be among the top 20% of the heaviest players?
   a. 80.8  b. 106.8  c. 64.4  d. 73.2     e. none of the above

SECTION B: WRITTEN SECTION

QUESTION 1 15MARKS

a) The price of meat year on year has been increasing at the following rates for the last four years: 5%, 12%, 11% and 9%. What is the average annual rate of increase in the price of meat (correct to two decimal places)? [5]

b) Suppose the population of Durban in 2000 was 2 345 000 and in 2010 was 3 657 000. Calculate the average annual growth rate in the population of Durban. [5]

c) The age distribution of a random sample of runners at the Collegiate Club is as follows: 3 are 21 years old; 2 are 25 years old, 5 are 35 years old; and 4 are 44 years old. Calculate the mean age of the runners in the sample (to the nearest whole year). [5]
QUESTION 2

The table below summarises the weekly expenditure on groceries of 100 randomly selected shoppers at Shoprite Checkers, Scottsville.

<table>
<thead>
<tr>
<th>Grocery purchases (in Rands)</th>
<th>Number of shoppers</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 – 200</td>
<td>4</td>
</tr>
<tr>
<td>200 – 300</td>
<td>15</td>
</tr>
<tr>
<td>300 – 400</td>
<td>25</td>
</tr>
<tr>
<td>400 – 500</td>
<td>30</td>
</tr>
<tr>
<td>500 – 600</td>
<td>20</td>
</tr>
<tr>
<td>600 - 700</td>
<td>6</td>
</tr>
</tbody>
</table>

Based on the information provided in the table above calculate:

a) The average weekly expenditure on groceries. [6]
b) The median weekly expenditure. [6]
c) The modal expenditure. [6]
d) The standard deviation of the distribution [8]
e) The coefficient of variation. [2]
f) Sk_p (Pearson’s Coefficient of Skewness). [2]
QUESTION 3  
30 MARKS

The following table presents the annual average prices and quantities of utilities used in a certain city.

<table>
<thead>
<tr>
<th>Household Utilities</th>
<th>Unit Prices</th>
<th>Quantity Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>Electricity</td>
<td>1.97</td>
<td>2.05</td>
</tr>
<tr>
<td>Sewage</td>
<td>0.62</td>
<td>0.68</td>
</tr>
<tr>
<td>Water</td>
<td>0.29</td>
<td>0.31</td>
</tr>
<tr>
<td>Telephone</td>
<td>1.24</td>
<td>1.18</td>
</tr>
</tbody>
</table>

Based on the information provided in the table above calculate:

a) The price relative index for electricity using 2008 as the base year.  
   [5]
b) The quantity link relatives index for sewage.  
   [5]
c) The composite price index using the average of relative prices method for 2009 using 2008 as the base year.  
   [5]
d) The Paasche Price Index for 2010 using 2008 as the base year.  
   [5]

QUESTION 4  
10 MARKS

The table below presents the average monthly earnings of Certified Accountants. Based on the information provided calculate:

a) The real earning in 2009 (2007 = 100) (round off to the nearest Rand).  
   [2]
b) The growth in nominal income in 2010 compared to 2007 (2007 = 100).  
   [2]
c) The growth rate of real income in 2011 compared to 2009 (2007 = 100).  
   [2]
d) If the base year is shifted to 2008 what is the new CPI in 2007 (round off to two decimal places)?  
   [2]
e) What is the amount of real earning in 2007, with 2008 as the base year (to the nearest whole number)?  
   [2]
The table below presents data on rental rate per m² (X) for office space and the occupancy rate of office buildings (Y) for seven cities.

<table>
<thead>
<tr>
<th>Rent per m² (X)</th>
<th>12</th>
<th>17</th>
<th>9</th>
<th>15</th>
<th>11</th>
<th>7</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupancy rate (%) (Y)</td>
<td>83</td>
<td>77</td>
<td>92</td>
<td>82</td>
<td>88</td>
<td>90</td>
<td>75</td>
</tr>
</tbody>
</table>

**a)** Using the STAT function of your calculator determine the following intermediate results.

\[
\sum x = \quad \sum y = \quad \sum x^2 = \quad \sum y^2 = \quad \sum xy = \quad [5]
\]

**b)** Using the formula provided calculate and interpret the correlation coefficient.  

**c)** Using the formulae provided calculate the regression coefficients and clearly write the regression equation and interpret the coefficients.  

**d)** Calculate the elasticity of occupancy with respect to rent at the mean values and interpret.  

**e)** Present the data in a scatter diagram and superimpose your regression line on the scatter diagram (no graph paper required a reasonably accurate sketch is sufficient).  

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**QUESTION 5**  
**30 MARKS**
a) Mrs Wise decides to invest R500 per month for six years at 15% compounded monthly to pay the University fees for her 12 year old daughter. Calculate the amount available when the investment matures. [5]

b) Mr Maponya has set up a trust fund to support the School he attended as a child in his village. The funds that are placed in the trust are to be paid out to the School in six equal instalments starting in the fourth year from the date the trust fund was set up. Interest on the funds will be compounded annually at 16% p.a. Calculate the amount the School will receive from each instalment. [5]