UGANDA MARTYRS UNIVERSITY

FACULTY OF BUSINESS ADMINISTRATION AND MANAGEMENT

BAM I SUPPLEMENTARY ASSESSMENT

QUANTITATIVE METHODS

August 2009
9am to 12pm
3hours

INSTRUCTIONS:
Candidates should read the paper through carefully.
Answer **ALL** the questions. Each question is worth 20 marks.
Be sure to show ALL work and present it neatly.

3 Pages

Question 1.

(A) If the present value of an annuity of 800 000/- p.a. received over n years is Sh 6.5mn when the discount rate is 11%, find n to the nearest year.

[*Hint:* $P = \dfrac{A\{1-(1+r)^{-n}\}}{r}$]

[10]

(B) What is the present value of receiving 250 000/- in 1 year's time, 265 000/- in 2 year's time and 290 000/- in 3 year's time when the discount rate(i) is 9.5%? [Hint: $P = \sum_{x=1}^{n} \frac{Ax}{(1+i)^x}$]

[4]

(C) The initial value of a particular asset is known to be SH 966 mn and its salvage value is estimated at Sh 60 mn after a useful life of 10 years. What would be the depreciation rate as a percentage, if the depreciation was to be calculated on the reducing balance method?

[*Hint:* $D = V_0(1-i)^n, \quad where \quad n = years$]

[6]

Question 2.
A random sample of the weights (kg) of 15 students out of 130 are:

45	40	40	45	55	55
40	50	65	60	50	65
45	45	55			

(a) Find the median [Hint: arrange data in ascending order]. **[6]**

(b) Scan the data and give a good approximate value of the standard deviation **[2]**

(c) Calculate the sample mean and the sample deviation

Sample Variance: $s^2 = \dfrac{\sum_{i=1}^{n} y_i^2 - \dfrac{\left(\sum_{i=1}^{n} y_i\right)^2}{n}}{n-1}$ Sample deviation: $s = \sqrt{s^2}$ **[12]**

Question 3.

(a) Find the derivative of the following functions:

(i) $y = 12 - 7x^2 + 8x^4$ **(ii)** $y = (2x^2 - 5x)^4(8x - 3)$ **[6]**

(b) Evaluate $\int_{-3}^{6}(6x^2 - 5)dx$ **[4]**

(c) A company's revenue function and cost function were determined to be

$C(x) = 5x^2 + 9x + 15$ And $R(x) = x^2 + 33x - 5$, respectively.

Both cost and revenue are in ten thousands (10 000/s) of USh and quantity, x, is in hundreds(00s).

(i) Derive the profit function, $\Pi(x)$.

(ii) Find the profit break-even levels of output (i.e. when $\Pi(x) = 0$, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

(iii) Calculate the level of demand that maximises profit and the amount of profit obtained. **[10]**

Question 4.

(a) Define the following terms used in probability theory and give the formula to be used:

(i) probability,

(ii) conditional probability, **[6]**

(b) Of 23 equal candidates for a job: 12 are mathematicians, 6 are statisticians, and 7 are neither. Find using a Venn Diagram

(i) probability that a mathematician gets the job,

(ii) given that a mathematician gets the job, that he/she is a statistician,

(iii) the probability that an mathematician gets the job, given that a statistician did not get the job. **[4]**

(c) A radio has 10 transistors, 3 of which are defective. Two transistors are selected at random, removed from the radio and inspected(assume each is not relaced). Let y equal the number of defectives observed, where $y_i = 0, 1, 2$). (Keep your answers in fractional form.)

(i) Using a tree diagram, find the probability distribution for y, p(y), and then display in tabular form.

(ii) Find the probability that at least one of the transistors is defective.

(iii) Calculate the expected value of y, $E(y) = \sum_{i=0}^{3} y_i p(y_i)$. **[10]**

Question 5.

(a) Time Series:

(i) Define what a time series is.

(ii) Give two methods of decomposing the time series data so as to give a more accurate forecast for the future.

(iii) How do we determine which method should be used for the forecasting.

[5]

(b) The following figures relate to the purchase of CDs for ABC Ltd over the last 5 years

Year	2003	2004	2005	2006	2007
Purchase	140	137	147	145	146

(i) Construct a time-series graph (frequency polygon) for the data given above.

(ii) Copy and complete the following table:

Year	Year Coded (x)	Purchases (y)	$x \bullet y$	x^2
2003	1			
2004	2			
2005	3			
2006	4			
2007	5			
	$\sum x =$	$\sum y =$	$\sum x \bullet y =$	$\sum x^2 =$

(iii) Compute the secular trend equation with the least-squares method and graph on the same axis as in (i).

[HINT: $y = a + bx$; $b = \dfrac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2}$;

$a = \dfrac{\sum y}{n} - b\dfrac{\sum x}{n}$ where n is the number of years

(iv) Forecast the purchases for the next 3 years, using the least squares regression line.

[15]