

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

ATC(U) EXAMINATIONS

LEVEL ONE

BUSINESS MATHEMATICS & STATISTICS - PAPER 3

TUESDAY 17 JUNE 2003.

INSTRUCTIONS TO CANDIDATES:

1. Time allowed: **3 hours**
2. Attempt **all** questions in Section A, any **two** questions in Section B and any **two** questions in Section C.
3. Section A has **twenty** compulsory multiple-choice questions, each carrying $1\frac{1}{2}$ marks.
4. Section B has **three** questions and only **two** are to be attempted. Each question carries 20 marks.
5. Section C has **three** questions and only **two** are to be attempted. Each question carries 15 marks.
6. Please read further instructions on the answer booklet.

SECTION A**Question 1**

- (i) Find the correct value of $(2.7 \times 10^3) + (4.5 \times 10^4)$ in standard form.
- (a) 4.77×10^4
 - (b) 1.215×10^4
 - (c) 7.2×10^7
 - (d) 7.2×10^{12}
- (ii) Given that $a * b = (ab)^{\frac{1}{2}} - 2$, find the value of $7 * (27 * 3)$.
- (a) 5
 - (b) 27
 - (c) 49
 - (d) -81
- (iii) Find the quadratic equation in terms of x whose roots are -2 and 4 .
- (a) $3x^2 + 6x - 24 = 0$
 - (b) $-3x^2 + 6x + 24 = 0$
 - (c) $x^2 - x + 8 = 0$
 - (d) $x^2 + 2x + 8 = 0$
- (iv) If function $f(x) = 3x^3 - 3x - 5$. Find the minimum value of $f(x)$.
- (a) $1/3$
 - (b) 3
 - (c) -5
 - (d) $5/3$.
- (v) A man gave $\frac{2}{5}$ of his weekend allowance to his wife and $\frac{1}{2}$ of the remainder to his son. The rest was divided between his two daughters. If each of the daughters received Shs 4,500, what was his weekend allowance?
- (a) Shs 30,000.
 - (b) Shs 45,000.
 - (c) Shs 15,000.
 - (d) Shs 10,800.
- (vi) A shopkeeper set a price for his goods so as to earn a profit of 20%. In a sale, the marked price was reduced by 20%. What were the shopkeeper's earnings?
- (a) 4% loss.
 - (b) 20% profit.
 - (c) 20% loss.
 - (d) 4% profit.

- (vii) A firm bought a machine for \$ 16,000. It is expected to be used for 5 years, and then sold at \$1,000. Using the straight-line method, calculate the annual amount of depreciation.
- (a) \$3,200
 - (b) \$3,100
 - (c) \$3,750
 - (d) \$3,000
- (viii) Mukiga borrowed 800 dollars at 6% compound interest. At the end of each of the first two years he repaid 300 dollars. How much must he pay at the end of the third year to clear the debt completely?
- (a) 297 .80 dollars.
 - (b) 352.80 dollars.
 - (c) 317.60 dollars.
 - (d) 200 dollars.
- (ix) Given A and B are two sets where $A^I = 7$, $B^I = 12$ and $A \cap B = 3$. State $\cap(C)$.
- (a) 19
 - (b) 16
 - (c) 13
 - (d) 22
- (x) A firm bottles mineral water from a spring. Every 100th bottle is tested for purity. What sort of sampling is this?
- (a) Stratified.
 - (b) Quota.
 - (c) Systematic.
 - (d) Multistage.
- (xi) For Shs 350 a shopkeeper can buy x kg of Maganjo maize brand or $(x + 3)$ kg of Kob maize brand. He buys some of each and mixes the Maganjo brand with Kob brand in the ratio 1:2. What is the cost in shillings of 1 kg of the mixture?
- (a) $350(x + 1) \div x(x + 3)$
 - (b) $700(x + 1)$
 - (c) $350 (2x + 3)$
 - (d) $350x (x + 1) \div (2x + 1)$

- (xii) The term used to describe a sequence of payments made at fixed periods of time over a given time interval is:
- (a) Net present value.
 - (b) Amortisation.
 - (c) Annuities.
 - (d) Discounting.
- (xiii) Given the total cost equation of a manufacturer as $C = 6,000 + 375Q + 42.5Q^2$; the firms marginal cost is:
- (a) $6,000 + 375Q + 85Q^2$.
 - (b) $375Q + 42.5Q^2$.
 - (c) $375 + 85Q$.
 - (d) None of these.
- (xiv) An analysis of college students' register shows that 62% of all students are female. A group of 200 students is randomly selected. Using a binomial distribution, determine the mean and standard deviation of the male students in the register.
- (a) $\mu = 76, \delta = 6.86$.
 - (b) $\mu = 76, \delta = 0.38$.
 - (c) $\mu = 124, \delta = 6.86$.
 - (d) $\mu = 47.12, \delta = 0.49$.
- (xv) In 1987 Apollo High School had school fees collection of Shs 3,260,000 and was losing Shs 70,000 annually through fees defaulters. In the same year Gemini High School had school fees collection of Shs 1,640,000 and was gaining Shs 65,000 per year through recruiting new students. In what year will the two schools have the same fees collection?
- (a) 1989.
 - (b) 1992.
 - (c) 2007.
 - (d) 1999.
- (xvi) Which of the following best describes discrete data?
- (a) Data which cannot be measured precisely.
 - (b) Data which have values that can only be approximated.
 - (c) Data which can be measured precisely.
 - (d) Data with distinct values.

- (xvii) In 1987 Apollo High School had 3,260 and 70 students were dropping out of school annually. In the same year Germini High School had 1,640 students and was gaining 65 students per year. In what year did the two schools have the same number of students?
- (a) 1989.
 - (b) 2000.
 - (c) 2005.
 - (d) 1999.
- (xviii) Which of the following is true about micro and macro statistical data?
- (a) Micro is primary data while macro is secondary data.
 - (b) Micro is data produced by the private sector while macro is produced by the public sector.
 - (c) Micro data is unauthorised while macro data is legitimate data.
 - (d) Micro data is detailed while macro data is abstract.
- (xix) In 1980, a tourist from Uganda had permission to take Shs. 500,000 to India. Before leaving Uganda he changed his shillings into dollars at an exchange rate of Shs 500 to one dollar. In India he changed all his dollars into rupees at a rate of 10 rupees to one dollar. He spent 9,000 rupees and brought the rest back to Uganda where he changed his rupees to Uganda shillings at a rate of one rupee to Shs 60. How much, in Uganda shillings, did he remain with after the trip?
- (a) Shs 100,000.
 - (b) Shs 10,000.
 - (c) Shs 45,000.
 - (d) Shs 60,000.
- (xx) If the cost price of an article is \$ 90 and the selling price is \$ 120, then which of the following is correct?
- (i) Mark-up is 25%.
 - (ii) Margin is $33\frac{1}{3}\%$.
 - (iii) Margin is 25%.
 - (iv) Mark-up is $33\frac{1}{3}\%$.
- (a) (i) and (ii).
 - (b) (i) and (iii).
 - (c) (iii) and (iv).
 - (d) (ii) and (iii).

SECTION B**Question 2**

- (a) A retailer found that his net profit P , when selling N articles per week is given by the equation $P = (750N - 0.1N^3 - 20,000)$ shillings.
- (i) Determine the retailers profits when $N = 40$ and when $N = 60$. **(4 marks)**
 - (ii) Find the value of N which yields maximum profit and the actual maximum profit. **(6 marks)**
 - (iii) Suggest three reasons why profits decrease despite increase in sales. **(3 marks)**
- (b) Baron and Balak invested Shs 260,000 each, at a rate of 9% per annum for a period of 3 years. Find the difference between their interests if one used a simple interest and the other used compound interest. **(7 marks)**
- (Total 20 marks)**

Question 3

- (a) The matrices A, B, C are defined by $A = \begin{pmatrix} 3 & -1 \\ 0 & 2 \end{pmatrix}$ $B = \begin{pmatrix} 7 & 3 \\ -2 & 0 \end{pmatrix}$ $C = \begin{pmatrix} -1 & -1 \\ 1 & -1 \end{pmatrix}$
- (i) Find the inverse of A . **(3 marks)**
 - (ii) Find $A - B$. **(2 marks)**
 - (iii) Find the matrix D such that $AD = B$. **(8 marks)**
 - (iv) Find the matrix M such that $M = C + D$ **(2 marks)**
- (b) Solve the following simultaneous equations:
- $$\begin{aligned} 2x + y - 1 &= 0 \\ x - 2y - 8 &= 0 \end{aligned}$$
- (5 marks)**
- (Total 20 marks)**

Question 4

- (a) Calculate the present value of Shs 60,000 if a return of 15% per annum is obtainable after 4 years. **(3 marks)**
- (b) An investment will yield £ 1,000 per annum for 8 years. If finances can be obtained at 7% per annum and the investment costs £ 5,000, is it worth undertaking the investment? **(5 marks)**

- (c) An investor may deposit or withdraw money out of the investment, or the interest rate may change. Suppose Shs 3,000,000 is invested at 8% per annum. After two years a further Shs 1,000,000 is added to the investment. Three years later Shs 2,000,000 is withdrawn from the investment. A year after the withdrawal, the interest rate falls to 6% per annum.

Required:

Calculate the balance on the investment five years after the fall in the interest rate.

(8 marks)

- (d) Okello and Akello are business partners who share profits and losses in the ratio 4:5 respectively. In one year Akello received Shs 1,600,000 as her share of profits.

Calculate the total profits and Okello's share of profits.

(4 marks)

(Total 20 marks)

SECTION C

Question 5

- (a) In a survey, 100 motorists were asked to estimate petrol consumption of their cars in km per litre. Each figure was rounded to the nearest km per litre and the results are shown in the frequency distribution table.

Km / litre	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60
Frequency	4	6	18	34	20	12	6

- (i) State the limits of the modal class of this distribution.
(3 marks)
- (ii) On a graph paper draw the cumulative frequency curve (ogive).
(4 marks)
- (iii) Use your ogive to estimate the median and the semi – interquartile.
(2 marks)
- (iv) A good consumption is one which lies between 38 and 52 km/ litre.
Estimate the number of motorists whose petrol consumption is good.
(1 mark)
- (b) Determine the skewness of this distribution, where skewness = $3(\mu - \text{median}) / \text{SD}$.

(5 marks)

(Total 15 marks)

Question 6

- (a) Study the following list of surveys and state whether the data in the survey is an attribute, a discrete variable or a continuous variable:
- (i) Survey of statistics textbook to determine how many diagrams they contain. **(1 mark)**
 - (ii) Survey of cans in a supermarket to determine whether or not each has a price sticker. **(1 mark)**
 - (iii) Survey of athletes to find out how long they can take to run 100 metres. **(1 mark)**
- (b) Briefly explain the following errors in data collection:
- (i) sampling error. **(1 mark)**
 - (ii) response error. **(1 mark)**
 - (iii) non-response error. **(1 mark)**
- (c) You would like to collect data on people who live in a particular region. Give four reasons as to why you would choose a telephone interview as your best method. **(4 marks)**
- (d) Give five major drawbacks of a telephone interview in data collection. **(5 marks)**
- (Total 15 marks)**

Question 7

- (a) In Queens College, students study either Economics or Accounts or both. If 85% of the students study Economics and 25% study Accounts:
- (i) Use a venn diagram to show the percentage of students who study both subjects. **(3 marks)**
 - (ii) If 84 students study both subjects, what is the total number of students in Queens College? **(2 marks)**
 - (iii) If a student is chosen at random, find the probability that this student studies both subjects. **(1 mark)**
 - (iv) If a student is chosen at random from those who study Accounts, find the probability that this student also studies Economics. **(1 mark)**

- (b) A class of 15 students is about to sit a Statistics Examination. They will subsequently be ranked in a descending order of their marks. Assume that there are no tied positions with two or more students.

Required:

Calculate the number of different possible results for the top 3 places.

(3 marks)

- (c) The table below gives the probability distribution of a discrete random variable with expected value $E(x) = 4.15$. Find x and y .

i	1	2	3	4	5	6
Prob($x = i$)	0.1	0.2	0.1	x	y	0.4

(5 marks)

(Total 15 marks)