

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

ATC(U) EXAMINATIONS

LEVEL ONE

BUSINESS MATHEMATICS & STATISTICS – PAPER 3

SATURDAY, 7 JUNE 2014

INSTRUCTIONS TO CANDIDATES

1. Time allowed: **3 hours 15 minutes**.
The first 15 minutes of this examination have been designated for reading time. You may not start to write your answer during this time.
2. This examination contains Sections **A**, **B** and **C**.
3. Section **A** is bound separately from Sections **B** and **C**.
4. Attempt all the 20 multiple-choice questions in Section **A**. Each question carries $1\frac{1}{2}$ marks.
5. Attempt **two** of the **three** questions in Section **B**. Each question carries 20 marks.
6. Attempt **two** of the **three** questions in Section **C**. Each question carries 15 marks.
7. Formulae are provided on page 7.
8. Write your answer to each question on a fresh page in your answer booklet.
9. Please, read further instructions on the answer book before attempting any question.

SECTION B

Answer only two of the three questions from this section

Question 2

- (a) Distinguish between quantitative data and qualitative data. **(2 marks)**
- (b) Companies keep personal files about their employees that contain important information on each individual's background. This data could be used to predict employee performance ratings. Such data may include:
- (i) Age.
 - (ii) Years of experience with the company.
 - (iii) Highest educational level.
 - (iv) Job classification.
 - (v) Marital status.
 - (vi) Salary.

Required:

Identify each of these variables as either qualitative or quantitative.

(6 marks)

- (c) The binomial probability distribution is a type of distribution, where each single outcome depends on the value of n and p . Given that x is a binomial random variable with $n = 5$ and $p = 0.3$,

Required:

Calculate the values for $P(x)$ when $x = 0, 1, 2, 3, 4, 5$.

(12 marks)**(Total 20 marks)****Question 3**

- (a) Wabz went to Kafunda restaurant and found the following menu:

	Today's prices (Shs)
Tilapia	15,000
Rabbit meat	25,000
Goat meat	20,000
Coffee	6,000

In the following week, the price of rabbit meat was raised to Shs 30,000 and all the items were raised in the same proportion.

Required:

Find the new prices of the other menu items.

(6 marks)

- (b) A study of the practice location of accounting technicians is as shown in the table:

Location	Percentage (%)
Mega-urban	26
Urban	48
Sub-urban	15
Rural	8
Others	3

Required:

Present the data on a pie chart.

(6 marks)

- (c) A newspaper agent sells three papers, the Echo, the Mail and the Advertiser. In a certain week, 70 customers bought the Echo, 60 the Mail, and 50 the advertiser. 17 bought both the Echo and the Mail, 15 bought the Mail and the Advertiser, 16 bought both the Advertiser and the Echo, while 3 customers bought all the three.

Required:

- (i) Represent the information on a venn diagram.

(2 marks)

- (ii) Find the total number of customers the vendor has.

(6 marks)

(Total 20 marks)

Question 4

- (a) Explain the difference between a simple index and an aggregate index.

(4 marks)

- (b) The table shows the jobs advertised by major occupational groups in 2009 and 2010:

Occupation	2009	2010
Professionals (Graduates)	640	133
Associate Professionals (Diploma & certificate holders)	461	192
Clerks	39	12
Executive directors, managers & senior administrators	31	7
Others	79	9

Required:

- (i) Which occupation advertised most jobs in 2010? (1 mark)
 - (ii) Which occupation advertised the least number of jobs? (1 mark)
 - (iii) How many more jobs were advertised in 2009 than in 2010? (4 marks)
- (c) A monopolistic firm manufactures and sells x bales of clothes per week. The weekly price demand function is given by $P(x) = 1000\,000 - 1000x$ and the weekly cost function is given by $C(x) = 5000\,000 + 400\,000x$.

Required:

Determine the:

- (i) Revenue function. (2 marks)
 - (ii) Bales that should be produced to maximize the weekly revenue. (4 marks)
 - (iii) Maximum weekly revenue. (4 marks)
- (Total 20 marks)**

SECTION C

Answer only two of the three questions from this section

Question 5

- (a) Given a function $f(x) = x^4 - 4x^3 - 8.5x^2 + 7x + 15$,

Required:

- (i) Find $f(2)$
 - (ii) Find $f'(1)$ (6 marks)
- (b) A bus' diesel consumption y , (litres) observed with distance d (km) covered is given by a simple linear equation $y = 5 + \frac{d}{8}$

Required:

- (i) Interpret the y intercept.
- (ii) Find amount of diesel consumed in covering 400km.
- (iii) Determine the cost of diesel in (ii) if one litre costs Shs 3,300 (5 marks)

- (c) Mr. Makumbi purchased land at a cost of Shs 5 million. The land is estimated to appreciate at the value of 20% per annum compound interest.

Required:

Calculate the:

- (i) value of the land after 3 years
- (ii) compound interest.

(4 marks)

(Total 15 marks)

Question 6

- (a) The matrix shows the number of people who were seen by a doctor on a certain day:

Adults	16	15
Children	4	6
	Females	Males

Find the number of:

- (i) female adults.

(1 mark)

- (ii) adults.

(2 marks)

- (iii) people seen by the doctor on that day.

(2 marks)

- (b) Given matrix $A = \begin{pmatrix} x & 8 \\ 2 & x \end{pmatrix}$

Required:

Find the:

- (i) determinant of A in terms of x
- (ii) values of x when the determinant of A = 9.

(4 marks)

- (c) John bought 4 pens and 3 books and spent a total amount of Shs 4,100, while Betty bought 4 pens and 2 books at a total amount of Shs 3,400. The cost of a pen is Shs x and that of a book is Shs y.

Required:

- (i) Form equations to show the above information. **(2 marks)**
- (ii) Find the cost of a pen and a book using matrix method.

(4 marks)

(Total 15 marks)

Question 7

- (a) A small sugar milling company purchased sugarcane from farmers at Shs 2 million. It sold its sugar to a sugar corporation at Shs 3.5 million who in turn sold the sugar to the retailers at Shs 3.8 million. The retailers sold the sugar to the consumers at Shs 4 million. At every level, 18% value added tax (VAT) is charged.

Required:

Calculate the value added tax paid by each agent.

(4 marks)

- (b) The following table shows workers' contributions to a saving scheme:

Savings in Shs '000'	200	300	400	500	600	700
Number of workers	5	3	4	7	4	2

Required:

Calculate the mean contribution for the workers using a working mean of Shs 500,000.

(5 marks)

- (c) An administrator at an accountancy training college chooses 25 reports received from different departments, from which to determine x , the number of reports delivered in time. She assumes that 40% of the reports were delivered after the deadline given. Approximating the distribution of x with a normal distribution.

Required:

- (i) calculate the mean, the standard deviation and the interval for x .
(4 marks)
- (ii) Explain why it is appropriate to approximate the probability distribution of x with a normal.

(2 marks)

(Total 15 marks)

LIST OF FORMULAE

1. Coefficient of variation, for samples $= \frac{s}{\bar{x}} \times 100\%$
2. Coefficient of variation, for populations $= \frac{\sigma}{\mu} \times 100\%$
3. Weighted average $= \frac{\sum xw}{\sum w}$
4. Arithmetic mean $= \bar{x} = \frac{\sum fx}{\sum f}$
5. Geometric mean (GM) $= \sqrt[n]{x_1 \times x_2 \times x_3 \times x_4 \dots \times x_n}$
6. Harmonic mean (HM) $= \frac{n}{\sum \frac{1}{x}}$
7. Sample standard deviation, $\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$
8. Pearson coefficient of skewness (Sk) $= 3 \frac{(\bar{x} - \text{median})}{\sigma}$
9. Value after n years $= p \left[1 \pm \frac{r}{100} \right]^n$
10. Combinations ${}_nC_r = \frac{n!}{(n-r)!r!}$
11. Index numbers:
 - (a) Price relative index $= \frac{p_1}{p_0} \times 100$
 - (b) Weighted aggregate price index $= \frac{\sum (p_1 \times w)}{\sum (p_0 \times w)} \times 100$
 - (c) Laspeyre's price index $= \frac{\sum (p_1 \times q_0)}{\sum (p_0 \times q_0)} \times 100$
 - (d) Paasche's price index $= \frac{\sum (p_1 \times q_1)}{\sum (p_0 \times q_1)} \times 100$
12. Binomial distribution, $b(x; n, p) = \binom{n}{x} p^x q^{n-x}$