

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

ATC(U) EXAMINATIONS

LEVEL ONE

BUSINESS MATHEMATICS & STATISTICS - PAPER 3

WEDNESDAY, 20 JUNE 2007

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) Simplify the following expression:

$$\frac{3^{-2} \times 3^4 \times 3^{-3}}{3^1}$$

- (a) 3^0
- (b) 3^{-2}
- (c) 3^4
- (d) 3^8

Use the following information to answer questions (ii) and (iii):

$$A = \{2, 4, 6, 8, 12\}, B = \{6, 12, 18\} \text{ and } C = \{10, 16, 20\}$$

- (ii) Find
- $A \cap B$
- .

- (a) $\{2, 4, 8\}$
- (b) $\{6, 12\}$
- (c) $\{18, 4\}$
- (d) $\{2, 4, 6, 8, 12, 18\}$

- (iii) Find
- B^1

- (a) $\{2, 4, 8, 10, 16, 20\}$
- (b) $\{6, 12, 18, 4\}$
- (c) $\{2, 4, 8\}$
- (d) $\{10, 16, 20\}$

- (iv) Which of the following sets of equations are correct?

- (m) $X \cap \mathcal{E} = X$
- (n) $X \cup X = X$
- (o) $X \cap X^1 = X^1$
- (p) $X \cup X^1 = \mathcal{E}$

- (a) (m), (n), (o)
- (b) (m), (n), (p)
- (c) (n), (o), (p)
- (d) (m), (o), (p)

Use the following information to answer question (v) and (vi):

$$A = \begin{bmatrix} 3 & 2 \\ 7 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 9 & 5 \\ 0 & 6 \end{bmatrix}$$

(v) Find A. B

(a) $\begin{bmatrix} 27 & 27 \\ 63 & 41 \end{bmatrix}$

(b) $\begin{bmatrix} 12 & 10 \\ 7 & 7 \end{bmatrix}$

(c) $\begin{bmatrix} 29 & 16 \\ 64 & 18 \end{bmatrix}$

(d) $\begin{bmatrix} 18 & 29 \\ 64 & 16 \end{bmatrix}$

(vi) Find the determinant of A.B.

(a) -783

(b) -540

(c) -12

(d) -594

(vii) A sample can be a true representative of a population when:

(a) random numbers are used.

(b) it is very small.

(c) it is a subset of a population.

(d) a sampling frame is defined.

(viii) Which of the following appropriately defines a distribution of values with a long tail of high values?

(a) Marginally skewed.

(b) Negatively skewed.

(c) Positively skewed.

(d) Co-efficient of skewness.

- (ix) Work out the following to **two** decimal places.

$$\frac{0.46 \times 50}{0.763}$$

- (a) 30.14417
 - (b) 30.14
 - (c) 30.15
 - (d) 438.36
- (x) If Y varies inversely as X, and given that $X = 8$ when $Y = 6$, find Y when X is 12.
- (a) 9
 - (b) 4
 - (c) 10
 - (d) 48
- (xi) A photocopying machine bought in the Year 2004 at a cost of £ 6,500 depreciates at a compound rate of 12% per annum. Find its cost after three years.
- (a) £ 4,429.57
 - (b) £ 9,132.03
 - (c) £ 3,816.24
 - (d) £ 7,154.05
- (xii) Mr. Muhesi bought a set of chairs for which the cash price was Shs 2,567,000. He paid a total hire purchase price of Shs 3,978,200 making payments spread over six months. Calculate how much he was paying per month in hire purchase.
- (a) Shs 427,833.30.
 - (b) Shs 1,411,200.
 - (c) Shs 663,033.30.
 - (d) Shs 235,200.
- (xiii) A cash discount is given for:
- (a) purchase of goods in bulk.
 - (b) prompt payment for goods bought on credit.
 - (c) payment for services only.
 - (d) payment for goods only.

(xiv) Solve the following simultaneous equations:

$$12x + y = 8$$

$$3x - y = 12$$

(a) $\frac{4}{3}, -8$

(b) $-\frac{1}{3}, -12$

(c) $-\frac{4}{3}, 8$

(d) $12, \frac{1}{3}$

(xv) If $Y = (2x + 5)^2$, find the value of X for which $\frac{dY}{dx} = 0$.

(a) 2.5

(b) -2.5

(c) -1.414

(d) 1.414

Use the following information to answer questions (xvi) and (xvii).

The table below depicts the age distribution of Ngoni people in 2005:

Age group	X
0 – 20	Ж Ж, Ж.
21 – 40	Ж Ж, Ж К.
41 – 60	Ж Ж, Ж К.
61+	Ж Ж, К.

(xvi) If each Ж represents 0.25 million people, what was the total population of Ngoni people in 2005?

(a) 3.125 million.

(b) 3.250 million.

(c) 3.625 million.

(d) 3.375 million.

(xvii) Describe the above statistical representation.

(a) Photograph.

(b) Ogive.

(c) Pictogram.

(d) Human beings.

(xviii) Solve the following quadratic equation.

$$x^2 - 5x + 6 = 0.$$

- (a) -1,6
- (b) 2,3
- (c) -6, 1
- (d) -2, -3

(xix) The following statistics were produced for a sample of fuses produced by a certain firm in Uganda.

Mean = 5.4, median = 3, standard deviation = 6.

Calculate the value of the measure of skewness for the distribution.

- (a) 4.2
- (b) 1.2
- (c) 42
- (d) 12

(xx) According to a BBT journal, Japanese cars account for 5% of the cars on Kampala roads. While held up in traffic jams, Agnes examined the cars coming from the opposite side of the road. Given that 4 of the first 50 cars she observed were Japanese cars, determine the probability that the journal is correct.

- (a) 0.136
- (b) 3.263
- (c) 2.6657
- (d) 0.2667.

SECTION B**Question 2**

- (a) Define and give an illustration for each of the following:
- (i) Zero matrix. (2 marks)
 - (ii) Square matrix. (2 marks)
 - (iii) Identity matrix. (2 marks)
- (b) Solve for x and y in the following matrix.
- $$\begin{pmatrix} 4 & 1 \\ x & 2 \end{pmatrix} \begin{pmatrix} 1 \\ y \end{pmatrix} = \begin{pmatrix} 6 \\ 7 \end{pmatrix}$$
- (5 marks)
- (c) Given $A = \begin{pmatrix} 3 & 2 \\ 4 & 1 \end{pmatrix}$ Find:
- (i) $\det A$ (3 marks)
 - (ii) A^2 (4 marks)
 - (iii) A^T where T is a transpose matrix. (2 marks)
- (Total 20 marks)

Question 3

- (a) Define the following terms:
- (i) Marginal cost.
 - (ii) Marginal revenue. (2 marks)
- (b) Given that $f(q) = 2q^2 + 27q - 45$. Find the value of:
- (i) $f(1/3)$.
 - (ii) q for which $f(q) = 0$ (6 marks)
- (c) The demand function of a firm is given by:
 $P = X^2 - 24x + 117$.
- (i) Find the total revenue function. (2 marks)
 - (ii) Find the value of X for which the total revenue is maximum. (10 marks)
- (Total 20 marks)

Question 4

- (a) Lornaco Importers and Distributors plan to invest an amount of money which will accrue to \$150,000 at the end of four years. What is the value of the amount if the investment rate is 12%?
(5 marks)
- (b) In May 2007, a healing service for 60 believers was held at Mandela National Stadium. They were delivered from diseases; AIDS (A), Cancer (C) and Tuberculosis (T). 30 believers were delivered from A, 22 from C and 38 from T. 10 testified that they had C only, 5 had A only. Of those who had more than one sickness, 18 had A and T, while 4 had A and C only, and 8 had C and T. All the 60 believers had at least one of the sicknesses. Given that the number of believers who had T only exceed the number that had A only by 15, find the number that had:
(i) All the three sicknesses.
(ii) AIDS and Tuberculosis.
(iii) Percentage of those who had Cancer and Tuberculosis.

(15 marks)

(Total 20 marks)

SECTION C

Question 5

- (a) Distinguish between the following terms:
(i) Mode and Median. (2 marks)
(ii) Range and interquartile range. (2 marks)
- (b) Given 5, 3, 9, 1, 2 calculate:
(i) Mean. (3 marks)
(ii) Standard deviation. (4 marks)
- (c) The frequency distribution below shows marks scored out of 20 by 9 students.

Classes	Frequency
1 – 5	2
6 – 10	4
11 – 15	2
16 – 20	1

Identify the steps one would go through in construction of a Histogram of the data above. Following the steps, draw a histogram on a squared paper.

(4 marks)

(Total 15 marks)

Question 6

- (a) Define the following:
- (i) Independent Events. (2 marks)
 - (ii) Mutually Exclusive Events. (2 marks)
- (b) The probability that an ATC student passes Paper 3 is $\frac{2}{3}$, and the probability that he does not pass Paper 4 is $\frac{5}{9}$. If the probability of passing at least one paper is $\frac{4}{5}$, what is the probability that he will pass both? (5 marks)
- (c) A bag contains 4 red balls and 3 white balls. Two balls are picked one after the other without replacement. Find:
- (i) the probability of picking balls of the same colour.
 - (ii) first red and the second white.

(6 marks)

(Total 15 marks)

Question 7

- (a) Evaluate:
- (i) $4!$ ($!$ is a factorial).
 - (ii) 4C_1 (C is a combination).
 - (iii) 5P_3 (P is a permutation).
- (9 marks)
- (b) A university omnibus can take 15 passengers. On a routine run, it is estimated that any passenger seat will be filled with a probability of 0.40.
- Calculate the mean and variance of the binomial distribution of the number of passengers on the routine run?

(6 marks)

(Total 15 marks)