

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

BUSINESS MATHEMATICS & STATISTICS - PAPER 3

ATC(U) MODEL EXAMINATION PAPER

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) Which of the following best explains the term simple interest in relation to investments?

- (a) It is money invested.
- (b) It is interest earned on an investment.
- (c) It is interest earned on an investment but not added back to the principal amount invested.
- (d) It is interest earned on an investment added back to the previous amount accrued.

(ii) $X = \begin{bmatrix} 3 & 1 & 1 & 6 \\ 9 & -3 & 8 \\ 5 & 0 & 9 \end{bmatrix}$ $Y = \begin{bmatrix} 1 & 2 & 0 \\ 0 & -4 & 5 \\ 5 & -8 & 7 \end{bmatrix}$

X + Y is equal to:

- (a) $\begin{bmatrix} 4 & 13 & 6 \\ 9 & -7 & 13 \\ 10 & -8 & 16 \end{bmatrix}$
- (b) $\begin{bmatrix} 2 & 9 & 6 \\ 9 & 1 & 3 \\ 0 & 8 & 2 \end{bmatrix}$
- (c) $\begin{bmatrix} 3 & 11 & 6 \\ 9 & -3 & 8 \\ 5 & 0 & 9 \end{bmatrix}$
- (d) $\begin{bmatrix} 4 & 9 & 10 \\ 13 & -7 & 8 \\ 6 & 13 & 16 \end{bmatrix}$

- (iii) If a bunch of matooke cost Shs.2,900 in 1996 and Shs.4,000 in 2001, calculate the price index for 2001, using 1996 = 100.
- (a) 152.3%.
 - (b) 137.9%.
 - (c) 136.4%.
 - (d) 142.1%.

(iv) $Y = \frac{3-2x}{2+2x}$

Find $\frac{dy}{dx}$

- (a) $\frac{1}{(3+2x)}$
(b) -2
(c) $-\frac{12}{(3+2x)^2}$
(d) 2
- (v) Abu is a sales manager of Namulonge Farm Produce Uganda Ltd. He earns a commission of 15% on the profits after his commission has been deducted in addition to his basic salary. If in 1999, the profits of Namulonge Farm Uganda Ltd. before his commission were Ushs. 20,000,000.
- Calculate the amount due to him as commission.
- (a) Ushs.3,000,000.
(b) Ushs.2,608,696.
(c) Ushs.153,333,333
(d) Ushs.10,000,000.
- (vi) The cost of making a tonne of bricks is Ushs.250,000. Balamu earns a profit of Ushs.50,000 per tonne. What is his mark up?
- (a) 20%.
(b) 25%.
(c) 50%.
(d) 17%.
- (vii) Calculate the median for the following distribution of delivery times of orders sent out from a firm:-

Delivery time (days)	0	1	2	3	4	5	6	7	8	9	10	11
Number of orders	4	8	11	12	21	15	10	4	2	2	1	1

- (a) 4.
(b) 7.
(c) 46.
(d) 56.

(viii) Calculate the standard deviation of the following:-

7,8,10,13,14,19,20,25,26,28

- (a) 424.
- (b) 170.
- (c) 667.
- (d) 731.

(ix) Which of the following best explains secondary data?

- (a) Data used for the specific purpose for which they were collected.
- (b) Data used for some purpose other than that for which they were collected.
- (c) Data collected and stored for future use.
- (d) Data used immediately.

(x) A company vehicle has 7 passenger seats and on a routine run, it is estimated that any passenger seat will be filled with probability 0.42.

What is the mean of the binomial distribution of the number of passengers on a routine run?

- (a) 1.71.
- (b) 4.06.
- (c) 2.94.
- (d) 5.88.

(xi) What is the variance of the binomial distribution in (x) above?

- (a) 2.94.
- (b) 5.88.
- (c) 4.06.
- (d) 1.71.

(xii) Calculate the values of x and y from the following equation:-

$$\begin{pmatrix} 3 & 3 \\ 1 & 5 \end{pmatrix} \begin{pmatrix} 2x \\ y \end{pmatrix} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

- (a) $x = \frac{3}{4}$, $y = \frac{1}{2}$
- (b) $x = 1$, $y = 2$
- (c) $x = 4$, $y = 6$
- (d) $x = 6$, $y = 4$

(xiii) Express the following expression as a summation:-

$$(y_3)^2 z_3 + (y_4)^2 z_4 + (y_5)^2 z_5 + \dots + (y_s)^2 z_s$$

- (a) $\sum_{i=3}^s (y_i z_i)^2$
- (b) $\sum_{i=3}^s y_i z_i^2$
- (c) $\sum_{i=1}^n (y_i)^2 z_i$
- (d) $\sum_{i=3}^s (y_i) (y_i)^2 z_i$

(xiv) Nsubuga sells his products at Ushs.50,000 per unit. He gives a trade discount of 20% to customers who purchase 100 to 200 units and 30% on more than 200 units. A customer bought 120 units.

What is the net amount paid by this customer?

- (a) Ushs.6,000,000.
- (b) Ushs.4,800,000.
- (c) Ushs.1,200,000.
- (d) Ushs.7,200,000.

(xv) The following can be classified as random or probability sampling methods except:-

- (a) Random sampling.
- (b) Stratified sampling.
- (c) Systematic sampling.
- (d) Quota sampling.

(xvi) Sam, Edward and James are students. They are all applying for vocational employment. The probability of Sam getting employment is 0.15, that of Edward getting the job is 0.05 and that of James getting the job is 0.10.

What is the probability that all the three will not get employment?

- (a) 0.273.
- (b) 0.727.
- (c) 0.075.
- (d) 0.925.

(xvii) A and B are two different sets:-

$$A = (1,3,5,7,9,11,13) \quad B = (5,9,13,17)$$

What is $(A) - (B)$?

- (a) (1,3,7,11).
- (b) (5,9,13).
- (c) (1,3,5,7,9,11,13,17).
- (d) None of the above.

(xviii) The volume of a piece of wood is 9000 cm^3 . It is 30 cm wide and 5cm thick. What is its length?

- (a) 300 cm.
- (b) 150 cm.
- (c) 60 cm.
- (d) 60 cm^2

(xix) Find the simple interest on Shs.85,000 for 3 years at 8% p.a.

- (a) Shs 375,000.
- (b) Shs 680,000.
- (c) Shs 2,040,000.
- (d) Shs 20,400.

(xx) Which of the following is a price relative?

(a) $\frac{\sum p_o q_n \times 100}{\sum p_o q_o}$

(b) $\frac{\sum p_n q_o \times 100}{\sum p_o q_o}$

(c) $\frac{\sum q_o q_o \times 100}{\sum q_n q_o}$

(d) $\frac{\sum p_o p_n \times 100}{\sum q_n q_o}$

SECTION B

Question 2

- (a) The variable costs associated with the production of nuts in AB Ltd. are Shs.250,000 per nut. The fixed costs per day are Shs.100,000 with special costs of $50,000y^2$, where y is the number of nuts produced.

Required:

- (i) Derive a function to describe the cost per nut for a day's production. (5 marks)
 - (ii) How many nuts are required daily to minimise the cost per nut produced? (4 marks)
 - (iii) Find the cost of a day's production that minimises the cost per nut. (1 mark)
- (b) Define marginal cost and marginal revenue. (2 marks)
- (c) If the total cost function is given by $C = 20 + 4x$ and the revenue function is given by $R = 22x - 4x^2$.
- (i) Derive an expression for the total profit (P). (3 marks)
 - (ii) Calculate the level of activity that maximises profits and the amount of profit at this level. (2 marks)
 - (iii) What is the profit situation if 200 units are produced. (3 marks)

(Total 20 marks)

Question 3

A computer whose cost is Shs. 4,500,000 will depreciate to a scrap value of Shs 150,000 in 5 years.

- (a) If the reducing balance method of depreciation is used, find the depreciation rate. (8 marks)
- (b) What is the book value of the computer at the end of the third year, using the reducing balance method? (5 marks)
- (c) By how much more would the book value be at the end of the third year if the straight-line method of depreciation had been used? (7 marks)

(Total 20 marks)

Question 4

(a) What is an annuity as distinguished from a future value? **(4 marks)**

(b) What is the net present value of an ordinary annual annuity of Ushs.10,000?

(i) Over 5 years.

(ii) Over 10 years.

(iii) Indefinitely.

If the investment rate is 11.5%

(16 marks)

(Total 20 marks)

SECTION C

Question 5

(a) Distinguish between mutually exclusive events and independent events. **(4 marks)**

(b) Can two mutually exclusive events be independent? **(1 mark)**

(c) It is estimated that 70% of the ATC students who will register for the December 2001 examinations will be female. If by June 2001 5 students have registered for those exams, what is the probability that they are:-

(a) all female.

(3 marks)

(b) All male.

(3 marks)

(c) At least one is male.

(4 marks)

NB. Assume that these students are not related.

(Total 15 marks)

Question 6

(a) Define skewness **(1 Mark)**

(b) The following data relates to the number of successful sales made by the salesmen employed by a large microcomputer firm.

Number of sales	0-4	5-9	10-14	15-19	20-24	24-29
Number of salesmen	1	4	23	21	15	6

Calculate:-

- (i) The Arithmetic mean sales. **(4 marks)**
 - (ii) The median sales. **(2 marks)**
 - (iii) The modal sales. **(2 marks)**
 - (iv) Pearson's measure of skewness. **(2 marks)**
 - (v) The standard deviation. **(4 marks)**
- (Total 15 marks)**

Question 7

Nsubuga would like to open up a business. He can either test the market (begin his business) or give up the idea completely. The details are set out below:

He can begin his business with a capital of Ushs.500,000.

The likely outcomes are favourable ($P=0.7$) or unfavourable ($P=0.3$).

If favourable, he can operate in 3 demand situations i.e.

Low	$P=0.25$	Loss	Ushs.200,000
Medium	$P=0.60$	Profit	Ushs.1,000,000
High	$P=0.15$	Profit	Ushs.5,000,000

If he realises that his business will be unfavourable, he will give up the idea.

Giving up the idea at any stage results in a profit of Ushs.500,000 out of the specialised equipment used.

Required:

- (a) Draw a decision tree showing the nodes and probabilities. **(6 marks)**
 - (b) Analyse the decision tree above. **(9 marks)**
- (Total 15 marks)**