AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XI

MODEL EXAMINATION PAPER 2023 AND ONWARDS

Business Mathematics Paper II

Time: 1 hour 5 minutes   Marks: 20

INSTRUCTIONS

Please read the following instructions carefully.

1.   Check your name and school information. Sign if it is accurate.

> **I agree that this is my name and school.**
> **Candidate's Signature**

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2.   There are SIX questions. Answer ALL the questions. Choices are specified inside the paper.

3.   When answering the questions:

Read each question carefully.
Use a black pointer to write your answers. DO NOT write your answers in pencil.
Use a black pencil for diagrams. DO NOT use coloured pencils.
DO NOT use staples, paper clips, glue, correcting fluid or ink erasers.
Complete your answer in the allocated space only. DO NOT write outside the answer box.

4.   The marks for the questions are shown in brackets ( ).

5.   A formulae list is provided on page 2. You may refer to it during the paper, if you wish.

6.   You may use a scientific calculator if you wish.

Aga Khan University Examination Board
List of Formulae for Business Mathematics XI

Note:

- The symbols have their usual meanings.

- The same formulae list will be provided in annual and re-sit examinations.

Interest and Annuities

$$I = \frac{PTR}{100} \qquad A = P \times \left(1 + \frac{r}{n}\right)^{nt} \qquad R = \left(1 + \frac{i}{n}\right)^{n} - 1$$

$$j = \left(1 + \frac{r}{m}\right)^{m} - 1 \qquad \text{Accumulating factor} = \left(\frac{(1+i)^{n} - 1}{i}\right) \qquad \text{Annuity} = R \times \left(\frac{(1+i)^{n} - 1}{i}\right)$$

Linear Equations, Functions and their Graphs

The general form of linear equation is $ax + by + c = 0$

The intercepts form of the linear equation is $\frac{x}{a} + \frac{y}{b} = 1$

$a \neq 0$ and $b \neq 0$

Quadratic Equations, Functions and their Graphs

Quadratic Formula $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Derivative of Algebraic Functions

$$\frac{d}{dx}[c] = 0 \qquad\qquad \frac{d}{dx}[f(x)]^n = n[f(x)]^{n-1} \times f'(x)$$

$$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x) \qquad \frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

Sequence and Series

$$a_n = a_1 + (n-1)d \qquad S_n = \frac{a_1(1 - r^n)}{1 - r} \text{ if } |r| < 1 \qquad S_n = \frac{a_1(r^n - 1)}{r - 1} \text{ if } |r| > 1$$

$$S_n = \frac{n}{2}(2a_1 + (n-1)d) \qquad a_n = a_1 r^{n-1}$$

Q.1. (Total 4 Marks)

The time required to process an order of books at a bookshop varies directly with the number of books purchased and inversely with the number of salespersons allocated to fulfil the order.

If 5,000 books can be packed by 6 salespersons in 4.5 hours, then calculate the time required for 8 salespersons to pack 8,000 books.

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(ATTEMPT EITHER PART a OR PART b OF Q.2.)

Q.2. (Total 4 Marks)

a. For a certain amount x, the compound interest compounded annually is Rs 100 more than the simple interest. The rate of interest for 4 years is 6% per annum.

   With reference to the given information, find
   i.   an expression for simple interest (1 Mark)
   ii. an expression compound interest in terms of x. (2 Marks)
   iii. the unknown amount, x. (1 Mark)

b. A woman invests Rs x semi-annually in a bank. The bank offers profit at the rate of 7% per annum compounded semi-annually. The value of annuity is Rs 30,000 after 7 years.

   Using the given information, show that $n = 14$, $i = 0.035$, $x\left[(1 + 0.035)^{14} - 1\right] = 1050$ and hence, find the unknown amount x. (4 Marks)

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Q.3. (Total 3 Marks)

If the sum of a number and its reciprocal is $\dfrac{13}{6}$, then find the number.

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(ATTEMPT EITHER PART a OR PART b OF Q.4.)

Q.4. (Total 3 Marks)

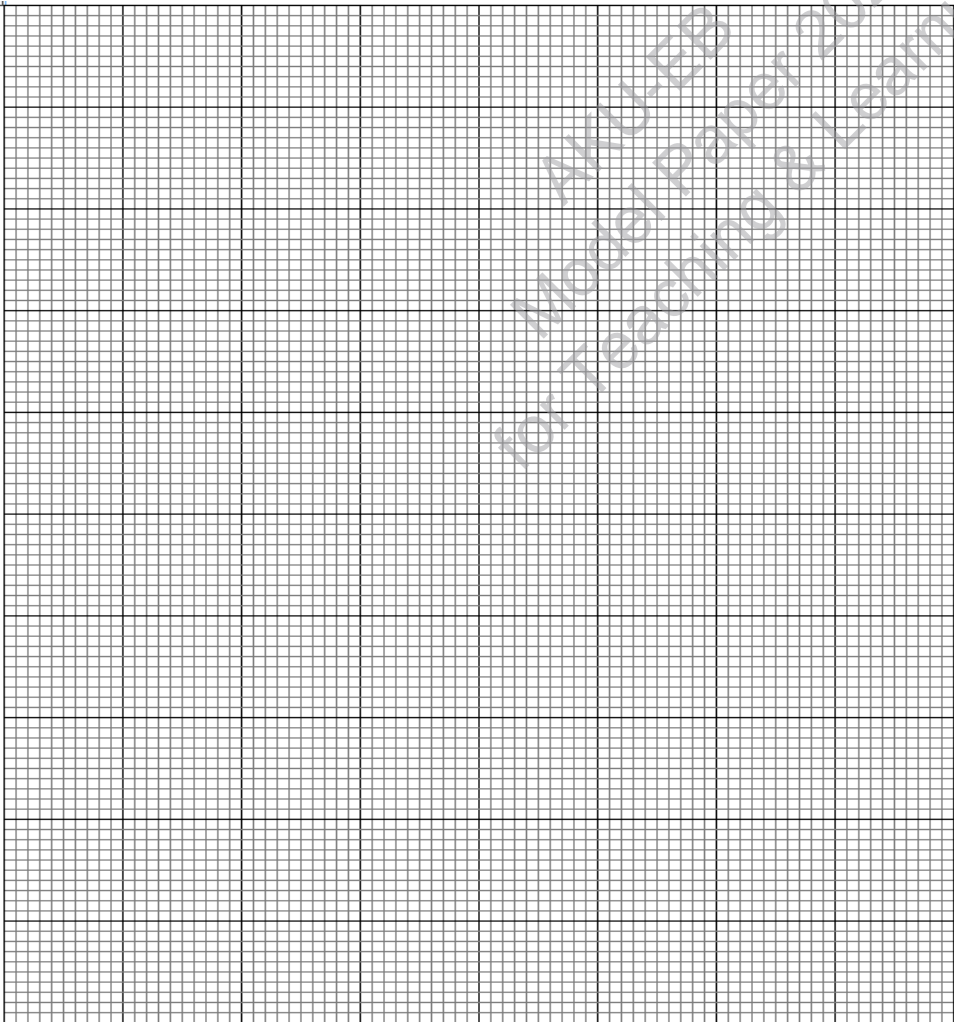a.   Find the solution of the given simultaneous equations.

$$4x + y = 50$$

$$5x + \frac{y}{2} = 20$$

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b. Draw the graph for the inequalities $2x + y < 8$ and $3x + 2y < 6$. Hence, find the region bounded by the inequalities.

(**Note**: $x > 0$ and $y > 0$)

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Q.5. (Total 3 Marks)

For the singular matrix $A = \begin{bmatrix} 2 & -4 \\ 3 & x \end{bmatrix}$, find the

i.   value of x. (2 Marks)

ii.   matrix B if $A + B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ using your answer in part i. (1 Mark)

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(ATTEMPT EITHER PART a OR PART b OF Q.6.)

Q.6.   (Total 3 Marks)

a.   In an arithmetic progression, the 1st term is 120 and the 101th term is 60. Find the common difference and the 201th term of the sequence.

b.   Find the sum of the given series $81+27+9+3+\ldots$ to the 7th term.

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END OF PAPER

Business Mathematics Model Paper XI

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