AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XI

ANNUAL EXAMINATIONS (THEORY) 2023

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**

RUBRIC

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.

List of Formulae

Note:

- The symbols have their usual meanings.

Interest and Annuities

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

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

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 $\dfrac{x}{a} + \dfrac{y}{b} = 1$ $a \neq 0$ 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

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

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

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

Sequence and Series

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

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

Q.1. (Total 4 Marks)

A quantity *p* varies directly with quantity *q* and *r*. For $q = 2$ and $r = 4$, $p = 8$. Find the

i. equation connecting *p*, *q* and *r*. (3 Marks)

ii. value of *q*, when the value of $r = 5$ and $p = 10$. (1 Mark)

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

Q.2. (Total 4 Marks)

a.

i. Saif deposited Rs 500,000 into his bank account. The bank offers compound interest rate of 6% quarterly.

Find the amount accumulated in his account after 5 years. (2 Marks)

ii. Nisa borrowed Rs 100,000 from her friend Laiba at simple interest rate. She returned Rs 115,000 after 3 years.

Calculate the annual interest rate. (2 Marks)

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

b. Aslam plans to save certain amount of money for his child's higher education in 10 years' time. A famous education fund requires investors to deposit in equal instalments quarterly at interest rate of 6%.

If he deposits Rs 5,000 quarterly in this education fund, then calculate the

i. number of annuity payments. (1 Mark)

ii. sum of annuity (accumulated value) after 10 years. (3 Marks)

Q.3. (Total 3 Marks)

For the parabola $y=(x-3)^2+1$, find the

i. *y*-intercept (1 Mark)

ii. vertex (1 Mark)

iii. direction (concavity) (1 Mark)

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

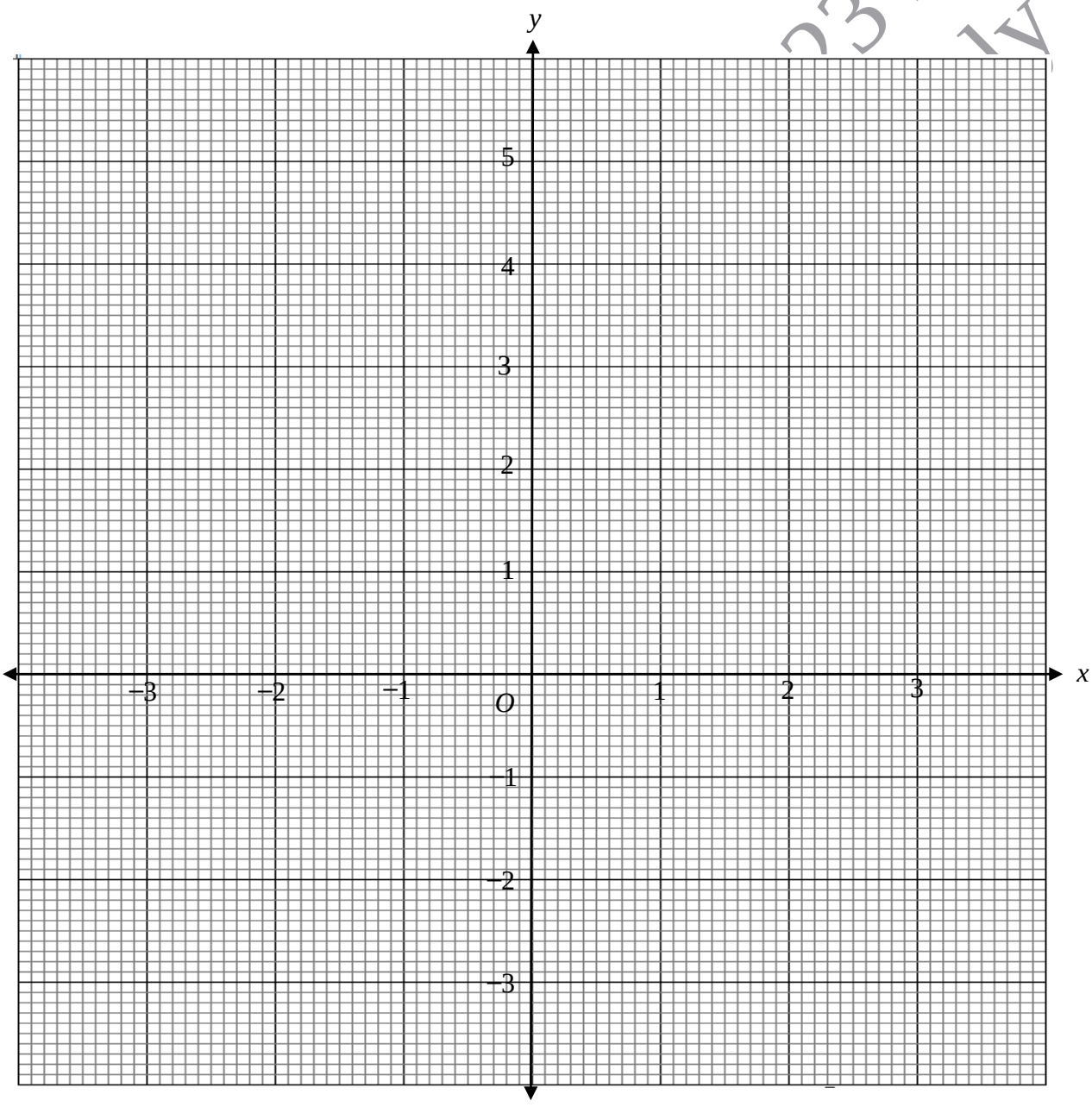
Q.4. (Total 3 Marks)

a. Solve the simultaneous equations given as

$$x^2 + y^2 = 16$$
$$x - y = 4$$

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

b. In the given grid, show the solution region of $x - y < 2$ and $2x + y > 1$. (3 Marks)



Q.5. (Total 3 Marks)

It is given that $P = \begin{bmatrix} -1 & 5 \end{bmatrix}$, $Q = \begin{bmatrix} 1 & -3 \\ 2 & -2 \end{bmatrix}$ and $R = \begin{bmatrix} 3 \\ -4 \end{bmatrix}$.

i. Find the matrix PQR. (2 Marks)

iii. Hence, find the value of k if $PQR = \begin{bmatrix} k+10 & 5 \end{bmatrix}$. (1 Mark)

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

Q.6. (Total 3 Marks)

a. The 5^{th} and 11^{th} terms of a geometric progression are -32 and -2048 respectively. Find the value of the common ratio and the first term of the sequence.

b. Find the sum of the given geometric series up to the 9^{th} term.

$1+0.1+0.01+0.001+\ldots$

END OF PAPER

Please use this page for rough work

Please use this page for rough work