AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XI

MODEL EXAMINATION PAPER 2018

Mathematics Paper II

Time: 2 hours Marks: 60

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 NINE questions. Answer ALL 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. You may use a scientific calculator if you wish.

Q.1. (Total 4 Marks)

Without using calculator, apply basic operations to separate real and imaginary parts of $\frac{(3+2i)^2}{1+i}$.

Q.2. (Total 7 Marks)

a. For the matrices $A = \begin{bmatrix} i \\ 2i \\ 3i \end{bmatrix}$ and $B = \begin{bmatrix} i & 4i \end{bmatrix}$, find $A \times B$ and $(A \times B)^t$.

(**Note:** $i = \sqrt{-1}$) (3 Marks)

b. The multiplicative inverse of the matrix $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 1 \\ 2 & 1 & 0 \end{bmatrix}$ is $\begin{bmatrix} -1 & 0 & a \\ 2 & 0 & -1 \\ -4 & 1 & 2 \end{bmatrix}$. Without using a calculator find the value of a.

(4 Marks)

Q.3. (Total 5 Marks)

Find the first term (a_1) and common difference (d) of an arithmetic sequence which satisfies conditions $4 \times a_6 = a_{26}$ and $a_{15} = 47$.

Q.4. (Total 4 Marks)

a. Find the sum up to the n^{th} term of an arithmetic sequence whose 1^{st} term is 7 and 7^{th} term is 37. (3 Marks)

b. Using result of part i, find the sum of first hundred terms of the arithmetic sequence. (1 Mark)

Q.5. (Total 6 Marks)

a. How many different words can be formed with the letters of word **BREAD** if

i. all letters are used? (1 Mark)

ii. all letters are used and B and R always come together? (1 Mark)

iii. only three letters are used? (1 Mark)

b. A basket contains 6 white balls and 4 black balls. If all the balls are identical, then how many selections of 4 balls can be made such that at least 3 of them are white balls? (3 Marks)

Q.6. (Total 7 Marks)

a.

i. Verify that there is no term involving x^5 in the expansion of $\left(x^2+2\right)^7$. (2 Marks)

ii. Find the 5^{th} term in the expansion of $\left(x^2+2\right)^7$. (1 Mark)

b. Show that $\frac{8^n-3^n}{5}$ is an integer for all natural numbers. (4 Marks)

(**Note**: $n \in N$)

(ATTEMPT EITHER PART a OR PART b OF Q.7.)

Q.7. (Total 7 Marks)

a. Find the solution set of the equation $x^2 + \frac{1}{x^2} - 7\left(x + \frac{1}{x}\right) + 12 = 0.$ (7 Marks)

b.

i. Solve the following system of equations. (6 Marks)

$$x^2 + y^2 + 2y = 16$$
$$3x + y = 6$$

ii. Prove that $\omega^7 = \omega.$ (1 Mark)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.8.)

Q.8. (Total 14 Marks)

a.

i. Find the remaining trigonometric ratios, if $\sin\theta = \frac{5}{13}$ and the terminal ray of θ is not in the first quadrant. (4 Marks)

ii. Show that $\frac{1-\cot^2\theta}{1+\cot^2\theta} = \sin^2\theta - \cos^2\theta$. (3 Marks)

(ATTEMPT EITHER PART a OR PART b OF Q.8.)

Q.8.

b.

i. Show that $\cos(\alpha+\beta)\times\cos(\alpha-\beta)=1-(\sin^2\alpha+\sin^2\beta)$. (4 Marks)

ii. With the help of $\cos\alpha$, show that $\sin\frac{\alpha}{2}=\pm\sqrt{\frac{1-\cos\alpha}{2}}$. (3 Marks)

(ATTEMPT ANY TWO PARTS FROM a, b AND c OF Q.8.)

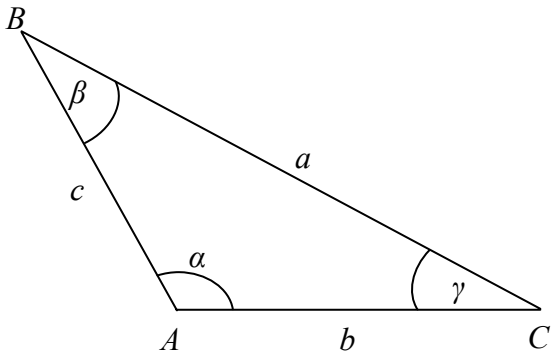
Q.8. (Total 7 Marks)

c.

i. With the help of suitable diagram of an oblique triangle *ABC*, show that $\frac{a}{\sin\alpha} = \frac{c}{\sin\gamma}$.
(5 Marks)

Space for diagram

ii. In the given diagram, find the value of a when b = 25 cm, $\alpha = 115^o$, $\beta = 35^o$ and $\gamma = 30^o$. (2 Marks)



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Q.9. (Total 6 Marks)

a. Find the solution set of the trigonometric equation $\sin 2x = \cos x$, when $0 \le x \le 2\pi$. (4 Marks)

b. Find the solution set of the trigonometric equation $\tan^2 \theta + 3 = 0$, when $0 \le \theta \le 2\pi$. (2 Marks)

END OF PAPER

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