BOARD OF INTERMEDIATE EDUCATION, KARACHI

H.S.C. Annual Examinations 2021

MATHEMATICS PAPER-I (MODEL PAPER)
(Science Pre – Engineering & Science General Groups)

REVISED

Max marks: 50 **SECTION A**
(Multiple Choice Questions) **Time: 30 minutes**

NOTE: This question consists of 25 part questions and all are to be answered.
Each part question carries TWO marks.

Q.1. Select the correct answer from the given options.

(i) Let A = { 0 , 1 } , B ={ 1 , 2 } , C = { 2 , 3 }. Then A x (B ∩ C) = :
* ϕ * { (1, 3) , (0 , 1) } * { (0 , 2) , (1 , 2) } * { (2 , 3) , (1 , 1) }

(ii) If A and B are subsets of a set U such that A ∪ B = U , then the sets A and B are called:

* Exhaustive sets * Disjoint sets * Equal sets * Unequal sets

(iii) Multiplicative inverse of $z = 3 - 4i$ is :

* $\frac{3}{5}+\frac{i4}{5}$ * $\frac{3}{5}-\frac{i4}{5}$ * $\frac{3}{25}+\frac{i4}{25}$ * $-\frac{3}{5}-\frac{4}{5}i$

(iv) Factors of $4x^2 + 9y^2$ are :
* (2x + í 3y) (2x - í 3y) * (2x+ 3y) (2x-3y) *$(2x + 3iy)^2$
* (4x + 9yi) (4x – 9yi)

(v) If $z_1 = 3 + 2i$ and $z_2 = 5 - 2i$, then real part of $z_1 \cdot z_2$ is:
* 4 * - 19 * - 4 * 19

(vi) If $b^2 - 4ac < 0$, then the roots of a quadratic equation are :
*equal and complex * unequal and complex
* equal and real * unequal and real

(vii) The product of all cube roots of 27 is :

* zero * 1 * 27 * ω

(viii) 3 is a root of the equation :

* $y^2 - 5y + 6 = 0$ * $y^2 + 5y - 6 = 0$

* $y^2 + 7y + 12 = 0$ * $y^2 + 4y + 3 = 0$

(ix) If α , β are the roots of the equation $y^2 - 5y + 9 = 0$, then value of $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}}$ is :

*0 * $\frac{5}{9}$ * $\frac{5}{3}$ * $\frac{9}{5}$

(x) Sum of first n terms of 2 , 4 , 6 , ... is :

* $n^2 + n$ * n^2 * $\frac{n}{2}$ * $n^2 - n$

(xi) 1 , x^2 , $6 - x^2$ will form a G.P. if x = :

* 2 * 4 * 8 * $\sqrt{2}$

(xii) The H.M. between ½ and ¼ is

* $\frac{1}{6}$ * $\frac{1}{8}$ * $\frac{1}{3}$ * $\frac{1}{5}$

(xiii) If 1/15 ,1/20 , 1/25 are in H.P. then 15 , 20 , 25 will be in :

* H.P. * A.P. * G.P. * both A.P. and H.P.

(xiv) The number of ways in which 7 persons can be seated around a table is:

* 6! * 7! * $^7P_7$ * $^7C_7$

(xv) If $(a+b)^{11}$, then it will contain:

*11 terms * 13 terms * 10 terms * 12 terms

(xvi) If $(a+b)^{13}$, then middle terms/middle term will be :

* 7th term & 8th term * 8th term & 9th term

* 7th term * 8th term

(xvii) If $(a+b)^n$; n ε N , then T_{r+1} = : (r = 0,1,2,….n)

* ${}^nC_r a\ {}^n b^{n-r}$ * ${}^nC_{r+1}\ a^{n-r}\ b^r$

* ${}^nC_r\ a^{n-r}\ b^r$ * $a^{n-r}b^r$

(xviii) Arc length of semi circle of a unit circle is :

* 2π * 3π * π * 1

(xix) Sin 2 θ = :

* 1 +2 $Sin^2\theta$ * $2Cos^2\theta$ - 1 * $Cos^2\theta + Sin^2\theta$ * $2\text{Sin}\theta\text{Cos}\theta$

(xx) Cos u - Cos v = :

* 2 Cos $\frac{u+v}{2}$ Sin $\frac{u-v}{2}$ * 2 Sin $\frac{u+v}{2}$ Cos $\frac{u-v}{2}$

* 2 Cos $\frac{u+v}{2}$ Cos $\frac{u-v}{2}$ * - 2 Sin $\frac{u+v}{2}$ Sin $\frac{u-v}{2}$

(xxi) Tan $(\frac{\pi}{2} + \theta)$ = :

* - Cot θ * Cosθ * - Sinθ * Tan θ

(xxii) In a ΔABC , a = b = c , then Δ = :

* $\frac{\sqrt{3}}{3}a$ * $\frac{\sqrt{3}}{2}a$ * $\frac{\sqrt{3}}{4}a$ * $\frac{\sqrt{3}}{4}a^2$

(xxiii) If in a ΔABC , the angle A is at standard position , then Law of cosine is :

* $a^2 = b^2 + c^2$ - bc Cosα * $a^2 = b^2 + c^2$ + 2bc Cosα

* $b^2 = a^2 + c^2$ - bc Cosα * $a^2 = b^2 + c^2$ - 2bc Cosα

(xxiv) In a ΔABC, Sin $\frac{\alpha}{2}$ =…..

* $\sqrt{\frac{(s-b)(s-c)}{bc}}$ * $\sqrt{\frac{(s-a)(s-b)}{ab}}$ * $\sqrt{\frac{(s-a)(s-c)}{ac}}$ * $\frac{\Delta}{s-a}$

(xxv) If Sinx = $\frac{1}{2}$, then x =

* $\frac{\pi}{3}, \frac{2\pi}{3}$ * $\frac{\pi}{6}, \frac{5\pi}{6}$ * $\frac{\pi}{2}, -\frac{\pi}{2}$ * $\frac{\pi}{4}, \frac{-\pi}{4}$

TIME: One and Half hours **MARKS: 50**

SECTION ' B '
SHORT -ANSWER QUESTIONS (30 Marks)

Note :Answer any six part questions from this section , selecting two part questions from each question.

Complex numbers and Algebra

Q.2. (i) Solve the complex equation $(x + 2y\,i)^2 = x\,i$

(ii) Show that $z = 1 + i$ and $z = 1 - i$ satisfy the equation $z^2 - 2z + 2 = 0$

(iii) Find all the cube roots of 125, also show that their sum is zero and their product is 125.

(iv) If α , β are the roots of $8x^2 - 6x + 3 = 0$, form an equation whose roots are $\alpha - 3$, $\beta - 3$.

Q.3. (i) If ${}^{n}P_3 = 12\,{}^{\frac{n}{2}}P_3$, find n .

(ii) The 2^{nd} , 31^{st} and the last terms of an A.P. are $\frac{31}{4}$, $\frac{1}{2}$ and $\frac{-13}{2}$ respectively. Find the number of terms.

(iii) Find the sum of the 1^{st} n terms of $5 + 55 + 555 + \ldots\ldots$

(iv) Prove by mathematical induction.

$1^2 + 3^2 + 5^2 + \ldots\ldots\ldots\ldots\ldots + (2n-1)^2 = \frac{1}{3} n (2n-1)(2n+1)$, $\forall\ n \in N$.

Trigonometry

Q.4. (i) If a point on the rim of a 16 cm diameter fly wheel travels 7000 meters in a minute , through how many radians does the wheel turn in two seconds?

(ii) Prove that : $1 + \cot^2\frac{\pi}{3} = \operatorname{Cosec}^2\frac{\pi}{3}$ (without using calculator)

(iii) For any triangle ABC , Derive the law of tangent.

OR

For any triangle ABC, show that $\Delta = \sqrt{s\ (s-a)(s-b)(s-c)}$

(iv) Solve : $2\ \text{Sin}^2 x + 2\sqrt{2}\ \text{Sin}\ x - 3 = 0$

SECTION ' C '
(DETAILED-ANSWER QUESTIONS) (20 Marks)

Note : Attempt any two questions from this sectioon

Q.5. (i) Which term of the H.P. $6, 2, \frac{6}{5}, \ldots\ldots$ is equal to $\frac{2}{33}$?

(ii) Find the term independent of x in $\left(\sqrt{x} - \frac{2}{x^2}\right)^{10}$

OR

Find the middle term in the expansion of $\left(\frac{a}{y} - \frac{y}{a}\right)^{12}$

Q.6. (i) Three points A, B , C form a triangle such that ratio of the measure of their angles is 1 : 2 : 3 , find the ratio of lengths of the sides.

(ii) Solve the system of the equations

$x + y = 5 \quad , \frac{3}{x} + \frac{2}{y} = 2$

Q.7. (i) Prove any two of the following :

(a) $\text{Cos}4x = 8\ \text{Cos}^4 x - 8\ \text{Cos}^2 x + 1$ (b) $\frac{Sin\theta + Sin\varphi}{Sin\theta - Sin\varphi} = \frac{\text{Tan}\frac{\theta+\varphi}{2}}{Tan\frac{\theta-\varphi}{2}}$

(c) $\frac{Sin3\theta}{Sin\theta} - \frac{Cos3\theta}{Cos\theta} = 2$

(ii) The measure of the two sides of a triangle are 4 and 5 units . Find the third side so that the area of the triangle is 6 square units.

OR

In the expansion of $(x^2 + \frac{1}{x})^m$; $m \in N$, the binomial coefficients of the fourth and the thirteenth terms are equal to each other, find the eleventh term.