GENERAL :

1. The sealed booklet is your Question Paper. Do not break the seal till you are instructed to do so.
2. The question paper CODE is printed on the right hand top corner of this sheet and the right hand top corner of the back cover o this booklet.
3. Use the Optical Response Sheet (ORS) provided separately for answering the question.
4. Blank spaces are provided within this booklet for rough work.
5. Write your Name and Roll Number in the space provided on the below cover.
6. After the open booklet, verify that the booklet contains all the **60** questions along with the options are legible.

QUESTION PAPER FORMAT AND MARKING SCHEME :

7. The question paper has three parts : **Mathematics, Physics and Chemistry**. Each part has two sections.
8. Each section as detailed in the following table :

Section	Question Type	Number of Questions	Category-wise Marks for Each Question				Maximum Marks of the Section
			Full Marks	Partial Marks	Zero Marks	Negative Marks	
1	One or More Correct Option(s)	10	+4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened	+1 For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened	0 If none of the bubbles is darkened	–2 In all other cases	40
2	Comprehension (Single Correct Option)	10	+4 If only the bubble corresponding to the correct option is darkened	–	0 If none of the bubbles is darkened	–2 In all other cases	40

OPTICAL RESPONSE SHEET :

9. Darken the appropriate bubbles on the original by applying sufficient pressure.
10. The original is machine-gradable and will be collected by the invigilator at the end of the examination.
11. Do not tamper with or mutilate the ORS.
12. Write your name, roll number and the name of the examination centre and sign with pen in the space provided for this purpose or the original. **Do not write any of these details anywhere else**. Darken the appropriate bubble under each digit of your rol number.

DARKENING THE BUBBLES ON THE ORS :

13. Use a **BLACK BALL POINT** to darken the bubbles in the upper sheet.
14. Darken the bubble **COMPLETELY.**
15. Darken the bubble **ONLY** if you are sure of the answer.
16. The correct way of darkening a bubble is as shown here : ●
17. There is **NO** way to erase or "un-darkened bubble.
18. The marking scheme given at the beginning of each section gives details of how darkened and **not darkened** bubbles are evaluated.

NAME OF THE CANDIDATE : .....

ROLL NO. : .....

I have read all the instructions and shall abide by them

I have verified the identity, name and roll number of the candidate.

Signature of the Candidate

Signature of the Invigilator

PART : I MATHEMATICS

SECTION – 1 : (Maximum Marks : 40)

This section contains **TEN** questions
Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
For each question, marks will be awarded in one of the following categories :

Full Marks	: +4	If only the bubble(s) corresponding to all the correct option(s) is(are) darkened.
Partial Marks	: +1	For darkening a bubble corresponding to **each correct option,** provided NO incorrect option is darkened.
Zero Marks	: 0	If none of the bubbles is darkened.
Negative Marks	: –2	In all other cases.

For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks ; darkening only (A) and (D) will result in +2 marks and darkening (A) and (B) will result in –2 marks, as a wrong option is also darkened.

1. A (–2, 4), B(–1, 2), C(1, 2), D(2, 4) are the vertices of a quadrilateral ABCD. E is a point on the side AD such that area (quad. BCDE) = area (ΔABE), then the abscissa of the point E is

(A) 0 (B) $\frac{1}{2}$

(C) 1 (D) $\frac{3}{2}$

Space for Rough Work

2. If a, b, c are in G.P. and the equation $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root then

(A) $\frac{a}{d}, \frac{b}{e}, \frac{c}{f}$ are in H.P.

(B) $\frac{d}{a}, \frac{e}{b}, \frac{f}{c}$ are in A.P.

(C) $\frac{a}{d}, \frac{b}{e}, \frac{c}{f}$ are in G.P

(D) $\frac{a}{d}, \frac{b}{e}, \frac{c}{f}$ are in A.P.

3. Let three terms of a non-constant positive G.P. be the sides of a triangle. If r is the common ratio of the G.P then

(A) $r^2 + r^{-4} = 4$

(B) $1 < r < 2 \cos 36°$

(C) $2\sin 18° < r < 1$

(D) $r > 3$

4. The set of values of x which satisfy the inequality $(x.\log_{\frac{1}{10}}(x^2 + x + 1)) > 0$ can be

(A) $(-\infty, 0)$

(B) $[0, 1)$

(C) $(-\infty, -1)$

(D) $(-2, -1)$

5. Given that the 4^{th} term in the expansion of $\left(2+\frac{3x}{8}\right)^{10}$ has the maximum numerical value, then x can lie in the intervals.

(A) $\left(2, \frac{64}{21}\right)$

(B) $\left(\frac{-60}{23}, -2\right)$

(C) $\left(\frac{-64}{21}, -2\right)$

(D) $\left(2, \frac{-60}{23}\right)$

6. If $\cot\theta + \tan\theta = x$ and $\sec\theta - \cos\theta = y$

(A) $\sin\theta\cos\theta = \frac{1}{x}$

(B) $\sin\theta \cdot \tan\theta = y$

(C) $(x^2y)^{2/3} - (xy^2)^{2/3} = 1$

(D) $(x^2y)^{1/3} + (xy^2)^{1/3} = 1$

7. If A and B are acute angles such that A + B and A – B satisfy the equation $\tan^2\theta - 4\tan\theta + 1 = 0$, then

(A) $A = \frac{\pi}{4}$

(B) $A = \frac{\pi}{6}$

(C) $B = \frac{\pi}{4}$

(D) $B = \frac{\pi}{6}$

8. If in a triangle ABC, $\angle B = 60°$ then

(A) $(c - a)^2 = b^2 - ac$

(B) $(b - c)^2 = a^2 - bc$

(C) $(a - b)^2 = c^2 - ab$

(D) $a^2 + b^2 + c^2 = 2b^2 + ac$

9. The point of intersection of the lines $\frac{x}{a} + \frac{y}{b} = 1$ & $\frac{x}{b} + \frac{y}{a} = 1$ lies on the line

(A) $x - y = 0$

(B) $(x + y)(a + b) = 2ab$

(C) $(\ell x + my)(a + b) = (\ell + m)ab$

(D) $(\ell x - my)(a + b) = (\ell - m)ab$

10. The set of all x satisfying $4^{x^2+2} - 9.2^{x^2+2} + 8 = 0$ consists of

(A) infinitely many points

(B) finitely many points from the set of all natural numbers

(C) finitely many points from the set of all integers

(D) exactly two integers

SECTION – 2 : (Maximum Marks : 40)

- This section contains **FIVE** paragraphs
- Based on each paragraph, there will be **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four option is correct
- For each question, darken the bubble corresponding to the correct option in the ORS
- Marking scheme :

+4 If only the bubble corresponding to the correct option is darkened
0 If none of the bubbles is darkened
–2 In all other cases

Paragraph for Question Nos. 11 to 12

Sum of the following three series is given

$1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} \ldots\ldots\ldots\ldots = \log 2$ .....(i)

$1 + \frac{1}{3} - \frac{1}{5} - \frac{1}{7} + \frac{1}{9} + \frac{1}{11} \ldots\ldots\ldots = \frac{\pi}{2\sqrt{2}}$ .....(ii)

$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} \ldots\ldots\ldots\ldots = \frac{\pi}{4}$ .....(iii)

11. Sum of the series $1 - 2\left(\frac{1}{3.5} + \frac{1}{7.9} + \frac{1}{11.13} + \ldots\right)$ is

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2} - 1$ (D) $\frac{\pi}{2} + 1$

12. Sum of the series $1 - \frac{1}{2} - \frac{1}{3} + \frac{1}{4} + \frac{1}{5} - \frac{1}{6} - \frac{1}{7} + \ldots\ldots\ldots\infty$ is

(A) $\frac{\pi}{4} - \log 2$ (B) $\frac{\pi}{4} + \log 2$ (C) $\frac{\pi}{4} - \log\sqrt{2}$ (D) $\frac{\pi}{4} + \log\sqrt{2}$

Paragraph for Question Nos. 13 to 14

For $n \in N$, we have

$$(1 + x + x^2)^n = \sum_{r=0}^{2n} a_r x^r \quad \text{.....(i)}$$

13. Which of the following is true ?

(A) $a_r = a_{n-r}$ (B) $a_{2r} = a_{n-r}$ (C) $a_r = a_{2n-r}$ (D) None of above

14. Value of $2(a_0 + a_1 + ...+ a_{n-1}) + a_n$ is

(A) $2^{2n} - 1$ (B) 3^n (C) $\frac{3^n}{2}$ (D) $\frac{3^n - 1}{2}$

Paragraph for Question Nos. 15 to 16

x, y, z are respectively the sines and p, q, r are respectively the cosines of the angles α, β, γ which are in A.P. with common difference $\frac{2\pi}{3}$.

15. $x + y + z$ is equal to

(A) 0 (B) 1 (C) 2 (D) –1

16. $yz + zx + xy$ is equal to

(A) $\frac{-3}{4}(p + q + r + 1)$ (B) $\frac{3}{4}(x + y + z + 1)$

(C) $\frac{-3}{8}$ (D) $\frac{3}{4}$

Paragraph for Question Nos. 17 to 18

Let $Y = \dfrac{\log(x+1).(x^2-3x+2).x^2}{(x-4)^3(x+5)(x-3)(x^2+2x+2)}$

17. The complete set of value of x satisfying $Y \geq 0$ belongs to the interval

(A) $x \in (0, 1) \cup (2, 3) \cup (4, \infty)$

(B) $x \in [0, 1] \cup [2, 3) \cup (4, \infty)$

(C) $x \in [1/2, 1] \cup [2, 3) \cup (3, \infty)$

(D) $x \in [1/2, 1) \cup [2, 3) \cup (3, \infty)$

18. The complete set of value of x satisfying $Y < 0$ belongs to the interval

(A) $x \in (-\infty, 0) \cup (1, 2) \cup (3, 4)$

(B) $x \in (-\infty, 0) \cup (2, 3) \cup (3, 4)$

(C) $x \in (-1, 0) \cup (1, 2) \cup (3, 4)$

(D) $x \in [-1, 0) \cup [1, 2) \cup (3, \infty)$

Paragraph for Question Nos. 19 to 20

$\cos\theta . \cos 2\theta . \cos 3\theta = \frac{1}{4}$ $\quad (0 \le \theta \le \pi)$

19. Sum of the roots of this equation is

(A) π (B) 2π

(C) 3π (D) 4π

20. If α is a root of this equation, $2\cos\alpha$ is a root of the equation.

(A) $x^2 - 1 = 0$ (B) $x^2 + 1 = 0$

(C) $x^4 - 4x^2 + 3 = 0$ (D) $x^4 - 4x^2 + 4 = 0$