

$$\tan \frac{2\pi}{n} = 1 \Rightarrow n = \frac{8}{4k+1}$$

$$\Rightarrow n = 8.$$

$$(R) \frac{h^2}{6} + \frac{l^2}{3} = 1, h = \pm 2$$

$$\text{Tangent at } (2, 1) \text{ is } \frac{2x}{6} + \frac{y}{3} = 1 \Rightarrow x + y = 3.$$

$$(S) \tan^{-1} \left(\frac{1}{2x+1} \right) + \tan^{-1} \frac{1}{4x+1} = \tan^{-1} \frac{2}{x^2}$$

$$\tan^{-1} \left(\frac{3x+1}{4x^2+3x} \right) = \tan^{-1} \frac{2}{x^2}$$

$$\Rightarrow 3x^2 - 7x - 6 = 0$$

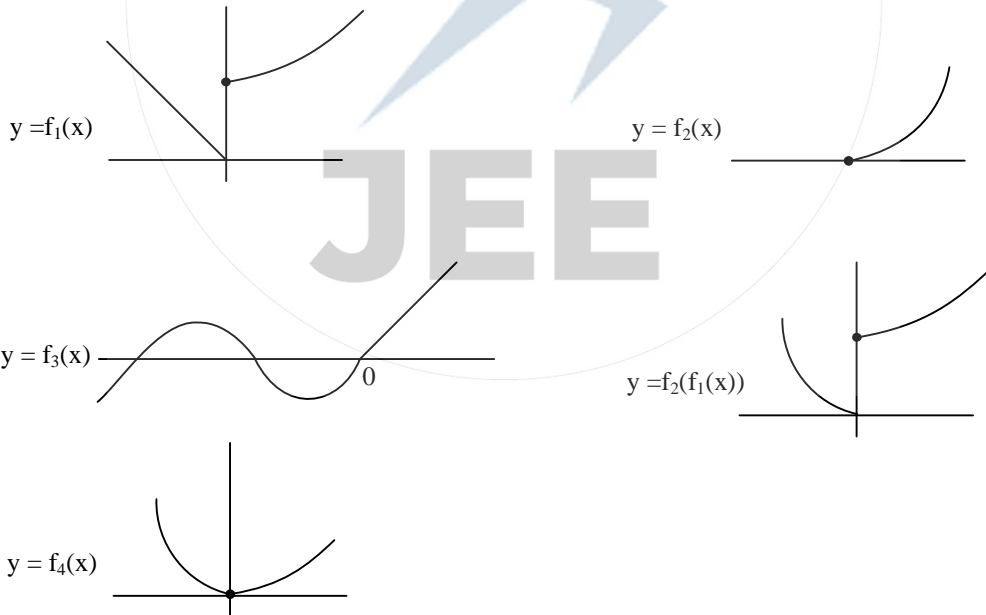
$$x = -\frac{2}{3}, 3.$$

$$59. f_2(f_1) = \begin{cases} x^2, & x < 0 \\ e^{2x}, & x \geq 0 \end{cases}$$

$$f_4: \mathbb{R} \rightarrow [0, \infty)$$

$$f_4(x) = \begin{cases} f_2(f_1(x)) & , x < 0 \\ f_2(f_1(x)) - 1 & , x \geq 0 \end{cases}$$

$$= \begin{cases} x^2 & , x < 0 \\ e^{2x} - 1 & , x \geq 0 \end{cases}$$



60. (P) z_k is 10^{th} root of unity $\Rightarrow \bar{z}_k$ will also be 10^{th} root of unity. Take z_j as \bar{z}_k .

(Q) $z_1 \neq 0$ take $z = \frac{z_k}{z_1}$, we can always find z .

$$(R) z^{10} - 1 = (z - 1)(z - z_1) \dots (z - z_9)$$

$$\Rightarrow (z - z_1)(z - z_2) \dots (z - z_9) = 1 + z + z^2 + \dots + z^9 \quad \forall z \in \text{complex number.}$$

Put $z = 1$

$$(1 - z_1)(1 - z_2) \dots (1 - z_9) = 10.$$

$$(S) \quad 1 + z_1 + z_2 + \dots + z_9 = 0$$

$$\Rightarrow \operatorname{Re}(1) + \operatorname{Re}(z_1) + \dots + \operatorname{Re}(z_9) = 0$$

$$\Rightarrow \operatorname{Re}(z_1) + \operatorname{Re}(z_2) + \dots + \operatorname{Re}(z_9) = -1.$$

$$\Rightarrow 1 - \sum_{k=1}^9 \cos \frac{2k\pi}{10} = 2.$$



D. Marking Scheme

17. For each question in **Section 1, 2 and 3** you will be awarded **3 marks** if you darken only the bubble corresponding to the correct answer and **zero mark** if no bubble is darkened. In all other cases, **minus one (-1) mark** will be awarded.

Appropriate way of darkening the bubble for your answer to be evaluated:

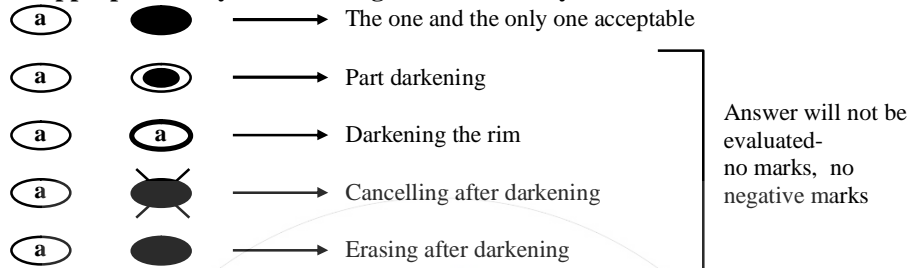


Figure-1 : Correct way of bubbling for a valid answer and a few examples of invalid answers. Any other form of partial marking such as ticking or crossing the bubble will be invalid.

5	0	4	5	2	3	1
0	<input checked="" type="radio"/>	0	0	0	0	0
1	<input checked="" type="radio"/>	1	1	1	1	<input checked="" type="radio"/>
2	2	2	<input checked="" type="radio"/>	2	2	2
<input type="radio"/>	3	3	3	3	<input checked="" type="radio"/>	3
4	4	<input checked="" type="radio"/>	4	4	4	4
<input checked="" type="radio"/>	5	5	<input checked="" type="radio"/>	5	5	5
6	6	6	6	6	6	<input type="radio"/>
7	7	7	7	7	7	7
8	<input type="radio"/>	8	<input type="radio"/>	8	<input type="radio"/>	<input type="radio"/>
9	9	9	9	9	9	9

Figure-2 : Correct Way of Bubbling your Roll Number on the ORS. (Example Roll Number : 5045231)

Name of the Candidate	Roll Number								
	<table border="1" style="width: 100%; height: 30px; border-collapse: collapse;"> <tr> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> </tr> </table>								
I have read all instructions and shall abide by them.	I have verified all the information filled by the candidate.								
..... Signature of the Candidate Signature of the invigilator								