

PARABOLA - MODULE 11

①

Single choice Questions:

Q1. (c) Given $x-1=0$ is directrix of $y^2 - kx + 8 = 0$

$$y^2 = k(x - 8/k)$$

$\Rightarrow x - 8/k + k/4 = 0$ is the equation of directrix.

$$\frac{8}{k} - \frac{k}{4} = 1 \Rightarrow k^2 + 4k - 32 = 0$$

$$k = -8, 4$$

Q2. (d)

Let OAB be the equilateral Δ with one of its vertex at the vertex of the parabola, $y^2 = 4ax$.

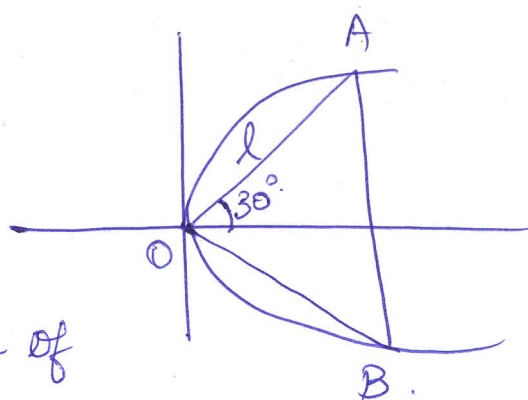
Let the length of the side of equilateral $\Delta = l$.

$$\Rightarrow OA = OB = AB = l$$

\therefore Coordinates of $A (l \cos 30^\circ, l \sin 30^\circ)$

A lies on $y^2 = 4ax$

$$\Rightarrow \left(\frac{l}{2}\right)^2 = 4a \times \frac{l \times \sqrt{3}}{2} \Rightarrow l = 8a\sqrt{3}$$



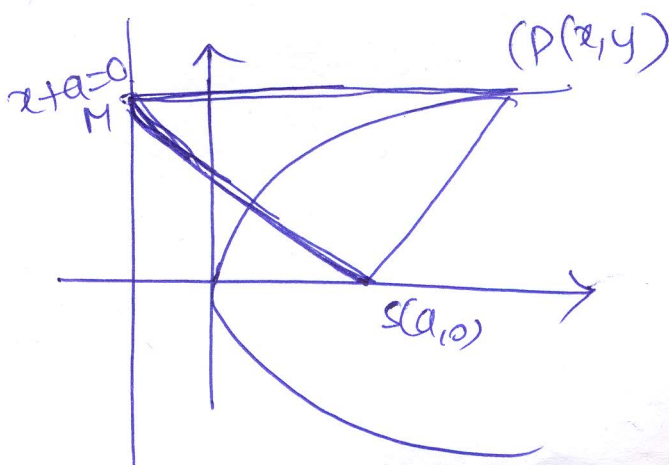
Q2. (d)

Given SPM is an equilateral Δ

$M(-a, y)$

$$SP = SM$$

$$(2a)^2 + y^2 = (x-a)^2 + y^2 \Rightarrow x-a = \pm 2a \Rightarrow x = 3a \text{ or } -a$$



$$\therefore SP = PM = |x+a| = |3a+a| = 4a.$$

(4) (a)

Mid-point of PN = (at^2, at)

line parallel to x-axis
& through (at^2, at) is $y=at$

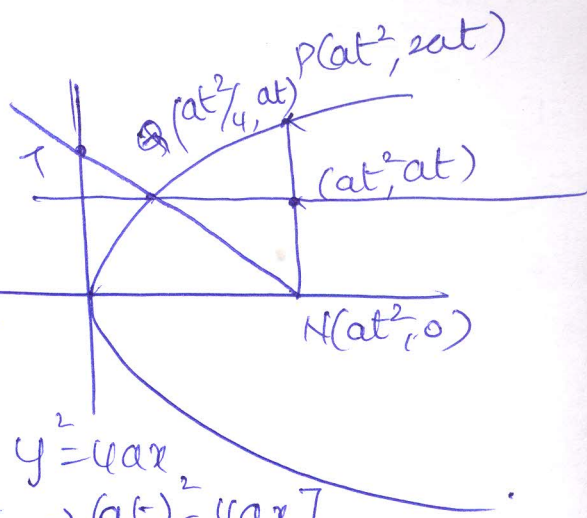
$$\therefore Q : \left(\frac{at^2}{4}, at \right) \quad \left[\begin{array}{l} y^2 = 4ax \\ \Rightarrow (at)^2 = 4ax \end{array} \right]$$

Eqn of line NQ: $\frac{y-at}{at-0} = \frac{x-at^2/4}{at^2/4-at^2} \Rightarrow \frac{y-at}{at} = \frac{x-\frac{at^2}{4}}{-\frac{3at^2}{4}}$

Put $x=0$, $y-at = \frac{4}{3}at$

$$y = \frac{4}{3}at$$

$\therefore T (0, \frac{4}{3}at)$



(5)

Let SAB be the given equilateral Δ .

Let l be the length of the sides of the Δ .

$$AC = l \sin 30^\circ$$

$$BC = l \cos 30^\circ$$

$$OC = OS - SC = \frac{l}{2} - \frac{l\sqrt{3}}{2}$$

$$= a - l \cos 30^\circ = a - \frac{l\sqrt{3}}{2}$$

\therefore coordinates of A = $\left(\frac{l}{2}, a - \frac{l\sqrt{3}}{2} \right)$

