

Q1. A circle  $S$  passes through the point  $(0, 1)$  and is orthogonal to the circles  $(x - 1)^2 + y^2 = 16$  and  $x^2 + y^2 = 1$ . Then

[Adv. 2014]

- (a) radius of  $S$  is 8      (b) radius of  $S$  is 7  
(c) centre of  $S$  is  $(-7, 1)$       (d) centre of  $S$  is  $(-8, 1)$

Sol 1. (b, c) Let the equation of circles be

$$x^2 + y^2 + 2gx + 2fy + c = 0 \quad \dots (i)$$

It passes through (0, 1)

$$\therefore 1 + 2f + c = 0 \quad \dots(ii)$$

Since circle (i) is orthogonal to circle  $(x - 1)^2 + y^2 = 16$

i.e.  $x^2 + y^2 - 2x - 15 = 0$

and  $x^2 + y^2 - 1 = 0$

$$\therefore 2g \times (-1) + 2f \times 0 = c - 15$$

$$\Rightarrow 2g + c - 15 = 0 \quad \dots(iii)$$

and  $2g \times 0 + 2f \times 0 = c - 1$

$$\Rightarrow c = 1 \quad \dots(iv)$$

Solving (ii), (iii) and (iv), we get

$$c = 1, g = 7, f = -1$$

$\therefore$  Required circle is  $x^2 + y^2 + 14x - 2y + 1 = 0$ , with centre  $(-7, 1)$  and radius = 7

$\therefore$  (b) and (c) are correct options.