(vi) The given quadric equation is $9x^2-24x+k=0$, and roots are real and equal

Then find the value of *k*.

Here, $a=9, b=-24 \text{ and}, c=k$

As we know that $D=b^2-4ac$

Putting the value of $a=9, b=-24 \text{ and}, c=k$

$$=(-24)^2-4\times 9\times k$$

$$=576-36k$$

The given equation will have real and equal roots, if $D = 0$

Thus,

Therefore, the value of $k=\boxed{16}$

(vii) The given quadric equation is $4x^2-3kx+1=0$, and roots are real and equal

Then find the value of *k*.

Here, $a=4, b=-3k \text{ and}, c=1$

As we know that $D=b^2-4ac$

Putting the value of $a=4, b=-3k \text{ and}, c=1$

$$=(-3k)^2-4\times 4\times 1$$

$$=9k^2-16$$

The given equation will have real and equal roots, if $D = 0$

Thus,

$$9k^2-16=0$$

$$9k^2=16$$

$$k=\sqrt{\frac{16}{9}}$$

$$=\pm\frac{4}{3}$$

Therefore, the value of $k=\boxed{\pm\frac{4}{3}}$

(viii) The given quadric equation is $x^2-2(5+2k)x+3(7+10k)=0$, and roots are real and equal

Then find the value of *k*.

Here, $a=1, b=-2(5+2k) \text{ and}, c=3(7+10k)$

As we know that $D=b^2-4ac$

Putting the value of $a=1, b=-2(5+2k) \text{ and}, c=3(7+10k)$

$$=(-2(5+2k))^2-4\times 1\times 3(7+10k)$$

$$=4(25+20k+4k^2)-12(7+10k)$$

$$=100+80k+16k^2-84-120k$$

$$=16-40k+16k^2$$

The given equation will have real and equal roots, if $D = 0$

Thus,

$$16-40k+16k^2=0$$

$$8(2k^2-5k+2)=0$$

$$(2k^2-5k+2)=0$$

Now factorizing of the above equation

$$\left(2k^2-5k+2\right)=0$$
$$2k^2-4k-k+2=0$$
$$2k(k-2)-1(k-2)=0$$
$$(k-2)(2k-1)=0$$

So, either

$$(k-2)=0 \quad \text{or} \quad (2k-1)=0$$
$$k=2 \qquad k=\frac{1}{2}$$

Therefore, the value of $k=\boxed{2,\frac{1}{2}}$

(ix) The given quadric equation is $(3k+1)x^2+2(k+1)x+k=0$, and roots are real and equal

Then find the value of *k*.

Here, $a=(3k+1), b=2(k+1) \text{ and}, c=k$

As we know that $D=b^2-4ac$

Putting the value of $a=(3k+1), b=2(k+1) \text{ and}, c=k$

$$=\left(2(k+1)\right)^2-4\times(3k+1)\times k$$
$$=4(k^2+2k+1)-4k(3k+1)$$
$$=4k^2+8k+4-12k^2-4k$$
$$=-8k^2+4k+4$$

The given equation will have real and equal roots, if $D=0$

Thus,

$$-8k^2+4k+4=0$$
$$-4\left(2k^2-k-1\right)=0$$
$$\left(2k^2-k-1\right)=0$$

Now factorizing of the above equation

$$\left(2k^2-k-1\right)=0$$
$$2k^2-2k+k-1=0$$
$$2k(k-1)+1(k-1)=0$$
$$(k-1)(2k+1)=0$$

So, either

$$(k-1)=0$$
$$k=1$$

or

$$(2k+1)=0$$
$$k=\frac{-1}{2}$$

Therefore, the value of $k=\boxed{1,\frac{-1}{2}}$

*********** END **********