Since we don't know the actual values of p or q, so we use the values of $H(t)$. Error in this case is given by $H_{approx}(t) - H_{actual}(t)$. Now $H_{actual}(t) = \text{constant} = H(t_0)$ so we have error $= H(t) - H(t_0) = H(t) - H(0)$.

So our error f^n is $H(t) - H(0)$.

RKDP_45 : For $n = 250$ $(h = 8)$ the error f^n is of order 10^{38} which is a very large value. So we can convincingly say that for $h = 8$ the solution does not converge to the actual solution. Moreover this h does not lie in the absolute stability region.

As the value of n increases, the solution starts to converge. For $n = 500$ $(h=4)$, there are drastic changes in error though max error is very small (order of 10^{-3}) which is very less than for what it was for $n = 250$. So now the solution starts converging.

For $n = 1000$ $(h=2)$, we get an approximately straight line whose slope is of the order 10^{-6} (calculated in the previous part). So now rate of change of error is very small and no sudden change is observed. Max error is of order 10^{-3}.

For $n = 2000$ $(h=1)$, we again do not get any drastic changes and rate of change of error (assume approx straight line) is of the order 10^{-8}. So now rate of change of error is even smaller. So we can observe that error keeps getting smaller. Max error is of order 10^{-5}.

For $n=4000$ $(h=0.5)$ the error is even smaller (10^{-6}).
So we can say that we enter the absolute stability region for $n=500$ $(h=4)$ but not for $n=250$ $(h=8)$ and the solution does not converge for $n=250$ $(h=8)$ and later starts converging as n increases.

Classical RK 4 Method :

For $n=250$ $(h=8)$. Max error is 0.25 which is not as large as in RKDP_45 but still the solution is not converging in this case too. Moreover we can say that this h is outside the absolute stability region.

For $n=500$ $(h=4)$. Max error is of 10^{-4} (-5×10^{-4}). This is much better than $n=250$ $(h=8)$. and now we can see that the solution is very close to the actual solution. drastic change is shown initially but it stabilises later.

For $n=1000$ $(h=2)$. Max error is of order 10^{-4} (-5×10^{-4}). The drastic change shown near 0 is lesser in this case.

For $n=2000$ $(h=1)$. Max error is of order 10^{-4} (-1×10^{-6})
But the change in error is very linear (no sharp changes)
Approx slope of this line $\approx 10^{-7}$.

For $n=4000$ $(h=0.5)$. Max error is of order 10^{-5} (-7×10^{-6})
The rate of change in error is again approx linear.
But now the rate is even smaller (approx $\approx 10^{-8}$).

So we see that as the value of n increases the solution gets closer to 0 (i.e converges to the actual solution).

But for $n = 250$ $(h = 8)$, the values lie outside of absolute stability region and values do not converge to actual sol^{ns}.

But for $n = 250$ $(h=8)$, the solution given by Classical RK4 method is closer to the actual solution as compared to RKDP_45 (for $n = 250$ $(h=8)$).