Abstract:
As an explanation for the flattening of galaxy rotation curves, it is proposed here that: Just as, a photon, while experiencing the ‘gravitational red-shift’, does not lose its velocity, and chooses to lose its energy, in the form of frequency; so exactly, the luminous stars at the out-skirts of a galaxy, may be losing their luminosity, in stead of their velocity.

Introduction:
The difference between observed velocities and the velocities expected as per Newton’s law of gravitation is currently being explained either in terms of ‘dark-matter’, or the Modified Newtonian Dynamics (MOND); but none of the two has been conclusively proven. So there is a scope for simpler easily understandable and testable new explanation, as proposed here.

We know that the photons pay their gravitational dues by partly losing their frequency, in stead of their velocity. Similarly, other luminous bodies can also pay their gravitational dues as if they too experience ‘gravitational red-shift’; as shown in the next section of derivations:

The Derivations:
Let us imagine a galaxy of a radius \( R \), and a star orbiting the galactic center at a radial distance \( r > R \). From the Newton’s law of gravitation we expect a relation:
\[
\frac{G M m}{r^2} = m \, \frac{v^2}{r} \]
………………………………..(1)
i.e. \( G M = \frac{v^2}{r} \)
\[
\text{i.e. } \frac{G M}{c^2} = \left( \frac{v^2}{c^2} \right) r
\]
i.e. \( \frac{(G M / c^2)}{r} = \left( \frac{v^2}{c^2} \right) \)
We find that the left-hand-side of the above expression is the famous expression for the gravitational red-shift; so we can write:
\[
\left( \frac{G M}{c^2} \right)/r = (h f_0 - h f)/h f = \frac{v^2}{c^2}
\]
i.e. \( h f_0 - h f = h f \left( \frac{v^2}{c^2} \right) \)
i.e. \( h f_0 = h f + h f \left( \frac{v^2}{c^2} \right) \)

i.e. \( h f_0 = h f + \left( \frac{hf}{c^2} \right) V^2 \)

i.e. \( h f_0 - h f = (\text{mass of the photon}) \cdot V^2 \)

i.e. \( \frac{h f_0 - hf}{r} = (\text{mass of the photon}) \cdot \frac{v^2}{r} \) \( \ldots \ldots \) (2)

From comparison of the expression-2 and 1, we can say that the left-hand-side of the expression-2 is equal to the gravitational-force experienced by every luminous body including stars at the out-skirts of a galaxy, and the photons.

**Conclusion:**

From the expressions-1 and 2 we can expect that every luminous body, including the stars at the out-skirts of a galaxy, may be experiencing ‘gravitational red-shift’, and may be maintaining their velocities, like the photons. This can be a new explanation for the ‘flattening of ‘galaxies rotation-curves.’