Updated Problem 2

Notice that the only change relative to the above solution is the value of k_{new}, which is given exogenously. At the point z_b we have the following equation:

$$\frac{z_b k^\alpha}{r+\lambda-\mu} + B_2 z_b^{\beta_2} = \frac{z_b k_{new}^\alpha}{r+\lambda-\mu} - \Phi(k_{new}, k) \tag{25}$$

which implies that

$$B_2 = B_2(z_b) = \frac{\frac{z_b k_{new}^\alpha}{r+\lambda-alpha} - \frac{z_b k^\alpha}{r+\lambda-alpha} - \Phi(k_{new}, k)}{z_b^{\beta_2}} \tag{26}$$

This would imply that the value of the firm at time zero is the following:

$$u_0(z_b) = u(z, k; z_b) = \frac{z k^\alpha}{r+\lambda-\mu} + B_2(z_b) z^{\beta_2} \tag{27}$$

It is natural that at time zero the manager of the firm chooses z_b to maximize the value of the firm. Therefore, the following condition must be satisfied:

$$u_0 = \max_{z_b}(u_0(z_b)) \tag{28}$$

Taking FOCs, it can be shown that z_b has the following form:

$$z_b = -\frac{\beta_2}{1-\beta_2} \frac{r+\lambda-\mu}{k_{new}^\alpha - k^\alpha} \Phi(k_{new}, k) \tag{29}$$