Lemma 1: $h_1(v)$ is admissible.

Proof: Let $\Psi^*(r_i, v)$ be the actual time of type-r_i resources needed by all unarranged jobs of v. Since $\Psi(r_i, v)$ denote the minimum total time of type-r_i resources required to process all unarranged jobs under v, $\Psi^*(r_i, v) \geq \Psi(r_i, v)$. Let $\varsigma^*(r_{ij}, v, l)$ be the actual earliest time that the l-th time interval of r_{ij} in $\alpha(v)$ may be used, where $l = 1, 2, \ldots, \tau(r_{ij}, v)$, $\varepsilon^*(r_{ij}, v, l)$ be the actual latest time that the l-th time interval of r_{ij} in $\alpha(v)$ may be used, and $\Lambda^*(r_{ij}, v)$ denote the actual longest total time that all idle intervals of r_{ij} can be used for unscheduled jobs of v. It is obvious that $\varsigma(r_{ij}, v, l) \leq \varsigma^*(r_{ij}, v, l)$ and $\varepsilon(r_{ij}, v, l) \geq \varepsilon^*(r_{ij}, v, l)$. Hence, $\Lambda(r_{ij}, v) \geq \Lambda^*(r_{ij}, v)$. Let $\varsigma^*(r_{ij}, v)$ be the actual earliest time that an unarranged job can be arranged after the last job in r_{ij} from v. It is obvious that $\varsigma^*(r_{ij}, v) \geq \varsigma(r_{ij}, v)$.

Therefore, we have

$$\begin{aligned} h^*(v) &\geq \max_{i \in z_m}\left\{\frac{\sum_{1 \leq j \leq C(r_i)} (\varsigma^*(r_{ij}, v) - \Lambda^*(r_{ij}, v)) + \Psi^*(r_i, v)}{C(r_i)} - g(v), 0\right\} \\ &\geq \max_{i \in z_m}\left\{\frac{\sum_{1 \leq j \leq C(r_i)} (\varsigma(r_{ij}, v) - \Lambda(r_{ij}, v)) + \Psi(r_i, v)}{C(r_i)} - g(v), 0\right\} = h_1(v) \end{aligned}.$$