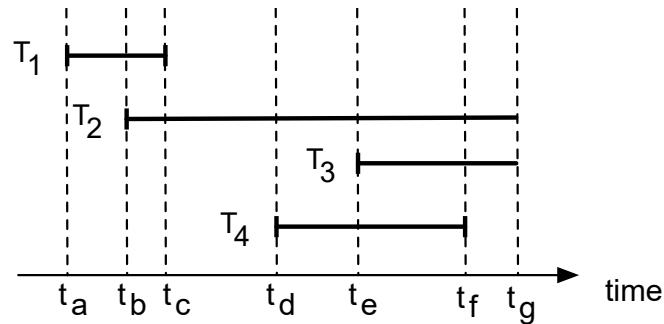


## Transaction Processing

### Exercise 8

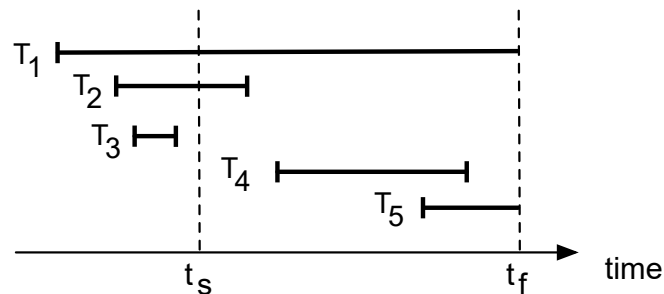
**Assignment 1:** Which requirements do recovery strategies need to fulfill? In particular, how can the correctness be ensured?

**Assignment 2:** Given is the following scenario:



At which point in time ( $t_a - t_g$ ) can transactions ( $T_1 - T_4$ ) swap their modified pages? Hereby, consider the different concrete recovery strategies. Discuss advantages and disadvantages of these strategies.

**Assignment 3:** Given the following scenario:



A savepoint was created at  $t_s$ . Explain the restart steps in this scenario after the failure at  $t_f$ .

**Assignment 4:** Explain the process of the Redo protocol based on the following example. To do this, explain all necessary components and describe the recovery process. Given is the schedule  $s = r_1(x)w_1(x)r_2(y)c_1w_2(y)c_2$ , whereby a system failure occurs directly after operation  $w_2(y)$ .

**Assignment 5:** Discuss the difference between the standard and the Twin-block shadow memory technique. What are advantages and disadvantages of these concepts?

**Assignment 6: Which methods offer the possibility of recovering a database after the occurrence of a media error? What types can be distinguished?**