Crossover

The crossover process is depicted in Fig. 23.5(a). Since all the chromosomes have a similar configuration in the problem when crossover is effected as shown in Fig. 23.5(a), the employees assigned to project 2 in parent 1 are changed to those assigned to project 2 in parent 2. Employees once allocated to a project (in any chromosome) will always remain allocated to the same project even after crossover. This does not serve to emulate a proper crossover. To avoid this situation one of the parents is rotated by a random amount before crossover after which only the employee Ids in the two parents are interchanged. This helps reshuffling of the employees amongst the projects. To maintain the structure of the chromosomes the child 2 is rotated back to its original configuration after the crossover. The method is depicted in Fig. 23.5(b). Another possible way to achieve a similar effect is to interchange two portions in one of the parents before crossover (Fig. 23.5(c)) and undo the interchange in the child chromosomes generated, after crossover.

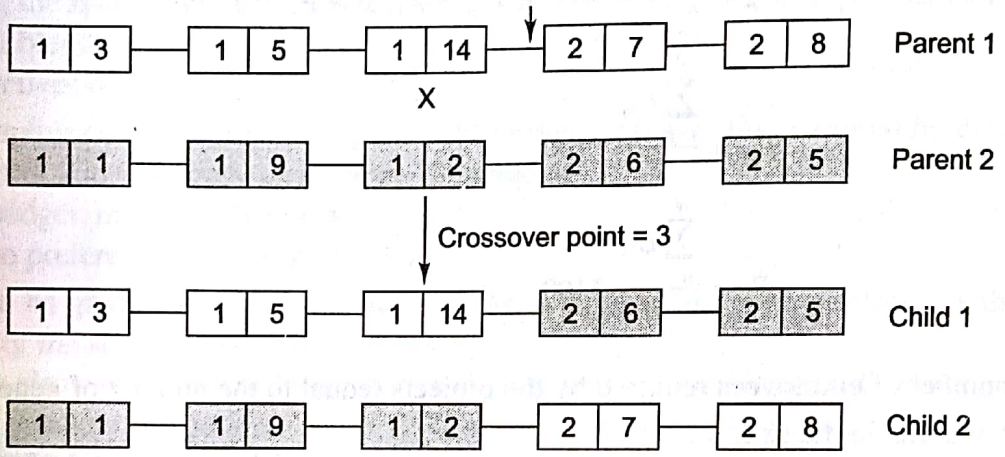

Fig. 23.5(a) *Simple Crossover (Ineffective)*

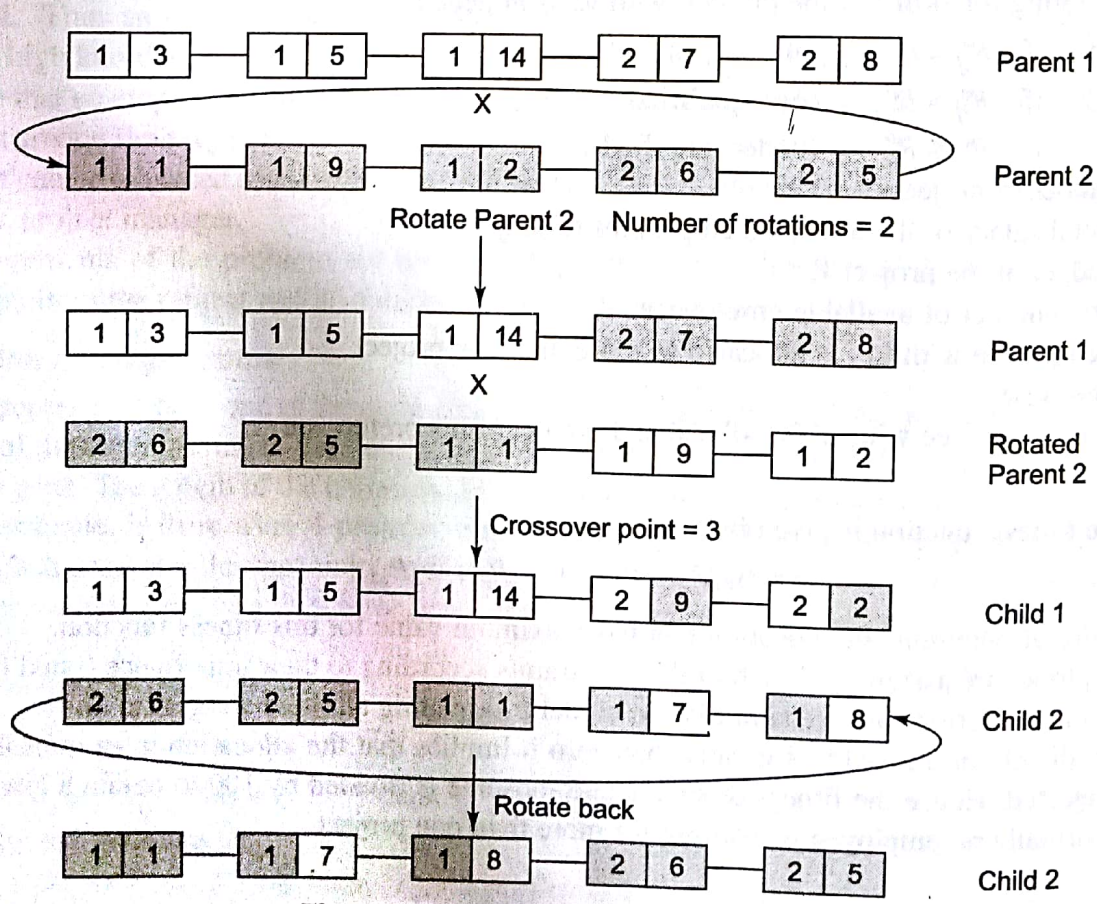

Fig. 23.5(b) *Crossover with Rotation*

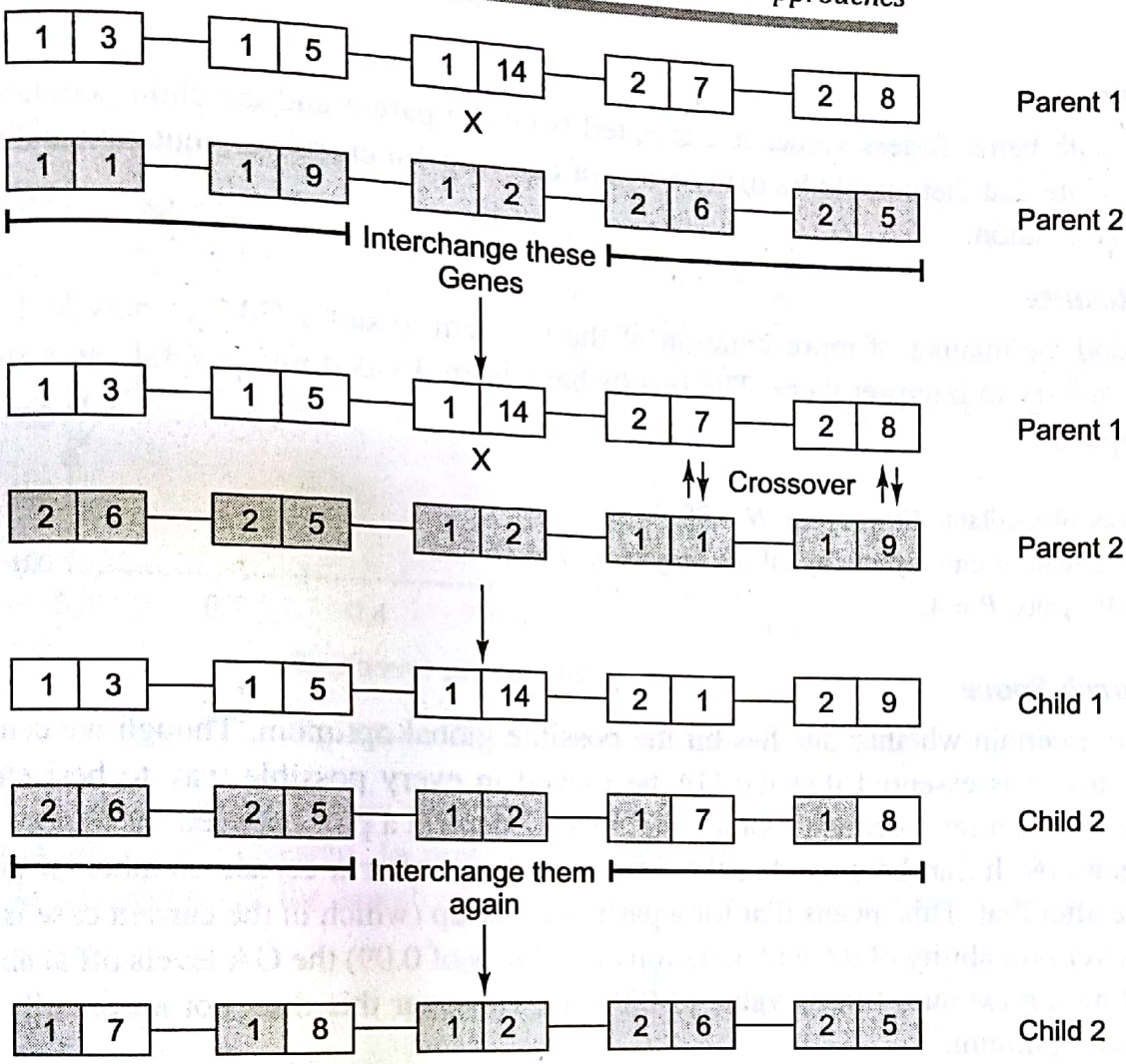

Fig. 23.5(c) *Crossover with Interchange*

Mutation

While in the previous problems we assumed that mutation need not take place, in this real world scenario it becomes imperative for us to effect the same. One possible way of realizing mutation in the present case is by swapping the employee Ids of different projects within the same chromosome. This can be done by the following two steps:

1. Generate two random numbers from 1 to *P*, where *P* is the number of projects. These numbers serve as the project Ids.
2. Swap the respective employees allocated to these projects.

The process is depicted in the Fig. 23.6.

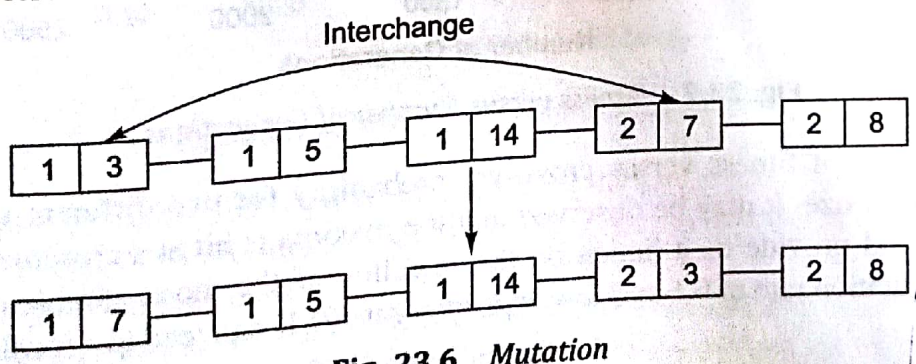

Fig. 23.6 *Mutation*