Abstract:

The present thesis entitled “Stochastic Modelling Relating to Some Engineering Systems” is an sincere effort to analyze the reliability and profit of a 2-unit standby Oil Delivering System. In the field of reliability none of the researchers has taken the concept of another line facility based on real data. Hence in the thesis an attempt is made to analyze reliability and profit for a two unit standby system with provision of switching over to another line as such systems are widely used in various industries. A practical example of such a system is an oil delivering system working in an oil refinery plant and we have collected the data from Indian Oil Corporation Limited (I.O.C.L) Panipat on various rates and costs involved for Oil Delivering System to analyze its reliability and profit under different situations. The oil delivering system has two main pumps. Out of two main pumps one is working and other is standby. The purpose of this system is to transport the oil from refinery to desired stations. To make the study useful and practical, real data on failures, repairs and costs of Oil Delivering System have been collected from Indian Oil Corporation Limited, (I.O.C.L) Panipat (India). The system is analysed on the basis of situation existing in the plant and also for some other expected/practical situations. Cost-benefit analysis is done on the basis of collected data for all the models discussed under different situations. Comparative study between the models (taken two at a time) is also carried out to find which and when the one model is better than the other. The whole range of the subject of study is covered in seven chapters. Chapter 1 includes the fundamental concepts and definitions related to work done in the thesis to make the thesis sufficient in itself. Chapter 2 presents the data collected from Indian Oil Corporation Limited (I.O.C.L.), Panipat on failures, repairs and various costs for an Oil Delivering System. Chapter 3 analyses two unit cold standby oil delivering system. The concept of switching over to the other similar system has been introduced here. Chapter 4 is extension of previous chapter and here concept of two types of failure modes is used i.e. unit may fail completely either
directly from normal mode or via partial failure. In case of partial failure the repair of the unit is done by switching off the unit. Repair of the units are done on FCFS basis. Chapter 5 is connected to chapter 4 and here system has both off line as well as on line repair facility on the occurrence of partial failure. Chapter 6 discusses the same system as discussed the system in chapter 4 except that in the situation of failure of both the units priority is given to the partially failed unit over the completely failed unit for the repair. Chapter 7 studies the same system as studied in chapter 5 but for repair priority is given to partially failed unit over completely failed unit. Chapter 8 comparative study of the models discussed in the above chapters has been done through graphs and various important conclusions have been drawn.

All the models discussed in the thesis have been analyzed by making use of semi-Markov processes and regenerative point technique. Various measures of the system effectiveness such as MTSF, steady-state availability, busy period analysis of the repairman, expected number of replacements, mean down time, and have been obtained. Profit is evaluated. Graphical study is also made for the cost benefit analysis for the models of the chapters 3 to 7.