

Exam: Mid-Semester Examination (MS QMS)

Subject: Reliability, Maintainability & Safety -1 (RMS-1)

Duration: 2.0 hrs. Max marks: 50

Answer any five Questions:

1. The probability that a person has a certain disease is **0.03**. Medical diagnostic tests are available to determine whether the person actually has the disease. If the disease is actually present, the probability that the medical diagnostic test will give a positive result (indicating that the disease is present) is **0.90**. If the disease is not actually present, the probability of a positive test result (indicating the disease is present) is **0.02**.
 - a) Suppose that the medical diagnostic test has given a positive result (indicating that the disease is present). What is the probability that the disease is actually present?
 - b) If the medical diagnostic test has given a negative result (indicating that the disease is not present). What is the probability that the disease is actually not present? **[5+5]**
2. You plan to invest Rs. 1000/- in a corporate bond fund or in a common stock fund. The following table present the annual returns (per Rs. 1000/-) of each of these investments under various economic conditions and the probability of each of those economic will occur.

Probability	Economic Condition	Corporate bond fund	Common stock fund
0.01	Extreme recession	-200	-999
0.09	Recession	-70	-300
0.15	Stagnation	30	-100
0.35	Slow growth	80	100
0.30	Moderate growth	100	350
0.10	High growth	120	350

Would you invest in the corporate bond fund or the common stock fund? Explain **[10]**

3.
 - a) Explain the memoryless property of a random variable.
 - b) Show that Geometric distribution is memoryless.

4. a) Write down the Poisson approximation to Binomial Distribution.
b) A process produces 1 defective item in every 100 item produced. You are interested to calculate the probability of more than one defect in a sample of 10. Show that the probability will be almost same if you calculate the probability using either Binomial or Poisson distribution. **[4+6]**
5. In a plastic bottle manufacturing process, a bottle is scrapped if any visual non-conformity (defect) is observed in the final inspection. In a recent past order there was 50 defects in 1000 bottles. If the process remain the same, then how many bottles need to be manufacture to fulfill an order of 10000 bottles? **[10]**
6. A dry fruit packaging machine produces 8 defective packets in every 100 packets. What is the probability that the first defective packet will be identifies when 10th one is tested? What is the probability that more than 10 packets to be tested to detect the first packet? **[5+5]**