Time: 03 Hrs.   Max. Marks: 80

1) Attempt any four questions.
2) Assume additional data if necessary & state the same.
3) Figures to the right indicates full marks.

1. a) Explain in detail the various redundancies used to improve the reliability of a system   [10]
b) A company in manufacturing electric bulbs. The bulbs were put to real life test for
   target performance under simulated condition. The test results are as follows-

| No. of bulbs	3	10	20	30	15	10	10	2
Time in hrs. in failures	1000	1200	1500	2000	2200	2500	2700	3000

Determine failure density, hazard rate and reliability.   [10]

2. a) A manufacturer of FAX machines claim that only 10% of his machine will require repairs
   within the warranty period of 12 month. If 5 of 20 of his machine required repair within the first
   year. Does this tend to support or refuse the claim?   [10]
b) The time to repair a power generator is best described by its probability density function

   $m(t) = \frac{t2}{333}$, $1 \le t \le 10$ hours:
         1) Find the probability that a repair will be completed in 6 hours.
         2) What is MTTR
         3) Find the repair rate   [10]

3. a) It is known that 5% of the book bound at a cretin bindery have defective bindings. find the
   probability that 2 of 100 books bound by this bindery will have defective binding using the
   Poisson approximation to the binomial distribution.   [10]

b) What is k out of n structure system? Derive for reliability of k out of n structure system.   [10]

4. a) Calculate system reliability from following figure.   [10]
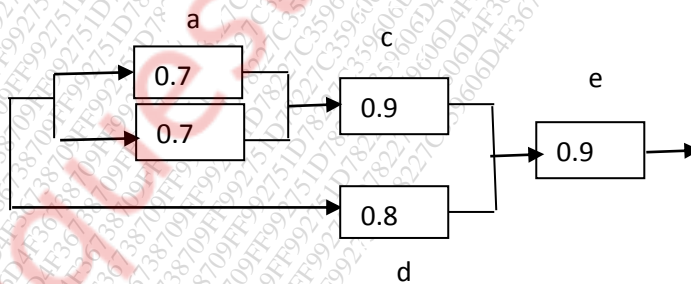

b) Briefly describe the Failure Mode and Effect Analysis (FMEA) procedure.   [10]

5. a) Explain in detail 'Bath Tub Curve' in Reliability   [05]
   b) Distinguish between repair and replacement   [05]
   c) Define and derive hazard rate, failure density and MTTF in terms of reliability.

                                                                                                 [10]

6. a) Determine reliability of the system as shown in figure by the following methods:
    a. Cut-Set Method
    b. Decomposition Method
    c. Enumeration Method. [14]
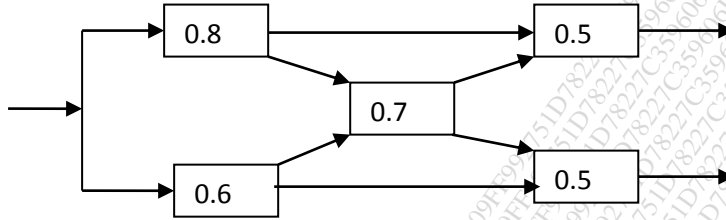
b) Describe in detail the qualitative aspects of Availability. [6]

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