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OMDQ/M-20 **2420**

RELIABILITY AND RENEWAL THEORY

Paper–ST-403 & ST-404

Option–(i)

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) Discuss Weibell model.

   (b) Find the reliability of four components system that functions when components 1, 4 and atleast one of the other components function.

   (c) What do you mean by stand by? Discuss different types of stand by.

   (d) State Elementary Renewal theorise.

   (e) Give one example of alternating renewal processes.

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UNIT–I

2. (a) Establish the interrelation between failure density, failure rate and reliability. Also differentiate between reliability and availability.

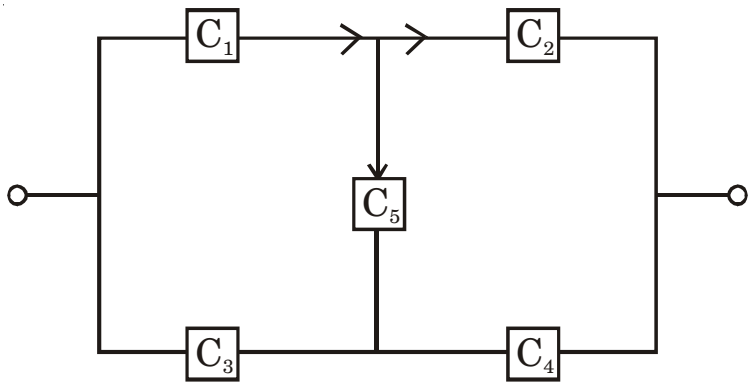
   (b) Define series, parallel and k-out of n system structures with example. Find the reliability and NTSF of n-identical unit series system with constant rates.

3. (a) The Hazard rate of a device is given by

   $h(t) = k - 1^m$

   Derive the corresponding R(t) and f(t).

   (b) Draw the logic diagram of following network and find the reliability :



UNIT–II

4. Give the minimal path sets and minimal cutsets for

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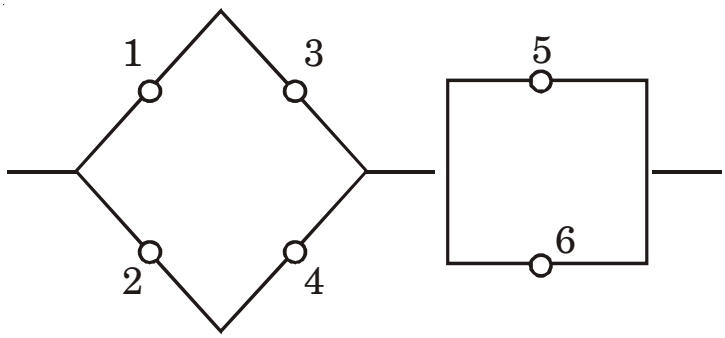
the following structure :



Also give the reliability function of the structures.

5. Find the relaibility of two identical units cord standby system with single repairman. Assume constant fairlure rates. Also find the availabity of the system.

UNIT–III

6. Define Renewal process Consider a renewal process {N (t), t ≥ 0} having a Gamma (r, λ) interarrival distribution, show that :

$$P[N(t) \geq n\} = \sum_{i=4r}^{\infty} \frac{e^{-\lambda t}(\lambda t)^i}{i}.$$

7. (a) For a Renewal process whose interarrival times are uniformly distributed over (0, 1), determine the expected time form t = 1 until the next renewal.

   (b) Find the r th moment of limiting distribution of S_n.

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UNIT–IV

8. Define Forward and Backward recurrence time. Derive the distribution of Forward recurrence time.

9. (a) State and prove Blackwell renewal process.

   (b) Define Regenerative process. Give some examples.