

Ph. D. IN STATISTICS (PHDSTAT)

Term-End Examination

December, 2024

**RST-006 : RELIABILITY THEORY AND
MODELLING**

Time : 3 Hours

Maximum Marks : 100

Note : (i) Attempt any **five** questions.

(ii) Use of scientific calculator (non-programmable) is allowed.

(iii) Symbols have their usual meanings.

1. (a) Define Laplace and Laplace-Stieltjes transforms. 4

(b) Find the inverse Laplace transform of : 8

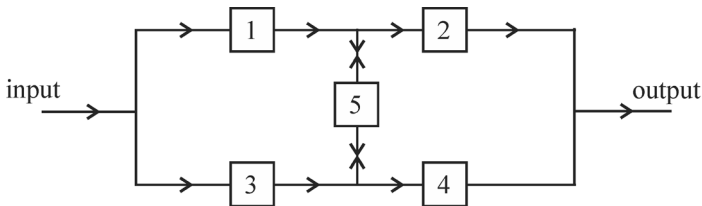
$$\frac{s^2 + s}{(s^2 + 1)(s^2 + 2s + 2)}.$$

(c) Evaluate : 8

$$L\left(\int_0^t e^t \frac{\sin t}{t} dt\right)$$

2. Define stochastic process and types of stochastic process with at least *one* example of each type. 20
3. Define Reliability. What are basic functions in Reliability ? Also discuss reliability evaluation of series, parallel and *k-out-of-n* simple systems. 20
4. Using conditional probability approach, evaluate the reliability of the system shown in the figure given as follows for a mission of 1000 hours. It is given that each component has reliability of 0.95 for a mission of 1000 hours. Assume that the components are independent :

20



5. Define each of the following with example :

5×4=20

- (i) Markov process
- (ii) Markov chain
- (iii) Transition matrix
- (iv) Poisson process
- (v) Renewal process

6. Describe regenerative point technique to solve reliability model. 20

7. Given the following 10 failure times in hours, estimate $R(t)$, $F(t)$, $f(t)$ and $\lambda(t)$ and compute a 90% confidence interval for the MTTF : 20
24.5, 18.9, 54.7, 48.2, 20.1, 29.3, 15.4, 33.9, 72.0, 86.1

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