# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **STATISTICS** 

**PART-A** 

FIFTH SEMESTER - NOVEMBER 2022

# **UST 5501 – APPLIED STOCHASTIC PROCESSES**

Date: 23-11-2022 Dept. No. Time: 09:00 AM - 12:00 NOON

# Answer ALL the questions

- 1. Define Stochastic Process.
- 2. What is state space? Give example.
- 3. Define Stationary distribution.
- 4. Define Markov process.
- 5. State the postulates for Poisson process.
- 6. What is Birth and Death process?
- 7. Define renewal process.
- 8. State the basic renewal theorem.
- 9. Define Probability of extinction.
- 10. Explain the probability generation functions of Branching processes.

#### PART-B

## Answer any FIVE questions

- 11. Elaborate on the classification of stochastic processes based on time and state space with example.
- 12. Describe Poisson process with two examples.
- 13. Derive  $P_n(t)$  for the Poisson process.
- 14. Discuss age replacement policy in renewal process.
- 15. Find the mean and variance of Branching process.
- 16. Derive the differential equation of pure birth process.
- 17. Show that one-dimensional random walk is recurrent.

18. Let  $\{X_n, n \ge 0\}$  be a markov chain having state space  $S = \{1, 2, 3, 4\}$  and transition matrix

P=	[1/3	2/3	0	ך 0
	1	0	0	0
	1/2	0	1/2	0
	0	0	1/2	1/2

Find equivalence classes. Also find period of states.

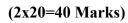
#### PART-C

## Answer any TWO questions

- 19. Explain in detail different types of stochastic processes.
- 20. (i) State and prove the elementary Renewal Theorem.
- (ii) State and prove the necessary and sufficient condition for state i to be recurrent. (10 marks)
- 21. Show that the Poisson process can be viewed as a renewal process.
- 22. (i) State and prove the backward Kolmogorov differential equations for birth and death process.

(ii) Explain Type I counter model in renewal process.

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(5x8=40 Marks)

Max.: 100 Marks

(10 x 2 =20 Marks)

(10 marks)

(10 marks)

(10 marks)