S.No. 6847 **P 16 MAE 2 A**

(For candidates admitted from 2016–2021 batch)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023.

Mathematics — Elective

STOCHASTIC PROCESSES

Time : Three hours Maximum : 75 marks

PART A — $(10 \times 2 = 20)$

Answer ALL questions.

1. Define order of a Markov chain.
2. What is path in a digraph?
3. Define persistent.
4. Define periodicity.
5. Write down an additive property of poisson process.
6. What is jump process?
7. Explain Yule – Furry process.
8. What is renewal process?

9. Explain traffic intensity.

10. What is processor – sharing?

PART B — (5 × 5 = 25)

Answer ALL questions, choosing either (a) or (b).

11. (a) Explain simple queuing model.

Or

(b) State and prove Chapman – Kol mogorov equation.

12. (a) Prove that state j is persistent iff $\sum_{n=0}^{\infty} p_{jj}(n) = \infty$.

Or

(b) State and prove Ergodic theorem.

13. (a) State and prove the difference of two independent poisson processes.

Or

(b) Find the probability that the customer arrive at a counter in accordance with a poisson process with mean rate of 2 per minute then the interval between any two successive arrivals following distribution with mean $\frac{1}{\lambda} = \frac{1}{2}$ minute.

14. (a) Derive the relation between $f(s)$ and $\rho(s)$.

Or

(b) State ad prove central limit theorem for renewal process.

15. (a) Explain the queuing model GI/M/1.

Or

(b) Explain P.K. Transform formula.

PART C — (3 × 10 = 30)

Answer any THREE questions.

16. Explain the Polya's urn model.

17. Explain about the Markov chains with continuous state space in Queuing process.

18. Prove that the p.g.f. of a non-homogeneous process $\{N(t), t \geq 0\}$ is given by $Q(s,t) = \exp\{m(t)(s-1)\}$.

Where $m(t) = \int_0^t \lambda(x)\,dx$ is the expectation of N(t).

19. State and prove Wald's equation.

20. Explain Birth and death process in queuing theory for Markovian model.