QP CODE: 24800578

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Reg No : .....

Name : .....

INTEGRATED MSC DEGREE EXAMINATION, DECEMBER 2023

Sixth Semester

NTEGRATED MSC BASIC SCIENCE-STATISTICS

CORE - IST6CR03 - MARKOV PROCESSES AND QUEUEING MODELS.

2020 Admission Onwards

048B8B0E

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Which are the four different types of stochastic processes according to their state space and parameter space?
2. What do you mean by evolutionary process?
3. Define Absolute probability.
4. What is meant by recurrent and transient states of a markov chain?
5. What is Class and Class property?
6. Define immigration-emmigration process.
7. Give Kolmogorov backward differential equation.
8. Define a queueing system.
9. What do you mean by M/M/1 queue?
10. Define a M/M/infinity queue.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Explain the following:
    i) Process with independent increments.
    ii) Gaussian process.

12. Explain :
    1) Stong markov property
    2)Transition probability matrix

13. i) What is meant by recurrent and non-recurrent states?
    ii) Distinguish between essential and non-essential states.

14. Prove the following:
    i) A persistent state communicate only with a persistent state.
    ii) A transient state communicate with a transient state.

15. State and prove additive property of poisson process.

16. Obtain the relationship between poisson process and geometric distribution.

17. Obtain Little's formula.

18. Derive the waiting time distribution of M/G/1 queue.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. i) Explain markov process with examples.
    ii) Obtain Chapman-Kolmogorv equations.

20. Suppose that the probability of dry day following a rainy day is 1/3 and probability of rainy day following a dry day is 1/2.
    Find
    a) Given May 1^{st} is a dry day then find the joint probability of May 2^{nd} and 3^{rd} will be a rainy day.
    b) Given May 1^{st} is a rainy day then find the probability that May 4^{th} will be a rainy day.
    c) Check whether markov chain is irreducible.
    d) Check whether markov chain is aperiodic.

21. State and prove any three properties of poisson process.

22. Make an explanatory note on M/M/1/k queues.

(2×5=10 weightage)