A Proposal for Queuing Theory and Modelling

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I. Introduction

Queuing Theory and Modelling is a vital area of operations research and applied mathematics that focuses on analysing and optimizing systems where waiting lines (queues) form. These systems are ubiquitous, found in everyday scenarios such as customer service lines, computer networks, manufacturing processes, and telecommunications.

The Queuing Theory and Modelling Virtual Lab provides an interactive platform for students, researchers, and professionals to explore and understand the fundamental principles and advanced concepts of queuing theory. Through a series of simulations and experiments, users can model real-world queuing systems, observe their behaviour, and analyse performance metrics such as wait times, queue lengths, and system efficiency.

This virtual lab allows users to experiment with different queue configurations, service disciplines, and arrival patterns, making it easier to visualize and comprehend the impact of various parameters on system performance.

II. Objectives of the Virtual Lab

The origins of queueing theory can be found in stochastic processes, and it is frequently utilised in operations research, probability, and statistics. Chemical kinetics, dynamic systems, telecommunications, computer systems, wireless networks, and financial mathematics are only a few of the applications. The main goal of this virtual lab is to create a software application that will assist students in comprehending and visualising queue principles, as well as providing them with the essential insight to apply queueing systems to real-world issues.

III. List of experiments

(A Virtual Lab consists of 10 experiments*)

1. Markovian queues with single serve (infinite capacity)(M/M/1).
2. Markovian queues with multiple-server (infinite capacity)(M/M/c).
3. Finite capacity single server Markovian Models (M/M/1/N).
4. Finite capacity multi-server Markovian Models (M/M/c/N).
5. Finite capacity single server queue with general distributed arrivals and exponential service (GI/M/1/N)
6. Finite capacity single server queue with exponential arrivals and general distributed service (M/G/1/N).
7. Finite capacity multi-server queue with general distributed arrivals and exponential service (GI/M/c/N).
8. Finite capacity multi-server queue with exponential arrivals and general distributed service (M/G/c/N).
9. Infinite capacity single server queue with general distributed arrivals and exponential service (GI/M/1).
10. Infinite capacity single server queue with exponential arrivals and general distributed service (M/G/1)-.

IV. Mapping of Proposed Lab with AICTE and UGC Courses

AICTE Course Mapping

Course: Queuing Theory and Modelling (PEC-CST)

UGC Approved Courses in Different Universities

S. No.	Discipline	Lab Name	University Name	Programme & Semester
1	Electrical Engineering (EE)	Stochastic Modelling and Theory of Queues (EE6150)	IIT Madras, Madras	M.Tech. (I/III)
2	Electrical Engineering (EE)	Markov Chains and Queuing Systems (EE621)	IIT Bombay, Bombay	M.Tech. (I/III)
3	Computer Science (CS)	Computer Network Analysis (CS549)	IIT Mandi, Mandi	B.Tech. (after IV)

4	Mathematics (MA)	Queuing Theory and Applications (MA597)	IIT Guwahati, Assam	B.Tech. (VII/VIII)
5	Computer Science (CS)	Markov Chains and Queueing Models (CS426)	IIT Gandhinagar, Gujarat	B.Tech.
6	Operational Research (OR)	Queuing System (MOR103)	Delhi University, Delhi	M.Sc. (I)
7	Statistics (ST)	Theory of Queues (ST-403)	Kurukshetra University, Haryana	M.Sc. (IV)