Banasthali Vidyapith

Department of Computer Science

MCA/ M.Sc. (CS) Third Semester/ M.Tech. (CS) First Semester (July - December 2025)

CS 419 Distributed Computing

First Assignment

Submission by: Wednesday, 20-August-2025 03:10 p.m.

1. Differentiate among the following types of operating systems by defining their essential properties:
(a) Time sharing   **(b)** Parallel processing
(c) Network   **(d)** Distributed

2. In what respect are distributed computing systems better than parallel processing systems? Give examples of three applications for which distributed computing systems will be more suitable than parallel processing systems.

3. Explain the difference between the terms *service* and *server.* In the design of a distributed operating system, discuss the relative advantages and disadvantages of using a single server and multiple servers for implementing a service.

4. What is *groupware?* Why is it considered to be a promising technology for software development?

5. Differentiate between the monolithic kernel and microkernel approaches for designing a distributed operating system. Discuss their relative advantages and disadvantages.

6. Describe blocking and nonblocking types of IPC. Which is easier to implement and why? Discuss their relative advantages and disadvantages.

7. Give two examples of applications for which each of the following types of multicast communication is most suitable:
(a) The 0-reliable   **(b)** The l-reliable
(c) The m-out-of-n reliable $(1 < m < n)$ **(d)** All-reliable

8. What is an idempotent operation? Which of the following operations are idempotent:
(a) *read_next_record* (filename)   **(b)** *readrecord* (filename, recordnumber)
(c) *append_record* (filename, record)   **(d)** *writerecord* (filename, after_record_n, record)
(e) *seek* (filename, position)   **(f)** *add* (integer_I, integer_2)
(g) *increment* (variable_name)

9. Suggest whether at-least-once or exactly-once semantics should be used for each of the following applications (give reasons for your answer):
(a) For making a request to a file server to read a file
(b) For making a request to a file server to append some data to an existing file
(c) For making a request to a compilation server to compile a file
(d) For making a request to a database server to update a bank account
(e) For making a request to a database server to get the current balance of a bank account
(f) For making a request to a booking server to cancel an already booked seat

10. What is the main purpose of using an acknowledgment message in an IPC protocol? Are acknowledgment messages always needed for reliable communication? Give reasons for your answer.

Vivek Purohit, Associate Professor (Computer Science), Banasthali Vidyapith

Suggested Readings:
1. Sinha, P.K. (1998). *Distributed Operating Systems: Concepts and Design.* Prentice-Hall of India Private Limited.
2. Tanenbaum, A.S. (2009). *Modern Operating Systems.* Pearson Education, Inc.
3. Rumelhart, D. E., McClelland, J.L., & PDP Research Group. (1987). *Parallel Distributed Processing* (Vol. 1 & Vol. 2). Cambridge, MA: MIT Press.

Instructions for Students:

1. The assignment is to be submitted in hard copy.

2. The assignment answers should be self-hand-written with blue or black ink on plain or ruled sheets.

3. The assignment should contain a cover page with following details:

> **First Assignment**
> **CS 419: Distributed Computing**
> **MCA Third Semester/ M.Sc. (CS) Third Semester/ M.Tech. (CS) First Semester**
> **Submitted by: Student's Name**
> *Examination Roll Number*

4. The assignment pages should be properly numbered and the assignment should contain Table of Contents (with page number column), and References.