Course Code	**:**	**MCS-022**
Course Title	**:**	**Operating System Concepts and Networking Management**
Assignment Number	**:**	**BCA(VI)/022/Assignment/2026-27**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**31st October, 2026 (For July 2026 Session)**
	:	**30th April, 2027 (For January 2027 Session)**

Note: This assignment consists of eight questions carrying 80 marks in total. The remaining 20 marks are allotted for viva voce. Answer all the questions. Illustrate your answers with suitable diagrams, tables and examples wherever required.

Q1:

(a) A software company has recently expanded its operations from one office to five geographically distributed development centres. The management wants employees to access shared computing resources without knowing the physical location of the servers.

Compare a **Distributed Operating System** and a **Network Operating System** with respect to:

- Resource sharing
- Transparency
- Scalability
- Fault tolerance

Suggest the most suitable operating system model for this organization with proper justification. **(5 Marks)**

(b) What are **system calls?** Explain how a user application requests memory allocation from the operating system using system calls. Illustrate the transition between **user mode** and **kernel mode** with a neat diagram. **(5 Marks)**

Q2:

(a) A manufacturing company uses four processes (P1–P4) competing for three resources (A, B and C). The resource allocation is shown below. **(5 Marks)**

Process	Allocation	Maximum Requirement
P1	1 0 1	3 2 2
P2	2 1 0	4 2 2
P3	0 1 2	2 2 3
P4	1 1 1	3 3 2

Available Resources:

A = 2

B = 1

C = 1

Using **Banker's Algorithm**

- Calculate the Need Matrix.
- Determine whether the system is in a safe state.
- If safe, write one safe execution sequence.

(b) Differentiate between **Round Robin Scheduling** and **Shortest Remaining Time First (SRTF)** scheduling. **(5 Marks)**

Discuss which scheduling algorithm is more suitable for:

- An online banking server
- A batch payroll processing system

Give reasons.

Q3:

(a) A computer system uses paging with **(5 Marks)**

- Logical Address Space = 128 KB
- Physical Memory = 256 KB
- Page Size = 8 KB

Calculate:

1. Number of pages
2. Number of frames
3. Page number and offset for logical address **57320**

(b) A university server begins responding slowly because many student applications are executing simultaneously. Explain the concept of **thrashing**. Discuss any **two operating system techniques** that can reduce or eliminate thrashing. **(5 Marks)**

Q4:

(a) Explain the structure of an **inode** in Linux. Describe the purpose of the following information stored inside an inode: **(5 Marks)**

- File permissions
- User ID
- Group ID
- File size
- Timestamps
- Data block pointers

Why is inode-based file management considered efficient?

(b) Write a Linux shell script that accepts a directory name as input and performs the following tasks: **(5 Marks)**

- Counts all executable files.
- Counts all hidden files.
- Displays the total size occupied by the directory.
- Displays an appropriate error message if the directory does not exist.

Q5:

(a) A university consists of four campuses and several departments. Explain how **Active Directory** can be designed for this university. **(5 Marks)**

Describe the roles of:

- Domain
- Organizational Unit (OU)
- Tree
- Forest

Use a suitable diagram.

(b) Differentiate between **Workgroup** and **Domain-based** networking. Why would a university with more than 1000 computers prefer a domain environment? Discuss at least two advantages. **(5 Marks)**

Q6:

(a) An employee connects a newly installed desktop to the office network and immediately receives a valid IP address automatically. Explain the complete **DHCP process** using the DORA mechanism. Illustrate each stage with a simple flow diagram. **(5 Marks)**

(b) Explain the working of the **Domain Name System (DNS)**. Differentiate between:

- Recursive Query
- Iterative Query

Support your answer with suitable examples. **(5 Marks)**

Q7:

(a) A company wants secure communication between its headquarters and branch offices through the Internet. Explain how **IPsec VPN** provides secure communication. **(5 Marks)**

Compare:

- Transport Mode
- Tunnel Mode

Illustrate both modes using diagrams.

(b) What is **Encrypting File System (EFS)**? Explain how EFS protects confidential documents stored on Windows systems. Compare EFS with BitLocker in terms of functionality and applications. **(5 Marks)**

Q8:

Write short notes on the following: **(10 Marks)**

(a) RAID Levels (RAID 5 and RAID 10)

(b) Virtual LAN (VLAN) and its advantages

(c) Linux user administration commands (useradd, usermod, passwd, chgrp)

(d) Difference among Gateway, Router and Layer-3 Switch

Q1:

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Compare a Distributed Operating System and a Network Operating System with respect to:

- **Resource sharing**
- **Transparency**
- **Scalability**
- **Fault tolerance**

Suggest the most suitable operating system model for this organization with proper justification. (5 Marks)

Answer

A **distributed operating system (DOS)** makes computers at different places work like parts of one combined system. In a **network operating system (NOS)**, each computer keeps its own operating system, and users normally access another computer through network services. The main difference is how much the system hides the separation between machines.

Basis	Distributed Operating System	Network Operating System
Resource sharing	Resources across nodes can be managed as one pool; a service may be selected automatically.	File shares, printers and services are offered by individually identified servers.
Transparency	High location and access transparency: users need not know which machine runs a task.	Lower transparency: server names, connections or shares may be visible.
Scalability	Can add machines and distribute load, but coordination and communication are challenging.	Easy to expand by joining servers, though management may remain separate.