**By Maha Rana**

# IT602 Finalterm subjective solved

## 1. Network Virtualization

Network Virtualization (NV) refers to the process of abstracting physical network resources and delivering them as virtual network services. It allows multiple physical networks to be combined into a single virtual network or a single physical network to be divided into multiple virtual networks.

**Key Features:**

- **Decouples network services from hardware:** Network functionalities like routing, switching, and firewalling are delivered in software.
- **Allows programmatic network management:** Administrators can create, configure, and manage virtual networks through software.
- **Enables flexibility and scalability:** Virtual networks can be adjusted easily without modifying the physical infrastructure.
- **Enhances security and efficiency:** Virtualized networks allow better control over data traffic and resource utilization.

 **Example:** Cloud environments where multiple tenants share the same physical network but have separate, secure virtual networks through VLANs or VXLANs.

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## 2. Container Technology

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Container Technology is a type of server virtualization that allows multiple isolated environments (containers) to run on the same operating system kernel. Unlike traditional virtual machines, containers do not require a separate OS installation for each instance, making them lightweight and efficient.

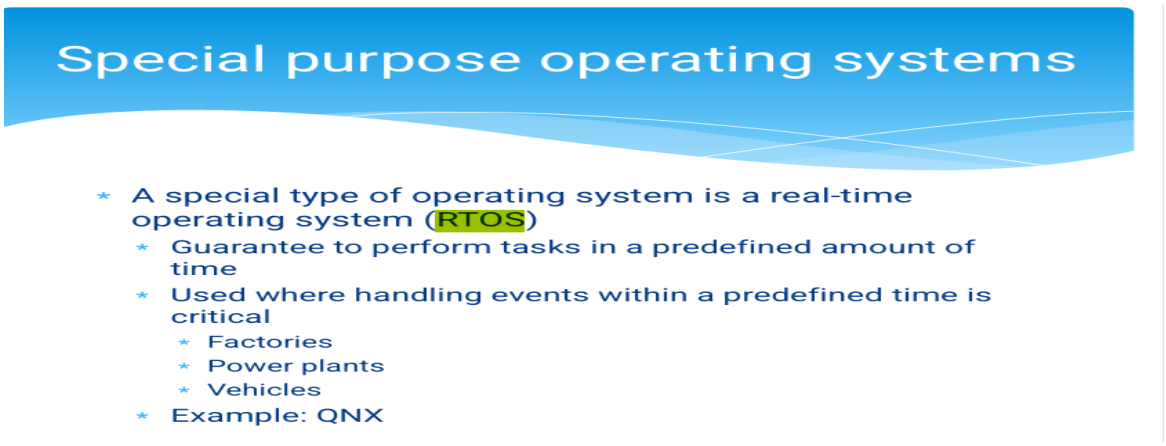
**Key Features:**

- **Isolation:** Each container runs independently with its own libraries and dependencies.
- **Portability:** Containers can run consistently across different environments, such as on-premises servers and cloud platforms.
- **Fast Deployment:** Applications in containers can be deployed quickly, making them ideal for DevOps and microservices architectures.

 **Example: Docker** and **Kubernetes** are popular containerization platforms used to manage and deploy containers efficiently.

**Short Question:**

**3. Special Purpose Operating System Names**



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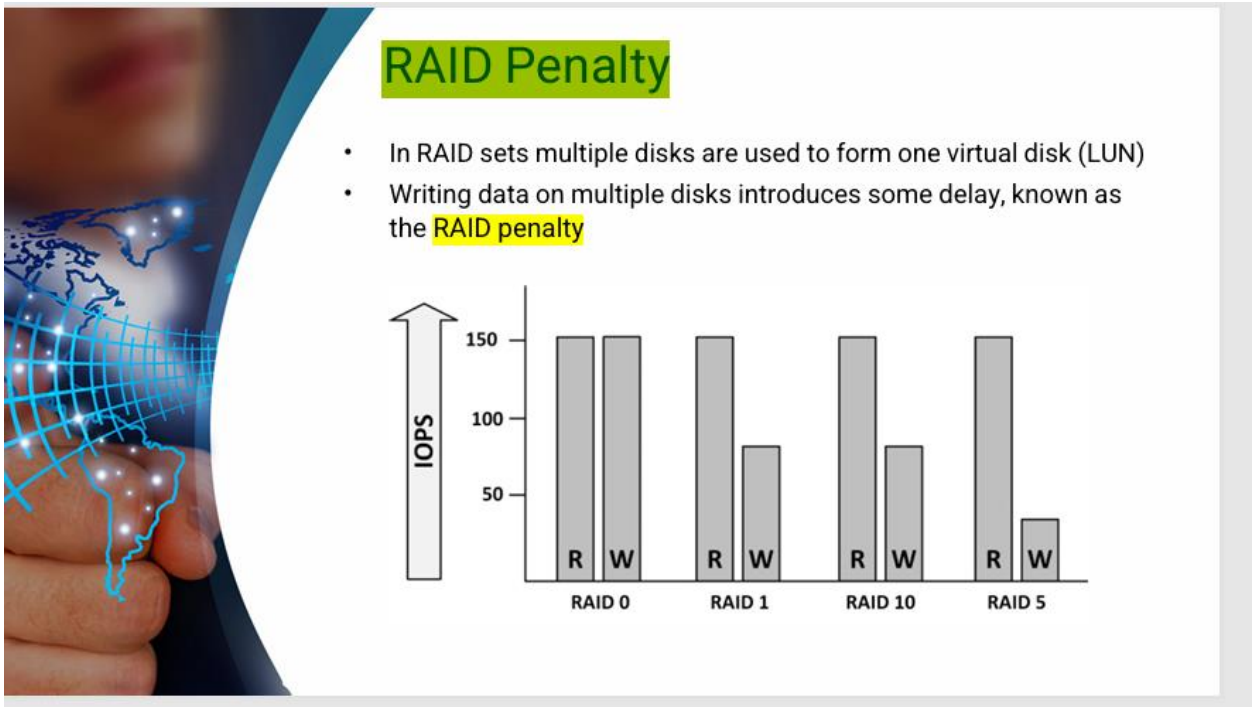
## 4. Drawbacks of Virtualization

- **Increased Resource Consumption** – Running multiple virtual machines on a single server can lead to performance degradation.
- **Security Risks** – If vulnerability exists in the hypervisor, all virtual machines can be compromised.
- **Management Complexity** – Requires additional tools, training, and expertise to maintain virtual environments.

## 5. What is Vendor Lock-in?

Vendor lock-in occurs when a company becomes dependent on a particular vendor's technology, making it difficult to switch to another provider due to compatibility issues, high switching costs, or proprietary technologies.

## 6. What is RAID Penalty and How Much is It?



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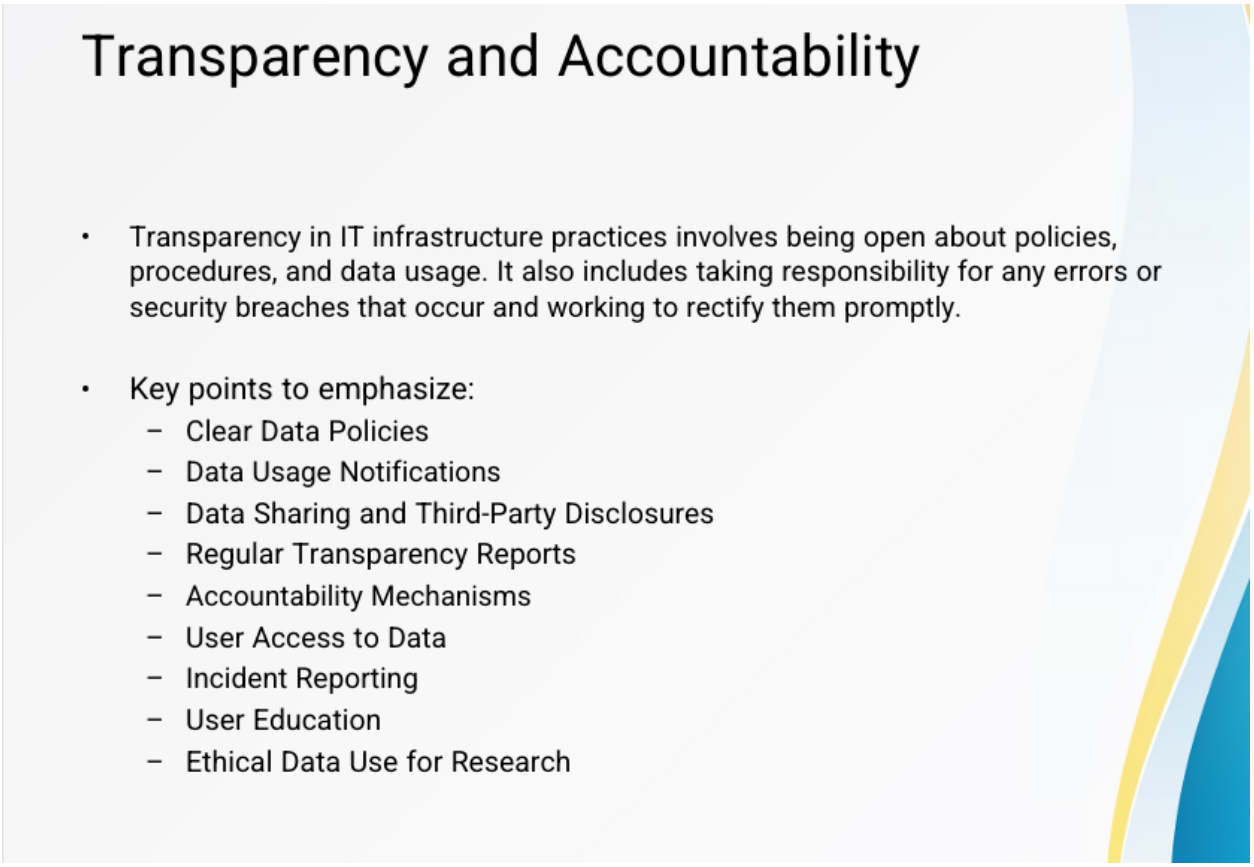
## 7. How to Achieve Transparency in Ethics (Any 3 Points)




## Long Questions

### 8. Layered Network Topology and Its Layers

• A network infrastructure should be built up in layers

– Improve availability and performance

– Provides scalability– Provides deterministic routing

– Avoids unmanaged ad hoc data streams

• Provides high availability

– Because the layering provides multiple paths to any piece of equipment.

**Layers of Layered Network Topology:**

• **Core layer**– This is the center of the network.

• **Distribution layer**– An intermediate layer between the core layer in the datacenter and the access switches in the patch closets– Combines the access layer data and sends its combined data to one or two ports on the core switches.

• **Access layer**– Connect workstations and servers to the distribution layer– For servers, located at the top of the individual server racks or in blade enclosures– For workstations, placed in patch closets in various parts of the building**.**

9. **READ Command in OS**

   The **READ** command in an operating system is used to retrieve data from storage devices such as hard drives or memory.

**Functions of the READ Command:**

- Allows programs to access and retrieve data from files.
- Works with system calls like `read()` in UNIX/Linux.
- Ensures efficient data transfer between memory and storage devices.
- Can be synchronous (blocking) or asynchronous (non-blocking).

For example, in **Linux**, the `read()` system call works as follows:

```
ssize_t read(int fd, void *buf, size_t count);
```

Where:

- `fd` = file descriptor
- `buf` = buffer to store the data
- `count` = number of bytes to read

### 10.Ethics in IT Infrastructure (Any 5 Points)


### Short Questions

### 11.File Sharing Protocol Name:

**–File sharing protocols:**

• NFS: originates from UNIX

• SMB/CIFS: originates from Windows

### 12. Define Network Virtualization

Network Virtualization (NV) is a process where physical network resources are abstracted and provided as virtual services. It enables the creation of multiple virtual networks over a single physical network infrastructure.

### 13. RAID Penalty Meaning & Configurations

- In RAID sets multiple disks are used to form one virtual disk (LUN)
- Writing data on multiple disks introduces some delay, known as the RAID penalty
- **Configurations & Write Penalty:**
  - **RAID 1 (Mirroring):** No write penalty.
  - **RAID 5 (Striping with Parity):** Write penalty = **4**.
  - **RAID 6 (Double Parity):** Write penalty = **6**.

### 14. Management Console Meaning & Uses

–The systems management console connects to all hypervisors and virtual machines

–When the security of the systems management console is breached, security is breached on all virtual machines

–Not all systems managers should have access to all virtual machines

–Special user accounts and passwords should be configured for high risk operations like shutting down physical machines or virtualized clusters

–All user activity in the systems management console should be logged.

## □ Long Questions

### 15. Capacity Management Objectives

Capacity Management ensures the timely availability of sufficient infrastructural capacity to process, transport, and store data now and in the future

**Objectives:**

1. **Optimize Resource Usage** – Ensures CPU, memory, and storage are efficiently utilized.
2. **Prevent Performance Issues** – Avoids system slowdowns due to overutilization.
3. **Cost Efficiency** – Reduces unnecessary hardware expenses.
4. **Scalability** – Helps in planning for future growth.
5. **Proactive Monitoring** – Identifies potential capacity issues before they impact services.

### 16. Storage Replication Types & Differences

| Replication Type | Definition | Key Difference |
|---|---|---|
| **Synchronous Replication** | Data is written to both primary and secondary storage at the same time. | Ensures real-time data consistency but adds latency. |
| **Asynchronous Replication** | Data is first written to primary storage, then replicated to secondary storage after a delay. | Faster performance but may cause data loss if failure occurs before replication. |

## 17. Security Features & How They Work

1. **Firewalls** – Block unauthorized network traffic by filtering packets based on rules.
2. **Encryption** – Protects data by converting it into unreadable formats using cryptographic keys.
3. **Access Control** – Restricts system access using authentication methods like passwords and biometrics.
4. **Intrusion Detection & Prevention (IDS/IPS)** – Monitors network activity and stops potential attacks.
5. **Backup & Disaster Recovery** – Ensures data recovery in case of failure or cyberattacks.

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## 18. How Performance Affects Operating System (3 Points + More)

1. **CPU Utilization:** High CPU usage can slow down task execution.
2. **Memory Management:** Efficient RAM usage prevents system slowdowns and crashes.
3. **Disk I/O Speed:** Faster storage access improves OS responsiveness.

 **Other Factors Affecting OS Performance:**

- **Process Scheduling:** Optimized scheduling prevents bottlenecks.
- **Network Latency:** Slow networks can delay system responses.
- **Background Services:** Too many running services consume system resources.

**Short Questions**

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## 19. IT Infrastructure Process

IT infrastructure process includes:

- **Planning & Design** – Setting up hardware, network, and security.
- **Deployment** – Installing servers, networks, and storage.
- **Monitoring & Maintenance** – Ensuring performance, security, and scalability.
- **Upgrades & Optimization** – Improving infrastructure based on usage.

## 20. RAID Penalty Types?

RAID penalty refers to additional write operations required for redundancy and data protection.

| RAID Level | Write Penalty |
|---|---|
| RAID 1 (Mirroring) | No penalty (Data is simply copied) |
| RAID 5 (Striping with Single Parity) | 4 (Each write = Read, Modify, Write, Parity Write) |
| RAID 6 (Striping with Double Parity) | 6 (Each write = Two Parity Calculations) |

## 21. Security Concern Process

- **Risk Assessment** – Identifying security threats.
- **Access Control** – Managing user permissions.
- **Data Encryption** – Protecting data from unauthorized access.
- **Incident Response** – Handling breaches and security issues.

### 22. IT Infrastructure (Accountability Aspects)

- **Transparency** – Clear policies and responsibilities.
- **Responsibility** – Ensuring IT staff follow security and compliance rules.
- **Audit & Compliance** – Regular checks to meet security standards.
- **Risk Management** – Identifying and mitigating IT risks.

### 6) Network Virtualization

Network Virtualization abstracts physical networking hardware into software-based virtual networks. It enables multiple isolated virtual networks over a single physical network infrastructure.

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### □ Long Questions

### 23. READ Command in OS

The **READ** command in an operating system retrieves data from storage devices like hard drives or memory.

**Functions:**

- Allows programs to access files and retrieve data.
- Works through system calls like `read()` in UNIX/Linux.
- Can be **blocking (synchronous)** or **non-blocking (asynchronous)** for performance optimization.

**□ Example in C (Linux read system call):**

```
ssize_t read(int fd, void *buf, size_t count);
```

Where:

- `fd` = File descriptor.
- `buf` = Buffer to store read data.
- `count` = Number of bytes to read.

### 24. Network Layer Protocol & Layers

The **Network Layer** is responsible for routing and delivering data between devices across different networks.

**Protocols in Network Layer:**

- **IP (Internet Protocol)** – Responsible for addressing and routing packets.
- **ICMP (Internet Control Message Protocol)** – Used for diagnostics (e.g., Ping command).
- **ARP (Address Resolution Protocol)** – Maps IP addresses to MAC addresses.

**Layers in Network Model:**

1. **Physical Layer** – Deals with transmission of raw data bits.
2. **Data Link Layer** – Manages MAC addressing and error detection.
3. **Network Layer** – Handles IP addressing and routing.
4. **Transport Layer** – Ensures end-to-end communication (TCP/UDP).
5. **Session Layer** – Manages sessions between applications.
6. **Presentation Layer** – Data encryption and formatting.
7. **Application Layer** – Provides network services to applications (HTTP, FTP, etc.).

## 25. Vendor Bidding (Procurement in IT Infrastructure)

**Vendor Bidding** refers to the process of selecting suppliers or service providers for IT infrastructure components.

**Key Steps:**

1. **Request for Proposal (RFP)** – Companies invite vendors to bid.
2. **Evaluation of Proposals** – Checking cost, features, and compatibility.
3. **Negotiation** – Finalizing price and contract terms.
4. **Selection & Procurement** – Choosing the best vendor and completing the deal.

 **Risk of Vendor Lock-in:** Some vendors use proprietary technologies, making it difficult to switch providers later.

## 26. Layered Network Topology

Layered Network Topology organizes network infrastructure into hierarchical layers for better performance, security, and scalability.

**Three Layers in Layered Network Model:**

1. **Core Layer** – High-speed backbone for network traffic.
2. **Distribution Layer** – Aggregates and forwards traffic between core and access layers.
3. **Access Layer** – Connects end-user devices like PCs and phones.

 **Benefits:**

- Improves **scalability** and **performance**.
- Provides **security** by isolating traffic.

- Supports **redundancy** and fault tolerance.

**27. Meaning of RADIUS**

**RADIUS (Remote Authentication Dial-In User Service)** is a networking protocol used for centralized authentication, authorization, and accounting (AAA) of users accessing a network.

 **Uses:**

- Provides authentication for network devices (e.g., routers, VPNs).
- Manages user permissions and access control.
- Used in enterprise and ISP environments for secure logins.

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**28. IT Infrastructure's 3 Steps According to Ethics**

Privacy and Data Protection • Transparency and Accountability • Accessibility

**4) System Management Console**

A **System Management Console** is a centralized interface used for monitoring, configuring, and managing IT infrastructure.

 **Functions:**

- **Monitoring:** Tracks system performance and usage.
- **Configuration:** Manages hardware and software settings.
- **Security:** Controls user access and permissions.

**Examples:**

- **Windows Admin Center** (for Windows Server management).
- **VMware vSphere** (for virtualization management).

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### 29. Deployment Infrastructure Model Names

There are **four** main deployment models for IT infrastructure:

1. **On-Premises (Traditional IT)** – Hardware and software managed in-house.
2. **Cloud Infrastructure** – Resources hosted on cloud service providers like AWS, Azure, or Google Cloud.
3. **Hybrid Infrastructure** – A mix of on-premises and cloud-based solutions.
4. **Edge Computing** – Processing data closer to the source (IoT devices, remote locations).

 **Long Questions**

### 30. DTAP Model (Development, Testing, Acceptance, Production)

The **DTAP model** is a structured approach to software deployment and IT infrastructure management.

 **Phases:**

1. **Development (D):** Coding and building the application.
2. **Testing (T):** Finding and fixing bugs.
3. **Acceptance (A):** Evaluating if the software meets business needs.
4. **Production (P):** Deploying the final version for end-users.

**Uses:**

- Ensures stability and security before deployment.
- Reduces risks of system failures.

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### 31. Five Purposes of an Operating System

1. **Process Management:** Allocates CPU resources to running applications.
2. **Memory Management:** Manages RAM allocation for efficient operation.
3. **File System Management:** Handles data storage and retrieval.
4. **Security & Access Control:** Protects user data through authentication and encryption.
5. **User Interface (UI):** Provides graphical or command-line interaction with the system.

### Short Questions

### 32. Kernel ke baare mein

The **Kernel** is the core component of an operating system that directly interacts with hardware and manages system resources.

 **Functions of Kernel:**

- **Process Management:** Handles running programs and multitasking.
- **Memory Management:** Allocates RAM for applications.
- **Device Management:** Controls hardware like disks, keyboards, and network devices.

- **System Security & Access Control:** Ensures data protection and system integrity.

### 33. Two File Transfer Protocols

1. **FTP (File Transfer Protocol):** Used for transferring files over a network.
2. **SFTP (Secure File Transfer Protocol):** Secure version of FTP using SSH encryption.

### 34. Cloud Computing (Detailed Explanation)

Cloud Computing provides on-demand access to computing resources (e.g., servers, storage, and applications) over the internet.

 **Types of Cloud Computing:**

1. **Public Cloud:** Services offered by third-party providers (AWS, Google Cloud).
2. **Private Cloud:** Exclusive cloud infrastructure for a single organization.
3. **Hybrid Cloud:** Combination of public and private cloud environments.
4. **Multi-Cloud:** Use of multiple cloud providers for redundancy and flexibility.

 **Benefits of Cloud Computing:**

- **Cost Efficiency:** No need for heavy upfront hardware investment.
- **Scalability:** Resources can be increased or decreased as needed.
- **Accessibility:** Services are available from anywhere with an internet connection.

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**May Allah grant you success, ease your efforts, and bless you with wisdom and perseverance. Keep your faith strong, for with prayer, every challenge becomes an opportunity. And please remember me in your prayers.**

**I hope this file helps you a lot; I have tried my best to find the most relevant and authenticated answers for the questions. However, in some cases, the questions might slightly differ from the ones in your slides. I recommend that every student kindly verify the answers on their own before using them. I am not responsible for any discrepancies.**

**Best wishes for Finals!**