1. a) What is process control block? Write down its main components.
b) What is an access control list? How is it used for securing data from the malicious users?
c) Write two basic differences between program and process. Give one example for each.
d) Why is multithreaded programming more efficient than multi-processing?
e) What is distributed operating system and how is it different from network operating system?
f) How is short term scheduler different from medium term scheduler? How is system performance depend upon the working of STS.
g) Why is translation look aside buffer important in paging technique?

2. a) Why is operating system known as a ‘Resource Manager’? Briefly explain service provided to each resource by the OS.
b) What are system threats? How does an operating system monitor and manages threat to provide secure computer system environment.

3. a) What is deadlock? What are the conditions for a deadlock to occur? How can it be avoided?
b) Consider the following table of 4 processes and determine whether the current allocation is in safe state for deadlock avoidance.

<table>
<thead>
<tr>
<th>Process</th>
<th>Max Need</th>
<th>Current usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>P2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>P3</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>P4</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

4. a) Draw process state transition diagram. When a process can transit from start (1) “start” to “end” (2) Running to wait.
b) What would be the effect of the system running too many I/O Jobs.
c) Differentiate between Internal and external memory Fragmentation.
5.
   a) What is a critical-section problem? How is a race condition avoided in the critical section? Explain giving one suitable example.
   b) Differentiate between:
      i) Multiprogramming and Multiprocessing
      ii) NTFS and FAT32
      iii) KERNEL mode and User mode

6.
   a) What is demand paging memory management technique? How is it different from demand segmentation? Explain giving one example for each technique.
   b) Briefly explain LRV page replacement technique. Give one scenario in which LRU is better than optimal page replacement technique.

7. Write short note on the following topics:
   a) Program threats and Security Threats
   b) Tertiary Storage devices
   c) Virtual Machines and Hypervisor