(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.

2) Figures to the right indicate marks.

3) Illustrations, in-depth answers and diagrams will be appreciated.

4) Mixing of sub-questions is not allowed.

Q. 1 Attempt all questions (15M)

(a) Multiple Choice Questions.

1. Software may trigger an interrupt by executing a special operation called a _____

A)system file   B) system program   C) system call   D) system software

2. Which is/are the advantage(s) of multiprocessor systems?
A) Increased throughput   B) Economy of scale
C) Increased reliability   D) all of these

3. _____ are necessary condition to occur deadlock
i. Mutual exclusion   ii. Hold and wait   iii. No pre-emption   iv. Circular wait
A) i, ii, iv   B) ii, iii, iv   C) i, ii   D) i, ii, iii, iv

4. In memory management, _____ registers define a logical address space.
A) a base and a limit   B) Program counter and temporary
C) Instruction and a limit   D) Accumulator and a base

5. The primary advantage of an _____ is the relative simplicity of the algorithms to traverse the graph and to determine when there are no more references to a file.
A) file B)acyclic graph C) single level directory D) tree structure

(b) Fill in the blanks.
(logical address, SCAN, CPU, thread library, page number, segment number)

1. A _____ provides the programmer with an API for creating and managing threads.

2. _____ bound process generates I/0 requests infrequently, using more of its time doing computations.

3. Every address generated by the CPU is divided into two parts: a _____ and a page offset

4. An address generated by CPU is commonly referred to as a _____.

5. In the _____ algorithm, the disk arm starts at one end of the disk and moves toward the end, servicing requests as it reaches each cylinder, until it gets to the other end of the disk.

(c) Answer in one or two sentences.
   1. What is mean by time sharing system?
   2. What is a device queue?
   3. Which methods are available to eliminate deadlock by aborting a process
   4. Which memory management strategies suffer from external fragmentation?
   5. What is file open count?

Q. 2 Attempt the following (Any THREE) (15M)
   (a) What are Distributed Systems? Give their advantages.
   (b) Write a note on client server computing and peer to peer computing
   (c) What is the use of system programs? Explain various categories of system calls.
   (d) Explain Process Control Block.
   (e) Explain indirect communication in message passing system.
   (f) What are single and multithreaded processes? Write benefits of multithreaded programming.

Q. 3 Attempt the following (Any THREE) (15M)
   (a) Write a note on Peterson's solution.
   (b) What is Semaphore? Write its usage.
   (c) Consider the following set of processes with the length of CPU burst time given in milliseconds. Illustrate the execution of the processes using Round Robin algorithm. Draw Gantt chart. Also calculate average waiting time and turnaround time. Given- Time quantum = 3 ms.

Process	Burst time
P1	3
P2	3
P3	6
P4	2
P5	4

   (d) Describe various criteria for CPU- scheduling algorithms.
   (e) What is resource allocation graph? Using resource allocation graph, show that a cycle in the graph is both necessary and sufficient condition for the existence of deadlock.
   (f) Explain safe state algorithm for deadlock avoidance.

Q. 4   Attempt the following (Any THREE)   (15)
  (a) Explain in short segmentation technique.
  (b) Describe procedure for handling page fault in virtual memory management with diagram.
  (c) Assume that there are total 200 tracks are present on each surface of the disk. If request queue is 45, 39, 90, 65, 180, 120 and initial position of the head is 50. Apply SSTF disk scheduling and calculate total head movements.
  (d) Explain in brief Single-level and Two- level directory structure.
  (e) Write a note on linear list and hash table algorithms for directory implementation.
  (f) Which are access method of file system, Explain

Q. 5   Attempt the following (Any THREE)   (15)
  (a) Write a note on operating system services.
  (b) What is Banker's Algorithm? Describe data structure needed to use in Banker's algorithm.
  (c) Consider the following page reference string and calculate total number of page faults using LRU and FIFO. (Assume frame size =3)
       Reference string – A,B,C,B,D,E,A,C,B,D
  (d) Describe various system calls used for File management and Device management.
  (e) What is Priority scheduling? Give an example. Write disadvantages of priority scheduling.

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