

**BE IT Third Year First Semester Examination 2024**  
**Subject: Operating System**

Full Marks – 100

Time: 1Hour

**General Instructions:**

1. This question paper consists of 5 questions, all are compulsory. However internal choice may be provided on some questions. Read these carefully before attempting any questions.
2. Write your name and roll number on every extra sheet taken by you.
3. Different parts of the same question should be answered together.
4. All symbols have their usual meaning unless otherwise stated.
5. Assume suitable data, if necessary.

**CO1: Discuss technologies used in different operating systems. (K2) (20 Marks)**

- 1) Answer any four of the following: [5×4]
- a) List out different types of Operating Systems? Differentiate between Multitasking and multiprogramming? [2+3]
  - b) Using Von Neumann architecture Discuss how modern computer works. [5]
  - c) List down the steps of how system call work. Write down the System call sequence to copy the contents of one file to another file. [2+3]
  - d) Illustrate various equivalent system calls for process control and file management in windows and UNIX Operating System. [2+3]
  - e) What is the roll of linker and loader? Why applications are Operating System specific? [3+2]

**CO2: Appraise and illustrate process management & thread management strategies along with their Operations. (K4) (20 Marks)**

- 2) Answer any four of the following: [5×4]
- a) What does it mean by a process? Draw state transition diagram of processes and explain it briefly. [1+4]
  - b) Describe the differences among short-term, medium-term, and long-term scheduling. [5]
  - c) Illustrate three major complications that concurrent processing adds to an operating system. [5]
  - d) Describe the actions a kernel takes to context switch between processes. [5]
  - e) What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other? Provide two programming examples of multithreading that would not improve performance over a single-threaded solution. [2+1+2]

**CO3: Recognize and analyze process scheduling, synchronization and Deadlock. (K4) (20 Marks)**

- 3) Answer any two of the following: [10×2]
- a) How does a deadlock detection algorithm work? List out some common deadlock detection algorithms used in operating systems. What are the main advantages and disadvantages of using a deadlock detection algorithm? Can deadlocks be completely prevented in distributed operating systems? [2+2+(2+2)+2]
  - b) Consider the following set of processes, with the length of the CPU-burst time given in milliseconds: [3+3+3+1]

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

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The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

- i) Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a nonpreemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.
  - ii) What is the turnaround time of each process for each of the scheduling algorithms?
  - iii) What is the waiting time of each process for each of the scheduling algorithms?
  - iv) Which of the scheduling algorithms result in the minimal average waiting time (over all processes)?
- c) Answer the following: [4+6]
- i) What advantage is there in having different time-quantum sizes on different levels of a multilevel queueing system?
  - ii) Explain the differences in the degree to which the following scheduling algorithms discriminate in favor of short processes:
    - (i) FCFS
    - (ii) RR
    - (iii) Multilevel feedback queues

**C04: Assess & demonstrate primary memory management techniques & virtual memory (K3) [20 Marks]**

- 4) Answer a) and any two from remaining: [8+(6×2)]
- a) What exactly is fragmentation? Explain the term internal and external fragmentation. What is the key distinction between Internal and External Fragmentation? [2+(2+2)+2]
  - b) Under what circumstances do page faults occur? What is/are the actions taken by the operating system when a page fault occurs? Assume you have page reference string for a process with  $m$  frames (initially all empty). The page reference string has length  $p$  with  $n$  distinct page numbers occurring in it. For any page replacement algorithm what is the upper bound and lower bound on the number of page faults? [1+3+2]
  - c) Consider a paging system with the page table stored in memory. [2+4]
    - i) If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?
    - ii) If we add associative registers, and 75 percent of all page-table references are found in the associative registers, what is the effective memory reference time? (Assume that finding a page-table entry in the associative registers takes zero time, if the entry is there.)
  - d) What is the cause of thrashing? How does the system detect thrashing? Once it detects thrashing, what can the system do to eliminate this problem? [2+2+2]

**C05: Examine file system interface & secondary memory management with case studies (K3) [20 Marks]**

- 5) Answer a) and any three from remaining: [8+(6×2)]
- a) List out five data structures that can be used for directory information. What problems might arise with above data structures? Give advantages of each directory structure above. [2+3+3]
  - b) What is a file? What is sequential file? Explain the purpose of open & close operations. [1+1+2]
  - c) Some systems automatically open a file when it is referenced for the first time, and close the file when the job terminates. Discuss advantages & disadvantages of this scheme as compared to the more traditional one, where the user has to open & close the file explicitly. [2+2]
  - d) Some systems provide file sharing by maintaining a single copy of a file; other systems maintain several copies, one for each of the users sharing the file. Discuss the relative merits of each approach. [2+2]
  - e) What advantages and disadvantages are there to this two-level directory? How do we overcome the disadvantages of the two-level directory? [2+2]
  - f) What problems might arise on deletion if a file is shared? How can we solve this problem? [2+2]