# OPERATING SYSTEMS
## (INFO 3102)

**Time Allotted : 3 hrs**                                                 **Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and*
*any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

## Group – A
## (Multiple Choice Type Questions)

1. Choose the correct alternative for the following:                **10 × 1 = 10**

   (i)    Which is not a layer in OS?
          (a) kernel                          (b) shell
          (c) application program             (d) critical section.

   (ii)   Let the page fault service time be 10ms in a computer with average memory
          access time being 20ns. If one page fault is generated for every $10^6$ memory
          accesses, what is the effective access time for the memory?
          (a) 21ns                            (b) 30ns
          (c) 23ns                            (d) 35ns.

   (iii)  Consider a machine with 64MB physical memory and a 32-bit virtual address
          space. If the page size is 2KB, what is the approximate size of the page table?
          (a) 16 MB                           (b) 8 MB
          (c) 2 MB                            (d) 4 MB.

   (iv)   Which of the following need not necessarily be saved on a context switch
          between processes?
          (a) General purpose registers       (b) Translation look-aside buffer
          (c) Program counter                 (d) All of the above.

   (v)    Determine the number of page faults when reference to page occurs in the
          following order using LRU algorithm: 1, 2, 4, 5, 2, 1, 2, 4. Assume that the main
          memory can accommodate 3 pages and the main memory already is loaded with
          page no 1 and 2, with page one have brought earlier than page two.
          (a) 6                               (b) 3
          (c) 4                               (d) 5.

(vi)     Consider a virtual memory system with FIFO page replacement policy. For an arbitrary page access pattern, increasing the number of page frames in main memory will
(a) Always decrease the number of page faults
(b) Always increase the number of page faults
(c) Sometimes increase the number of page faults
(d) Never affect the number of page faults.

(vii)    Fragmentation of the file system
(a) occurs only if the file system is used improperly
(b) can always be prevented
(c) can be temporarily removed by compaction
(d) is a characteristic of all file systems.

(viii)   What is a medium-term scheduler?
(a) It selects which process has to be brought into the ready queue
(b) It selects which process has to be executed next and allocates CPU
(c) It selects process to remove which from memory by swapping
(d) None of the mentioned.

(ix)     Four jobs to be executed in a single processor system arriving at time 0 in the order J1, J2, J3, J4 and having CPU burst time 4, 1, 8, 1 time units. The completion time of J1 under Round Robin Scheduling with time slice 1 unit is
(a) 9                                          (b) 4
(c) 8                                          (d) 10.

(x)      The first block of a file system is
(a) data block                                 (b) address block
(c) boot block                                 (d) inode block.

# Group – B

2.   (a)    What is the difference between Blocked, Waiting and Sleeping states of a process?

(b)    What is the purpose of Interrupt? What are the differences between TRAP and Interrupt?

**6 + (3 + 3) = 12**

3.   (a)    Compare between three different approaches of operating system structure.

(b)    Explain the difference between process and threads.

(c)    If we execute 4 consecutive fork() system calls, how many processes will be created? Explain your answer.

**6 + 3 + (2 + 1) = 12**

# Group – C

4. (a) What is resource allocation graph? How it can help us to deal with deadlock?

   (b) Prove that if we are able to avoid circular wait then deadlock will never happen.

   (c) A system has five processes P1 through P5 and four resource types R1 through R4. There are 2 units of each resource type. Given that:
   P1 holds 1 unit of R1 and requests 1 unit of R4
   P2 holds 1 unit of R3 and requests 1 unit of R2
   P3 holds one unit of R2 and requests 1 unit of R3
   P4 requests 1 unit of R4
   P5 holds one unit of R3 and 1 unit of R2, and requests 1 unit of R3
   Show the resource graph for this state of the system. Is the system in deadlock, and if so, which process(es) are involved?

   **(3 + 3) + 2 + 4 = 12**

5. (a) Consider the following set of processes with CPU burst time given in millisecond.

   | Process | Burst time | Priority |
   |---------|-----------|----------|
   | P1 | 10 | 3 |
   | P2 | 1 | 1 |
   | P3 | 2 | 3 |
   | P4 | 1 | 4 |
   | P5 | 5 | 2 |

   Calculate turnaround time and average waiting time for Round Robin and Priority scheduling.

   (b) What do you mean by the degree of multiprogramming? Which scheduler maintains this for a computer system?
   How Semaphore can be linked with deadlock and starvation? Explain with example.

   **(3 + 3) + (1 + 1 + 4) = 12**

# Group – D

6. (a) Sometime worst fit is better than best fit---Justify. Why segmentation and paging are sometimes combined into one scheme?

   (b) Consider a hard disk having 100 cylinders. The read-write head was placed on cylinder number 55 when the requests arrived in sequence from the following cylinders:
   99, 10, 54, 37, 24, 87, 35
   Compare the performances of SCAN, C-SCAN and C-LOOK algorithms in this scenario.

   **(2 + 4) + 6 = 12**

7.  (a)  Derive the formula to calculate the performance of demand paging. What is pure demand paging?

    (b)  What is Fragmentation and how can it be solved? What are the prerequisites of swapping?

$$(3 + 3) + (4 + 2) = 12$$

# Group – E

8.  (a)  What is DMA? How it improves the performance of the computer?

    (b)  State the difference between blocking and non blocking IO.

    (c)  Explain different methods used for free-space management in a file system.

$$(2 + 2) + 4 + 4 = 12$$

9.  (a)  How polling occurs? - Explain using a clear block diagram.

    (b)  What is encryption? How does it enhance security?

    (c)  What is VFS? What is OTP?

$$4 + (2 + 2) + (2 + 2) = 12$$

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| **IT** | https://classroom.google.com/c/MTIyNDAyOTM0Nzk0/a/Mjc0MDUwNTY0NDY0/details |