AUTUMN END SEMESTER EXAMINATION-2023

7th Semester B.Tech (Minor-II)

OPERATING SYSTEM

CS 2002

(For 2021 (L.E), 2020 & Previous Admitted Batches)

Time: 2 Hours Full Marks: 50

Answer ALL questions from Section-A
and any THREE from Section-B.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

SECTION-A

(Multiple choice and Short answer type)

1. (i) Which of the following is a valid process state transitions? [2×7]

(a) Ready – Ready
(b) Ready – Waiting
(c) Waiting – Ready
(d) Waiting – Running

(ii) Select the incorrect option regarding Process synchronization:

(a) Busy waiting cycles reduces the productivity of the processor
(b) Binary semaphore behave similar to the mutex lock
(c) Semaphores can also be used for resources handling
(d) Application of semaphore can never result in timing error

(iii) The arrival and burst times of three processes P0, P1, and P2, are given in the following table.

Process	Arrival time(ms)	Burst Time(ms)
P0	0	9
P1	1	4
P2	4	7

The algorithm employed is the pre-emptive shortest job first scheduling. Scheduling is performed only at the arrival of the processes. What is the average waiting time for the three processes?

(a) 5.33 ms
(b) 4.66 ms
(c) 4.33 ms
(d) 6.33 ms
(e) None of the above

(iv) Given a Resource allocation graph (RAG) with multiple instance multiple resources, choose the correct statement:

(a) A cycle in RAG guarantees deadlock.
(b) A cycle in RAG means no deadlock.
(c) A cycle in RAG may or may not guarantee deadlock.
(d) Absence of cycle may guarantee no deadlock.

(v) External fragmentation may be dealt with schemes:

(a) Only Compaction
(b) Paging
(c) Only Paging, Segmentation
(d) Compaction, paging, segmentation

(vi) Which of the following transition relates to non-preemption

(a) Running-Ready
(b) Running-Waiting
(c) Ready-Running
(d) Waiting-Ready

(vii) Which of the following operation is performed when an interrupt occurs?

(a) Interrupt is ignored
(b) The change in the state of the interrupted process after processing of interrupt
(c) Save the state of the interrupted process and reload the state of the new process
(d) Resume the interrupted process's execution after processing of interrupt

SECTION-B

2. (a) Explain the difference between batch, multi programming, time-sharing and distributed operating system. [2]

(b) Consider process arrival as given below where N = right most significant digit of your Roll No.(ex:- for Roll No. 180854, N=**4**): [10]

Process	CPU Burst Time(ms)	Arrival Time	Priority
A	4	0	2
B	3	3	3
C	6	N	6
D	5	5	N
E	1	15	4

Calculate the following for *priority (non preemptive)* and *round robin* (time quantum = 2 ms) CPU scheduling algorithm: [10 Marks]

i. Average waiting time

ii. Turnaround time for each process

iii. Order of completion

(*hints:-higher digits indicate higher priority*)

3. (a) What is "starvation" of process and how to prevent it? What do you mean by cascading termination? [6]

(b) Find the total head movement for FCFS scheduling with following disk queue requests on I/O blocks: 98, 183, 37, 122, 14, 124, 65, 67. Head starts at N (where N= your Roll No. MODULUS 100). [6]

4. (a) Why SJF and SRTF cannot be applied in real world solution? What is the solution for that? – discuss briefly [3]

(b) Consider the following page reference strings: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, X, 0, 1. What will be the difference in page faults between optimal page replacement and LRU with three empty frames? Note: X = roll no % 7 [5]

(c) A machine has 56-bit virtual addresses and 32-bit physical addresses. The size of a page is 4K. Find the number of entries needed for a conventional page table. [4]

5 In a railway ticket booking office, maximum 10 persons, either male, female, or both are allowed to go inside. There are three ticket counters in the booking office. Among these 10 persons, a maximum of 3 persons are allowed to book the ticket at a time with a restriction that all these 3 persons can neither be male nor be female. It means that maximum of 2 males with 1 female or maximum of 2 females with 1 male is allowed to book the ticket. Write a solution using semaphore to synchronize among the males and females to book their ticket. [12]

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