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Paper Code : CS-603

OPERATING SYSTEM

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following. $10 \times 1 = 10$

i) A page fault occurs

a) when the page is not in the memory

b) when the page is in the memory

c) when the process enters the blocked state

d) when the process is in the ready state.

ii) Which is the fastest of the following ?

a) Cache memory b) RAM

c) CD-ROM d) Register.

iii) What is a shell ?

a) It is a hardware component

b) It is a command interpreter

c) It is a part in compiler

d) It is a tool in CPU scheduling.

iv) A thread is a

a) Task b) Program

c) Process d) Lightweight process.

v) Round Robin scheduling is essentially the preemptive version of

a) FIFO

b) Shortest Job First

c) Shortest Remaining Time First

d) Longest Time First.

vi) In order to allow only one process to enter its critical section, binary semaphores are initialized to

a) 0 b) 1

c) 2 d) 3.

vii) Banker's algorithm for resource allocation deals with

a) Deadlock prevention

b) Deadlock avoidance

c) Deadlock recovery

d) Mutual exclusion.

viii) Which of the following page replacement algorithms suffers from Belady's anomaly ?

a) Optimal b) LRU

c) FIFO d) Both (a) and (b).

ix) The mechanism that brings a page into memory only when it is needed, is called

a) Segmentation

b) Fragmentation

c) Demand paging

d) Page and replacement.

x) If UNIX command *chmod 756* is applied to a file, then *others* will have

a) Read and write permission

b) Read and execute permission

c) Write and execute permission

d) None of these.

xi) Which of the following resources can cause deadlocks ?

a) Read only files b) Shared programs

c) Printers d) All of these.

xii) The number of processes completed per unit time is known as

a) Output b) Throughput

c) Efficiency d) Capacity.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) What is kernel ?

b) State the functions of system call. 2 + 3

3. a) What do you mean by real time system ?

b) Differentiate between soft and hard real time system. 2 + 3

4. a) What is Medium Term scheduler ?

b) Describe the functions of short-term and long-term scheduler. 2 + 3

5. a) What is deadlock ?

   b) Justify the following statement.

   "Cycle in resource allocation graph does not always imply the occurrence of deadlock." 1 + 4

6. a) Explain Race condition in context of process synchronization.

   b) What are semaphore and mutex ? 3 + 2

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What is thread ? Draw and explain thread life cycle.

   b) Differentiate between process and thread.

   c) Explain user and kernel thread in detail.

   (1 + 5) + 3 + 6

8. a) Explain the different states of a process using state transition diagram.

   b) What do you mean by preemptive and non-preemptive scheduling ?

   c) What is dispatcher ?

   d) Consider the following four processes, with the length of CPU-burst time given in milliseconds :

Processes	Arrival time	Burst time
P1	0	12
P2	0	10
P3	1	4
P4	4	10
P5	2	12

   Draw the Gantt chart using RR scheduling with time slice 3ms. Calculate average waiting time and average turn around time. 4 + 3 + 2 + 6

9. Write a program using signal to demonstrate a race condition.

10. Write a program using "fork" to demonstrate the mother-child relationship of processes.

11. a) What is overlay ?

   b) What are the advantages of segmentation over paging ?

   c) Explain the difference between internal fragmentation and external fragmentation. Which one occurs in paging system ? How the problem of external fragmentation be solved ?

   d) State the advantages and disadvantages of single contiguous memory allocation.

   2 + 3 + (2 + 1 + 3) + 4

12. a) What is the purpose of modify bit in page table ?

b) Consider the following page reference string :

7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1

How many page faults would occur for the following replacement algorithms, assuming 3 frames are available and initially none of pages in main memory ?

i) Optimal replacement

ii) FIFO replacement.

c) What is Thrashing ?

d) Explain Belady's anomaly. 2 + 8 + 2 + 3

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