53 (CS 303) OPSY

2019

OPERATING SYSTEM

Paper : CS 303

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Define the following : 5×2=10

   (i) System call

   (ii) Race condition

   (iii) Page fault

   (iv) Semaphore

   (v) Resident monitor.

Contd.

(b) What do you mean by real time and time-sharing operating systems? Mention their merits and demerits. 4+6=10

2. (a) Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6 respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Justify your answer. Do not count the context switches at time zero and at the end. 1+2=3

(b) Write the differences between user-level threads and kernel-level threads. 2

(c) What do you mean by starvation and ageing? 2+3=5

(d) Consider the following set of processes :

Process	Arrival time (*ms*)	Burst time (*ms*)
P_1	0	9
P_2	2	4
P_3	3	2
P_4	3	7

Using SJF scheduling (pre-emptive and non-pre-emptive) and round robin scheduling (assume time quantum = 3 *ms*), draw the Gantt chart and find out the following: 10

(i) average waiting time

(ii) average response time

(iii) average turnaround time.

3. (a) Write the difference between pre-emptive and non pre-emptive scheduling. 4

(b) Define deadlock. What are necessary conditions for deadlock to occur? 2+4=6

(c) What is demand paging? Briefly explain the steps of demand paging. What are its advantages? 1+6+3=10

4. (a) Consider a system with five processes P_0, P_1, P_2, P_3, P_4 and three resource types *A*, *B* and *C*. Resource type *A* has 10 instances, *B* has 5 and *C* has 7 instances. Consider that the following snapshot of the system has been taken at time T_0.

Processes	Allocation	Max	Available
	A B C	A B C	A B C
P_0	0 1 0	7 5 3	3 3 2
P_1	2 0 0	3 2 2	
P_2	3 0 2	9 0 2	
P_3	2 1 1	2 2 2	
P_4	0 0 2	4 3 3	

Using Banker's algorithm for deadlock avoidance answer the following :

(i) What is the content of matrix need ? 2

(ii) Is the system in a safe state ? If yes, then what is the safe sequence ? 2

(iii) If a request for resource (1, 0, 2) arrives from P_1, can the request be granted to the process ? 2

(b) Consider the following page reference string : 9

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

How many page faults would occur for replacement by LRU, FIFO and Optimal for three frames ? All frames are initially empty and first unique page reference causes a page fault.

5. *(a)* Define a file. Discuss *any three* operations that can be performed on a file. 2+6=8

(b) Discuss the sequential and direct access methods for accessing a file. 3+3=6

(c) What do you mean by spooling ? How is it different from buffering ? 3+3=6

6. *(a)* Mention *five* functions of an operating system. 5

(b) Define distributed operating system. What are its advantages ? 2+3=5

(c) What is a Process ? Explain the state transition diagram of a process. How does a thread differ from a process ? 1+5+4=10

7. Write short notes on the following : ***(any four)*** 5×4=20

(i) Paging

(ii) PCB

(iii) DMA

(iv) Segmentation

(v) Garbage collection

(vi) RAID.