Roll No.....

IC-1923

M.Sc. (INFORMATICS)/ II Sem – 2019,
Paper No: IT -23 Operating Systems

TIME: 03 hours **Max Marks: 75**

(Write your Roll No. on the top immediately on receipt of this question paper)

(Answer any 5 Questions) Attempt all sub-parts of a question together

Q1)

a) Identifying several advantages and disadvantages of open-source operating systems. Include the types of people who would find each aspect to be advantage or a disadvantage

b) Describe the differences between clustered systems and multiprocessor systems? What is required for machines belonging to a cluster to cooperate to provide a highly available service.

c) Explain **Remote Procedure Calls** (RPC) with an example

d) What are the categories in which benefits of multithreaded programming can be broken to? Explain

e) Discuss how clone() operation is supported by Linux is used to support both processes and threads

[3 * 5]

Q2)

a) Design a file-copying program named ***filecopy*** using ordinary pipes. The Program will create an ordinary pipe and write the contents of the file to be copied to the pipe. The child will read from the pipe, covert the same to Uppercase only if the string contains "Hello" (no change if no "Hello") and write to the destination file.

Program would be invoked as

filecopy in.txt out.txt

Write program using UNIX and C

b) Explain how compare_and_swap() instruction can be used to provide mutual exclusion that satisfies the bounded-waiting requirement

[9 + 6]

Q3)

a) Consider the following page reference string:

2, 4, 5, 3, 4, 0, 5, 9, 8, 7, 8, 0, 2, 7, 9, 6, 1, 4, 8, 3, 0, 5, 2, 6, 4, 1, 7

Assume demand paging with three frames, how many page faults would occur for the following replacement algorithms

i. LRU replacement

ii. Optimal Replacement

If the number of page frames increase to four, what will be the effects on the number of page faults?

b) What is **copy-on-write feature** and under what circumstances is its use beneficial? What hardware feature is required to implement this feature?

c) Explain **Acyclic-Graph Directories** with an example?

[8 + 3 + 4]

Q4)

a) Consider a set of processes {P1, P2, P3, P4, P5, P6}. The arrival time and the CPU time needed for the processes are given below.

Process	Arrival Time	CPU Time
P1	**4**	**6**
P2	7	5
P3	0	8
P4	2	7
P5	1	4

Calculate the average waiting time and turnaround time for the following cases,

i) Using FCFS scheduling

ii) Using Preemptive SJF scheduling

iii) Using RR scheduling (time quantum 3 ms)

b) Consider two processes, P1 and P2, where p1 = 60, t1 = 30, p2 = 80, t2 – 35

i) Can these two processes be scheduled using rate-monotonic scheduling? Illustrate using a Gantt chart

ii) Illustrate the scheduling of these two processes using earliest deadline first (EDF) scheduling

[9 + 6]

Q5)

a) Consider the following snapshot of the system.

	Allocation	Max	Available
	A B C D E	A B C D E	A B C D E
P1	1 1 0 1 0	2 1 3 1 0	0 0 x 1 1
P2	1 1 1 1 0	1 1 2 2 1	
P3	1 0 2 1 1	1 1 2 1 3	
P4	2 0 1 1 0	2 2 2 1 0	
P5	3 0 1 0 1	3 0 2 0 1	

Briefly describe banker's algorithm and use it to determine the smallest value of 'x' for which this is safe state

b) What issues should be address when preemption is required to deal with deadlocks?

c) How can we prevent a deadlock from occurring? Explain [9 + 3 + 3]

Q6)

a) Write a multithreaded program that generates the prime numbers and stores them in a file. The user will enter a number on command line. The Program will create a separate thread that will output all prime numbers less than the number entered by the user and stores in a file output.txt. When the thread finishes execution, the parent thread outputs the sequence generated by child thread.

b) What is priority inversion? Explain when and why is it required?

c) What are the causes of Thrashing? How does a system detect thrashing? What can a system do to eliminate this problem when it detects the same [8 + 3 + 4]