National University of Computer and Emerging Sciences

Chiniot-Faisalabad Campus

Operating System (CS2006)

Sessional-II Exam

Date: November 5th 2024

Course Instructor(s)

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Total Time (Hrs): 40 min

Total Marks: 35

Total Questions: 4

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Roll No Section Student Signature

Vetted by: _____ **Signature:**_____

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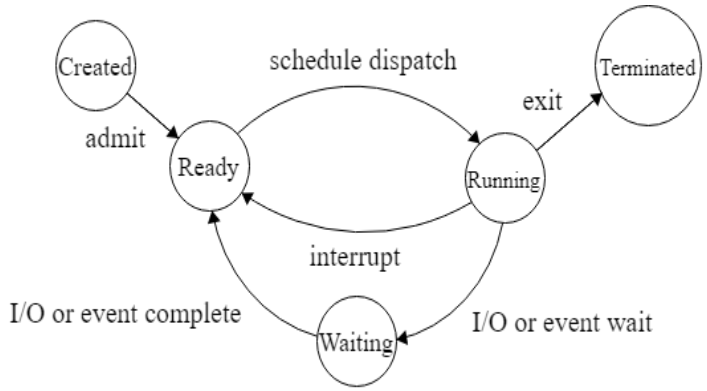
Attempt all the questions.

CLO 2: Implement solutions employing concepts of Processes and Threads

Q1: Considering the following diagram of a process state: Answer the following question [4 Marks]



a. Give three reasons that cause a process to move from the waiting/blocked state [1.5 Marks]

Rubrics = 0.5 x 3 = 1.5

1. I/O completion
2. Termination of a child process
3. A signal/message from another process

b. Give at least five components of the process's PCB. [2.5 Marks]

Rubrics = 0.5 x 5 = 2.5

1. **Process state**
2. **PID (Process ID)**
3. **PC (Program counter)**
4. **Contents of the processor's registers**
5. **Memory limits**
6. **List of I/O devices allocated to the process**

Q2: Differentiae the following at least 2 differences [6 Marks]

a. Differentia between named and unnamed pipes in IPC.

Rubrics = 0.5 x 4 =2

Unnamed/Ordinary Pipes	Named Pipes
Unnamed Pipes can be created by using pipe system call	Named pipes can be created by using mkfifo system call
Ordinary pipes are therefore unidirectional	Named pipes can be one-way or duplex.
Require parent-child relationship between communicating processes	Doesn't Require Parent Child Relation, Communication between the two or more processes

b. Differentiate between Direct and indirect communication

c. Rubrics = 0.5 x 4 =2

Direct	Indirect
Links are established automatically	Link established only if processes share a common mailbox
A link is associated with exactly one pair of communicating processes	A link may be associated with many processes
Between each pair there exists exactly one link	Each pair of processes may share several communication links
The link may be unidirectional, but is usually bi-directional	Link may be unidirectional or bi-directional

d. Differentiate between Data and task parallelism

Rubrics = 0.5 x 4 =2

Data parallelism	Task Parallelism
Same task are performed on different subsets of same data.	Different task are performed on the same or different data.
Synchronous computation is performed	Asynchronous computation is performed.
Amount of parallelization is proportional to the input size.	Amount of parallelization is proportional to the number of independent tasks is performed.

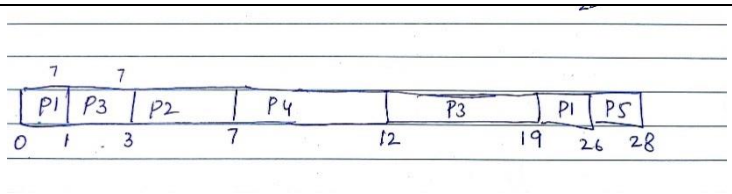
CLO 3: Evaluate the commonly used mechanisms for scheduling of tasks and implement synchronization mechanisms like Semaphores, TSL, etc

Q3: Consider the following scenario and apply Preemptive priority scheduling and complete the given table. Lower numbers indicate higher priority. [Marks = 16]

Rubrics = 0.5 x 15 =8

Process	Arrival Time	Burst Time	Priority	Turnaround Time	Waiting Time	Response Time
P1	0	8	4	26-0=26	26-8=18	0-0=0
P2	3	4	1	7-3=4	4-4=0	3-3=0
P3	1	9	3	19-1=18	18-9=9	1-1=0
P4	5	5	2	12-5=7	7-5=2	7-5=2
P5	4	2	5	28-4=24	24-2=22	26-4=22

a) Draw the Gantt Chart [5 Mark]



b) Compute Average Turnaround Time. [1 Mark]

26+4+18+7+24 / 5 = 15.8

c) Compute Average Waiting Time. . [1 Mark]

18+0+9+2+22 / 5 = 10.2

d) Compute Average Response Time. [1 Mark]

0+0+0+2+22 / 5 = 4.8

Calculation for QNO 03:

Q4: Consider the set of 6 processes whose arrival time and burst time are given below If the CPU scheduling policy is Round Robin with time quantum = 2 **[9 Marks]**

Process Id	Arrival time	Burst time
P1	0	4
P2	1	5
P3	2	2
P4	3	1
P5	4	6
P6	6	3

a) Draw the Gantt Chart **[5 Mark]**

b) Ready Queue **[2 Marks]**

0	1	2		3	4		6				
P1	P2	P3	P1	P4	P5	P2	P6	P5	P2	P6	P5

c) Calculate the throughput **[1 Mark]**

$$throughput = \frac{6}{21} = 0.2857$$

d) CPU Utilization Rate **[1 Mark]**

$$CPU\ Utlization\ Rate = \frac{21}{21} \times 100 = 100\%$$