Department of CSE, BRAC University
CSE321:Operating Systems
Final Exam, Fall 2016

Time: 2.5hours **Full Marks: 90**

Full Name:_____ **Student ID:**_____

Section A [Answer any FIVE] (5x6=30)

1. Write the benefits of multithreading. Cancellation of target thread may occur in two different scenarios- What are those.
2. How many ways are there for inter process co-operation? Also identify one problem for each of the ways.
3. Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96
5	400	200

What are the physical addresses for the following logical addresses?

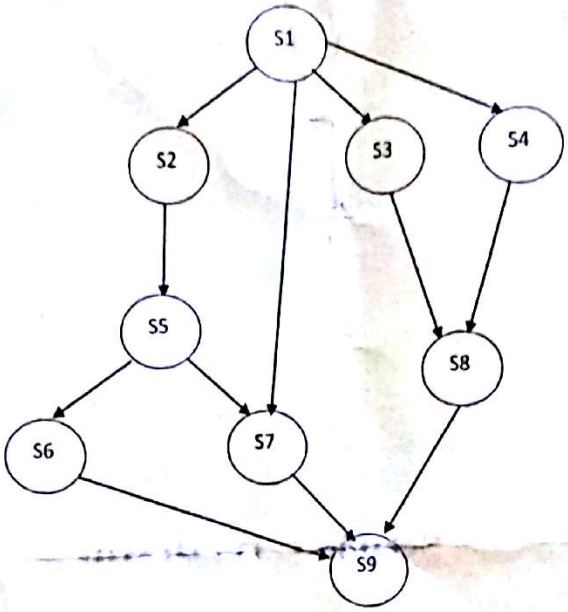
a. 430 for Segment 0; **b.** 10 for Segment 1; **c.** 500 for Segment 2;

d. 400 for Segment 3; **e.** 112 for Segment 4; **f.** 70 for Segment 5

4. High paging activity is called thrashing- justify this statement. Under what situations user-level threads are better than kernel-threads?
5. Define time sharing system. Can a process make a transition from the running to the waiting state? Why or why not?
6. Under what circumstances aging is important?When do page replacements occur? Explain.
7. Does a thread have their own heap and/or stack? Justify your answer.

Section B [Answer any <u>two</u>] (2x15=30)

1. a) Solve the graph of process synchronization drawn below using semaphore variables. [<u>Note:</u> Each node represents a statement (S) which is running independently. Write code using P() and V() operations only]. **9**



b) Identify critical section(s) for each of the following scenarios:

i. Suppose, you are browsing Internet using three different web-browsers (Firefox, Chrome and Opera) in full screen mode. You have only one monitor to watch a tab in a browser but multiple browsers can run at the same time. **3**

ii. Suppose, your teacher is checking lab assignment in a class of 30 students. S/he is checking one by one. S/he is also marking individually but s/he can show the marks to all students at the same time. **3**

2. Consider the following set of processes with the length of the CPU-burst time given in milliseconds:

Process	Burst Time	Priority	Arrival Time(ms)
P1	9	2	0.0
P2	6	1	2.0
P3	3	3	2.0
P4	2	1	23.0
P5	3	2	26.0

The processes are assumed to have arrived in the order *P1, P2, P3, P4* and *P5*

a) Draw two Gantt Charts illustrating the execution of these processes using preemptive priority (a smaller priority number implies a higher priority), and RR(time quantum = 5 milliseconds) scheduling. **8**

b) What is the turnaround time of each process for the given scheduling algorithms (refer to question)? **4**

c) Which one results in the minimal average waiting time (over all processes) among Priority and RR? **3**

3. What are the difficulties of SJF? The SJF CPU scheduling technique preempts an executing process. Using the SJF policy, construct a Gantt Chart and compute the waiting time for the 6 processes tabulated below (time in milliseconds): **3+12**

Process	Burst Time	Arrival Time
P1	8	0
P2	12	10
P3	8	13
P4	6	20
P5	7	23
P6	8	90

Section C (1x10=10)

1. Suppose, we have the following scenario in an OS. There are five processes and four resource types. Answer the following questions using Banker's Algorithm Algorithm.

a) Calculate Need matrix. **3**

Processes	Max				Allocation				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P1	4	2	3	3	2	2	1	0	1	1	2	1
P2	3	4	2	0	1	2	0	0				
P3	1	4	3	1	1	2	2	0				
P4	3	3	0	2	1	1	0	2				
P5	2	1	4	2	1	1	3	2				

b) Is this system in safe state? If yes, then find the sequence or if no, then provide necessary explaination? **4**

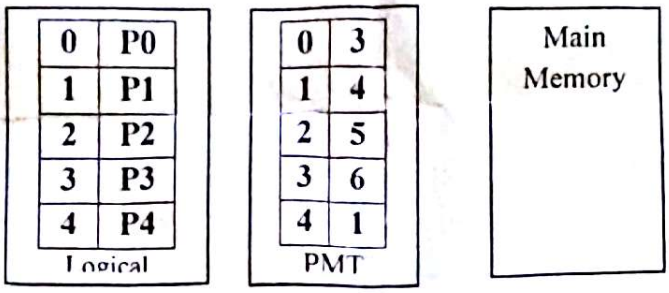
c) What happens if process P3 has (5, 6, 5, 5) in Max matrix instead of (1, 4, 3, 1)? **3**

Section D [Answer any <u>two</u>] (10x2=20)

1. Given memory partitions of 200k, 350k, 250k,150k, 90k,250k and 452k (in order, top to bottom), apply first fit, worst fit and best fit algorithms to place processes with the space requirement of

250k, 425k, 212k,160,210,451 and 426k (in order). Which algorithm makes the most effective use of memory? 6+1

Page size=5 bytes and Physical Memory = 25 bytes.



If the logical addresses are 0 and 2 respectively, how the users' view of memory can be mapped into physical memory? 3

2. **a)** Suppose there are 3 copies (instances) of resource Tape Drives, 3 copies (instances) of resource Graphics and 2 copies (instances) of resource Printers. Process 1 holds one unit of resources of both Graphics and Printers and is waiting for one unit of Type Drives.Process 2 holds two units of Type Drives and waiting one unit of Graphics. Process 3 holds one unit of Graphicsand one unit of Printers. Draw the resource allocation graph. Is the system in a deadlocked state? Why or why not?Draw a resource allocation graph for the above scenario.

In the above scenario, consider each resource type has single instance. Now, draw a wait-for graph from resource allocation graph. 6

b) Describe what device controllers and device drivers are, and write down their purposes. 4

3. What is the cause of thrashing? Draw a figure to illustrate how Shared Pages (sharing of common code) work. A very simple computer has 5 page frames. And a process makes the following list of page references:0,0,0,1,2,1,2,2,1,2,3,0,5,7,2,4,4,3,3,1,0,4,3,1,2,7. How many page fault occur using FIFO and Optimal page replacement algorithms? 1+2+7

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