Roll Number: _____

Thapar University Patiala
Computer Science & Engineering Department

B.E 2nd Yr. 1st Semester CSE
MST, 19th September 2017
Time: *2 Hrs.*

UCS303: Operating System
Maximum Marks: 20
Name of Faculty: ***Vinay, Tarunpreet, Ashish, Santosh, Raman***

Note: All Questions are Compulsory; Attempt in a **SEQUENTIAL ORDER;** Assume data from your side *(if found missing)*.

Q.1 a. Consider a system with the following set of processes, where arrival time and CPU-burst time are in milliseconds. Compute the average turnaround time for the system taking pre-emptive shortest job first (SJF) algorithm. (2+2)

Process	Arrival Time	Burst Time
P_1	0	5
P_2	1	3
P_3	2	3
P_4	4	1

b. Consider three processes, all arriving at time zero, with total execution time (CPU and I/O) of 10, 20 and 30 units, respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a SJF scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be overlapped as much as possible. For what percentage of time does the CPU remain idle?

Q.2 a. Explain the role of MBR and POST in context of the steps that a computer follows after getting the power supply. (2+2)

b. With a suitable diagram, comment on the statement, *Multi-tasking is an expansion of multi-programming.*

Q.3 a. With a suitable depiction, explain multi-threading models. (2+2)

b. List Pros and Cons of *Microkernel-based* architecture and *Layered approach* for designing an operating system.

Q.4 a. Consider the following snapshot of a system with four processes A, B, C, and D. Compute the average waiting time for the Round Robin scheduling, where quantum is taken as 1ms. (2+2)

Process	Arrival Time (in ms)	CPU Burst (in ms)
A	0.000	4
B	2.001	7
C	3.001	2
D	3.002	2

b. Explain the statement with proper justification: *In operating systems, the context switching represents a substantial cost to the system in terms of CPU time.*

P.T.O.

Q.5 Consider a system with 4 processes and 5 resource classes. At a particular time t_0, the snapshot for the various data structures involved in the system are as shown in the table below: (4)

Process	Allocation	MAX	Available
	ABCDE	ABCDE	ABCDE
P_0	10211	11213	00**X**11
P_1	20110	22210	
P_2	11011	21311	
P_3	11110	11221	

a. Compute the smallest value of **X** for which the system is in safe state. Write the safe sequence too.

b. After computing the values for **X** above, assume that a request of (00110) resources from P_3 arrives in the system. Describe by showing the values of various data-structures, the feasibility for granting the said request immediately.

c. (*This is in continuation of part b above*) Now, comment on the feasibility for granting the request of (00001) resources initiated by P_0.

d. Give the count for the total *(maximum)* available instances of all the resource classes present in the system.