National University of Computer and Emerging Sciences, Lahore Campus

	Course:	Advance Operating System	Course Code:	CS-505
	Program:	MS(Computer Science)	Semester:	Fall 2016
	Duration:	180	Total Marks:	80
	Paper Date:	14 December, 2016	Weight:	50%
	Section:	ALL	Page(s):	2
	Exam:	Final	Roll No.	

Instructions/Notes: Use less text and more diagrams for explanation. Fill the answers in the first few pages of your answer sheet. Do the rough work on last pages or separate sheet, and do not do any cutting where you answer the questions. Number the answers as the questions are numbered. Answer all parts of one question, then move to another question. Do not distribute parts of a question on disparate pages. **Not following the instructions will cause to deduct marks**.

Question 1 (5 points): What is 2-Phase locking, and what is the difference between (use diagrams)

A 2 Phase Locking

B Strict 2 Phase Locking

C Strongly Strict 2 Phase Locking

Question 2 (10 points): Recall Triple Modular Redundancy (TMR). There are three components A, B and C. Component A adds two integers, component B uses the output of A and multiplies it by 2. Component C uses the output of B and divided it by 2.

A Apply Triple Modular Redundancy to the scenario. Use the values 100 and 2 for the input of A and see what is the final output. Draw diagram for showing inputs and outputs.

B Now assume one copy of each component is faulty, the fault is that the component adds 1 to the correct answer. Show how the result is modified, if modified at all? Use an example with diagrams to prove your argument.

Question 3 (5 points): A real time system is scheduled according to rate monotonic scheduling. Following table shows the repetitive arrival times of each task. Now assign priority to each task, and give reason for that prioritization.

Task	Arrival Times
1	10
1	20
1	30
1	40
1	50
2	20
2	40
2	60
2	80
2	100
3	40
3	80
3	120
3	160
3	200

Question 4 (15 points): If all processes in above mentioned example use 10 execution cycles and they use the priorities you just assigned, then

A argue whether we have missed any deadlines or not? If not, then prove, if yes, then tell which ones.

B If deadlines are missed, then can you come up with an algorithm which allows all deadlines to meet? If not, then give reasons, if yes, then provide the algorithm.

C If you cannot come up with the algorithm, then what is the solution, how to meet all deadlines?

Question 5 (10 points): There are three distributed processes P_1, P_2 and P_3, and three resources available to these processes R_1, R_2 and R_3. All are running at the same time and try to acquire the resources in following manner.

- P_1: $R_1, R_2 R_3$

- P_2: $R_2, R_3 R_1$

- P_3: $R_3, R_1 R_2$

The processes are connected in a token ring configuration, meaning the token starts from P_1 it tries to acquire a resource, then the token passes to P_2, then P_2 tries to acquire a resource. Then the token passes to P_3 and it tries to acquire the resource and passes the token back to P_1. In this way the execution continues. Based on this information do following

A You could use ring algorithm here, instead use a **centralized resource manager** to manage the resources. Show the status of all **queues** in the manager at **each step** until the first deadlock occurs. Draw the resource allocation graph of the situation.

B Use **wait-and-die** algorithm to resolve the first deadlock and draw resource allocation graph again. The arrival sequence of processes is P_1, P_2 and then P_3.

Question 6 (5 points): Instead of using a centralized manager use Chandi-Misra-Haas Algorithm for the deadlock detection. You do **not** need to use wait-and-die algorithm once again for deadlock removal, rather you only have to show the steps how the first deadlock is detected using Chandi-Misra-Haas Algorithm. **NOTE:** Draw diagrams for the explanation.

Question 7 (10 points): There are 8 processes in a configuration, numbered from 1 to 8. The leader is the highest numbered process. After a while the leader crashes. Process number 1 holds the election, and configuration elects a new leader using **bully** algorithm. Draw a diagram of each step of leader election, including the respective messages and their types.

Question 8 (10 points): Just like in the above given scenario, when the leader crashes, the configuration holds an election based on **ring** algorithm. This time process 1 and 4 start the election simultaneously. Draw the diagram of each step of leader election, including the messages and their types.

Question 9 (10 points): Two processes P_1, P_2 having their own caches use bus snooping to keep their caches consistent, by using write-once protocol. In the beginning their caches are empty. Following is the sequence of actions performed by different processes. You have to tell the states of all caches in result of the actions (use diagrams)

1 Process P_1 reads a word W_1 from memory

2 Process P_2 reads a word W_1 from memory

3 Process P_2 changes the word W_1

4 Process P_1 changes the word W_1

5 Process P_2 reads a word W_1 from memory