DHARMSINHDESAIUNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH. SEMESTER VI [INFORMATION TECHNOLOGY]
SUBJECT: (IT 607) APPLIED OPERATING SYSTEM

Examination	**: Second Sessional**	**Seat No.**	**:**
Date	**: 15 / 02 / 2018**	**Day**	**: Thursday**
Time	**: 12:00 to 01:15 PM**	**Max. Marks**	**: 36**

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1 Do as directed. **[12]**

(a) What is race condition? Explain in brief with example. **[2]**

(b) A counting semaphore '*C*' protecting a resource having a single instance shared among *n* processes is initialized with value 1. If all processes perform '*P*' operation on semaphore '*C*' before critical section access and '*V*' operation on semaphore '*C*' after critical section except one process which performs '*V*' operation before critical section and '*P*' operation after critical section on *C.* What is the maximum number of processes that can be in the critical section simultaneously? [Justification Required] **[2]**

(A) *n* (B) *n – 1* (C) *n – 2* (D) None of these

(c) Consider the methods used by process P_1 and P_2 for accessing their critical sections whenever needed, as given below. The initial values of shared Boolean variables, S_1 and S_2 are random assigned. **[2]**

Method used by P_1	Method used by P_2

do{
flag[1] = True;
$S_1 = S_2$;
While(P);
Critical Section
flag[1] = False;
Remainder Section
}while(1);
	do{
	flag[2] = True;
	$S_1 = S_2 + 1$;
	While(Q);
	Critical Section
	flag[2] = False;
	Remainder Section
	}while(1);

For the program to guarantee mutual exclusion, the predicate P and Q in the while loop should be what? Reason your answer in detail.

(d) With a single resource deadlock occurs **[2]**
(a)If there is a single process competing for that resource.
(b)If there are more than 2 processes competing for that resource
(c)If there are only two process competing for that resource
(d)None of this

(e) Two shared resources R_1 and R_2 are used by processes P_1 and P_2. Each process has a certain priority for accessing each resource. Let T_{ij} denote the priority of P_i for accessing R_j. A process P_i can snatch a resource R_k from process P_j if T_{ik} is greater than T_{jk}. Given the following : **[2]**

1.) $T_{11} > T_{21}$ 2.) $T_{12} > T_{22}$ 3.) $T_{11} < T_{21}$ 4.) $T_{12} < T_{22}$

Which of the following conditions ensures that P_1 and P_2 can never deadlock?
A.) 1 and 4 B.) 2 and 3 C.) 1 and 2 D.) None of the above

(f) A system shares 9 tape drives. The current allocation and maximum requirement of tape drives for that processes are shown below: **[2]**

Process	Current Allocation	Maximum Requirement
P1	3	7
P2	1	6
P3	3	5

Which of the following best describes current state of the system?
A.) Safe, Deadlocked B.) Safe, Not Deadlocked
C.) Not Safe, Deadlocked D.) Not Safe, Not Deadlocked

Q.2 Attempt ***Any TWO*** of the following questions. **[12]**

(a) (1) Consider a disk queue with requests for I/O to blocks on cylinders 47, 38, 121, 191, 87, 11,92, 10. The C-LOOK scheduling algorithm is used. The head is initially at cylinder number 63, moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. The total head movement (in number of cylinders) incurred while servicing these requests is _____. **[4]**

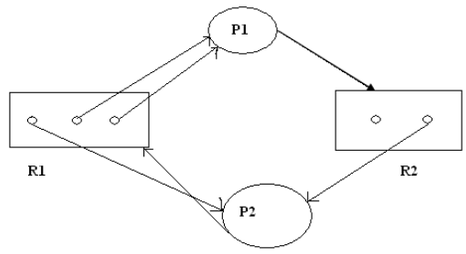
(2) Discuss various Deadlock Prevention Techniques. **[2]**

(b) Consider a system with five processes (P1,P2,P3,P4,P5) and four Resources (R1,R2,R3,R4). There are no current outstanding queued unsatisfied requests. Currently available resources R1-2,R2-1,R3-0,R4-0 **[6]**

	Current Allocation				Max Demand				Still Needs			
Process	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P1	0	0	1	2	0	0	1	2	0	0	0	0
P2	2	0	0	0	2	7	5	0	0	7	5	0
P3	0	0	3	4	6	6	5	6	6	6	2	2
P4	2	3	5	4	4	3	5	6	2	0	0	2
P5	0	3	3	2	0	6	5	2	0	3	2	0

If deadlock doesn't occur then what will be the sequence in which the processes finish execution?

(c) (1) Consider following resource allocation graph: where P1 and P2 are processes and R1 and R2 are resources. **[4]**



Now determine the True(T)/False(F) of the following statements respectively with reasons..

1. The system is not deadlocked
2. The Status of the system is unsafe if P1's request for R2 is granted first.

a.) TF b.) TT c.) FF d.) FT

(2) A system contains two programs and each requires three tape units for its operation. Find out the minimum number of tape units the system must have such that so deadlock never arise. **[2]**

Q.3 (a) The following program consist of 4 concurrent processes and 3 counting semaphores x, y and z, **[6]**

Process 1	Process 2	Process 3	Process 4
Wait(x) Print("V") Signal(y)	Wait(z) Print("I") Signal(z) Signal(y)	Wait(y) Print("J") Signal(x) Signal(x)	Wait(x) Wait(y) Print("M")

What must be the initial values of the three semaphores, so that output 'JVM' is obtained? Reason your answer in detail.

(b) What is busy waiting? Discuss the disadvantages of busy waiting and provide solution of busy waiting in Wait () and Signal () operations in detail. **[6]**

OR

Q.3 (a) Consider the following processes A and B, **[6]**

Process A	Process B

int y;
y = x * 2;
x = y;
	int z;
	z = x + 1;
	x = z;

The variable *x* is shared by both A and B. Initial value of *x* is 5. If A and B executes concurrently, how many distinct values of *x* are possible after both processes finish executing? [Assume each instruction is atomic] Detail explanation is required.

(A) 4 (B) 5 (C) 6 (D) 7

(b) Discuss Readers writers' problem, and provide critical section solution to the first reader writer problem using semaphore. **[6]**