

## KIIT Deemed to be University Online Mid Semester Examination(Spring Semester-2021)

**Subject Name & Code: OS Applicable to Courses:B.Tech** 

Full Marks=20 Time:1 Hour

# SECTION-A(Answer All Questions. All questions carry 2 Marks) <u>Time:20 Minutes</u> (5×2=10 Marks)

Que	Question		Question			Answer
<u>stio</u>	Type(M					Key(if
<u>n</u>	CQ/SAT					MCQ)
<u>No</u> <u>Q.N</u>	MCQ	Which of the following operation is performed when an interrupt				С
<u>0:1(</u>	MCQ	occurs.	owing operation is	periorined when an	merrupi	C
<u>a)</u>		(a) Interrupt is igno	ared			
_		1		rupted process after p	rocessing	
		of interrupt	ne state of the interi	aprea process area p		
		-	f the interrupted pro	cess and reload the st	ate of the	
		new process	1 1			
		_	terrupted process's	execution after proc	essing of	
		interrupt		•		
	MCQ			e saved when a conte	ext switch	B and C
		is occurred among t	-			
		(a) Translation look				
		(b) Program Count				
		(c) General purpose	•			
	MCO	(d) None of the abo				D 1 C
	<u>MCQ</u>	Which of the following below statements are correct with respect to				B and C
		user level and kernel level threads				
		(a) Context switch is faster in kernel threads (b) A system call in user thread can block the entire process				
		<ul><li>(b) A system call in user thread can block the entire process</li><li>(c) User threads are transparent to kernel</li></ul>				
		(d) All of the above				
	MCQ	Consider three processes P1, P2, and P3 with burst time 10, 20, and				С
		30 units and the arrival times are 0, 2, and 6 respectively. Determine				
		the number of context switches (without considering the context				
		switches at start and end) are required, if OS uses SRTF scheduling				
		algorithm.				
		(a) 3				
		(b) 4				
		(c) 2				
0.77	3500	(d) 1				~
<u>Q.N</u>	MCQ	Consider three processes P1, P2 and P3 along with their burst time and arrival time are specified in the below table.				С
<u>o:1(</u> <u>b)</u>			_			
77		Processes	Burst Time (ms)	Arrival Time(ms)		
		P1	9	0		
		P2	4	1		
		P3	9	2		

Find the average waiting time (ms) of above three processes using preemptive shortest job first scheduling algorithm.  (a) 4.33 (b) 7.33 (c) 5.0 (d) 6.33  Consider three processes P0, P1 and P2 along with their burst time and arrival time are specified in the below table.  Processes  Burst Time (ms)  Processes  Burst Time (ms)  Arrival Time(ms)  Po  5 0 P1 7 1 P2 4 3 Determine the order of completion of above three processes using Round Robin scheduling algorithm with time quantum of 2 units.  (a) P0, P2, and P1 (b) P0, P1, and P2 (c) P1, P0, and P2 (d) P2, P1, and P0  Consider five processes P0, P1, P2, P3 and P4 along with their burst time and arrival time are specified in the below table.  Processes  Burst Time (ms)  Arrival Time(ms)  P0  6 0 P1 2 3 P2 4 5 P3 6 7 P4 3 10 Find the average turnaround time (ms) of above five processes using shortest remaining time first scheduling algorithm.  (a) 7.2 (b) 6 (c) 8.5 (d) 5.6  MCQ  Consider five processes P0, P1, P2, P3 and P4 along with their burst time and arrival time, priority (lower number is the higher priority) are specified in the below table.  Processes Burst Time (ms)  P1 12 23 P3 10 21 P1 28 5 0 P2 2 11 28 5 0 P2 2 11 28 5 0 P2 2 11 28 7 11 11 11 11 11 11 11 11 11 11 11 11 1	MCQ	preemptive shortest (a) 4.33 (b) 7.33 (c) 5.0 (d) 6.33  Consider three production and arrival time are	t job first scheduling		esses using					
(a) 4.33 (b) 7.33 (c) 5.0 (d) 6.33  MCO  Consider three processes P0, P1 and P2 along with their burst time and arrival time are specified in the below table.  Processes  Burst Time (ms)  P0  1  P1  P2  4  3  Determine the order of completion of above three processes using Round Robin scheduling algorithm with time quantum of 2 units. (a) P0, P2, and P1 (b) P0, P1, and P2 (c) P1, P0, and P2 (d) P2, P1, and P0  Consider five processes P0, P1, P2, P3 and P4 along with their burst time and arrival time are specified in the below table.  Processes  Burst Time (ms)  Arrival Time(ms)  P0  6  0  P1  2  3  P2  4  5  P3  6  7  P4  3  10  Find the average turnaround time (ms) of above five processes using shortest remaining time first scheduling algorithm. (a) 7.2 (b) 6 (c) 8.5 (d) 5.6  MCO  Consider five processes P0, P1, P2, P3 and P4 along with their burst time, arrival time, priority (lower number is the higher priority) are specified in the below table.  Processes  Burst Time   Arrival   Priority   P0  11  P2  2  12  P1  P3  10  P2  2  11  P4  16  9  11  P4  16  9  11  P4  16  9  17  P4  P4  P4  P4  P5  P4  P4  P5  P5  P6  P7  P8  P9  P9  P9  P9  P9  P9  P9  P9  P9	MCQ	(a) 4.33 (b) 7.33 (c) 5.0 (d) 6.33 Consider three production and arrival time are	cesses P0, P1 and P	algorithm.						
(b) 7.33 (c) 5.0 (d) 6.33  MCQ  Consider three processes P0, P1 and P2 along with their burst time and arrival time are specified in the below table.  Processes  Burst Time (ms)  A  A  Determine the order of completion of above three processes using Round Robin scheduling algorithm with time quantum of 2 units. (a) P0, P2, and P1 (b) P0, P1, and P2 (c) P1, P0, and P2 (d) P2, P1, and P0  MCQ  Consider five processes P0, P1, P2, P3 and P4 along with their burst time and arrival time are specified in the below table.  Processes  Burst Time (ms)  Arrival Time(ms)  P1  P2  A  Arrival Time(ms)  P3  A Time (ms) of above five processes using shortest remaining time first scheduling algorithm. (a) 7.2 (b) 6 (c) 8.5 (d) 5.6  MCQ  Consider five processes P0, P1, P2, P3 and P4 along with their burst time, arrival time, priority (lower number is the higher priority) are specified in the below table.  Processes  Burst Time (ms)  P1  P1  P2  P3  P4  Arrival  Priority  Time(ms)  P0  P1  P1  P2  P3  P4  P4  P4  P5  P4  P6  P1  P4  P6  P1  P7  P8  P9  P9  P9  P1  P1  P1  P1  P1  P1  P1	MCQ	(b) 7.33 (c) 5.0 (d) 6.33  Consider three production and arrival time are	-							
MCO    MCO	MCQ	(c) 5.0 (d) 6.33 Consider three production and arrival time are	-							
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and arrival time are specified in the below table.    Processes   Burst Time (ms)   Arrival Time(ms)	MCQ	and arrival time are	-	(d) 6.33						
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Processes   Burst Time (ms)   Arrival Time(ms)   P0   5   0     P1   7   1     P2   4   3     Determine the order of completion of above three processes using Round Robin scheduling algorithm with time quantum of 2 units.  (a) P0, P2, and P1 (b) P0, P1, and P2 (c) P1, P0, and P2 (d) P2, P1, and P0      MCO										
PO   5   0     1     1     1										
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(c) P1, P0, and P2 (d) P2, P1, and P0  Consider five processes P0, P1, P2, P3 and P4 along with their burst time and arrival time are specified in the below table.  Processes  Burst Time (ms)   Arrival Time(ms) P0										
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MCQ Consider five processes P0, P1, P2, P3 and P4 along with their burst time and arrival time are specified in the below table.    Processes   Burst Time (ms)   Arrival Time(ms)										
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Processes   Burst Time (ms)   Arrival Time(ms)   P0	MCQ				their burst	A				
Processes   Burst Time (ms)   Arrival Time(ms)   P0					_					
P0					]					
P1		P0	<del>                                     </del>		1					
P2					-					
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(c) 8.5 (d) 5.6  MCQ Consider five processes P0, P1, P2, P3 and P4 along with their burst time, arrival time, priority (lower number is the higher priority) are specified in the below table.  Processes Burst Time Arrival Priority  [ms] P0		` '								
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Processes         Burst Time (ms)         Arrival Time(ms)         Priority           P0         11         0         2           P1         28         5         0           P2         2         12         3           P3         10         2         1           P4         16         9         4           Find the average waiting time (ms) of all the processes using preemptive priority scheduling algorithm.         (a) 28         (b) 29           (b) 29         (c) 32         (d) 26		1 1	1 ,	ber is the higher p	riority) are					
(ms)   Time(ms)		specified in the belo	ow table.							
P0		Processes Burst	Time Arrival	Priority						
P1 28 5 0 P2 2 12 3 P3 10 2 1 P4 16 9 4  Find the average waiting time (ms) of all the processes using preemptive priority scheduling algorithm.  (a) 28 (b) 29 (c) 32 (d) 26		(ms)	Time(ms)							
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P2 2 12 3 P3 10 2 1 P4 16 9 4 Find the average waiting time (ms) of all the processes using preemptive priority scheduling algorithm.  (a) 28 (b) 29 (c) 32 (d) 26		P1 28	5	0						
P3 10 2 1 P4 16 9 4  Find the average waiting time (ms) of all the processes using preemptive priority scheduling algorithm.  (a) 28 (b) 29 (c) 32 (d) 26										
P4 16 9 4  Find the average waiting time (ms) of all the processes using preemptive priority scheduling algorithm.  (a) 28 (b) 29 (c) 32 (d) 26				1						
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preemptive priority scheduling algorithm.  (a) 28  (b) 29  (c) 32  (d) 26			<u> </u>							
(a) 28 (b) 29 (c) 32 (d) 26										
(b) 29 (c) 32 (d) 26		1	scheduling algorith	m.						
(c) 32 (d) 26		(b) 29 (c) 32								
(d) 26										
Q.N   MCQ   Consider the following statements.		+								
<del></del>	<u>MCQ</u>	Consider the follow	ing statements.			C				
<u>0:1(</u>										
1-FCFS scheduling by its nature is always Non-Preemptive type.										
2-A process can directly go from waiting state to Running State		2-A process can dir	ectly go from waiting	ig state to Running S	State					
Q.N o:1( c)		MCQ	Determine the ord Round Robin schee  (a) P0, P2, and P1  (b) P0, P1, and P2  (c) P1, P0, and P2  (d) P2, P1, and P0  MCQ  Consider five proceed time and arrival time Processes P0 P1 P2 P3 P4 Find the average to shortest remaining (a) 7.2  (b) 6  (c) 8.5  (d) 5.6  MCQ  Consider five proceed time, arrival time, specified in the below proceed time, arrival time, specified time, arrival time, specified time, arriva	Determine the order of completion of Round Robin scheduling algorithm with (a) P0, P2, and P1 (b) P0, P1, and P2 (c) P1, P0, and P2 (d) P2, P1, and P0  MCQ  Consider five processes P0, P1, P2, P3 time and arrival time are specified in the Processes  Burst Time (ms)  P0 6 P1 2 P2 4 P3 6 P4 3 Find the average turnaround time (ms) shortest remaining time first scheduling (a) 7.2 (b) 6 (c) 8.5 (d) 5.6  MCQ  Consider five processes P0, P1, P2, P3 time, arrival time, priority (lower num specified in the below table.  Processes  Burst Time Arrival Time(ms)  P0 11 0 P1 28 5 P2 2 12 P3 10 2 P4 16 9 Find the average waiting time (ms) preemptive priority scheduling algorithm (a) 28 (b) 29 (c) 32 (d) 26  MCQ  Consider the following statements.  1-FCFS scheduling by its nature is always and priority is a priority and priority is a priority in the priority of the processes of the priority scheduling algorithm (a) 28 (b) 29 (c) 32 (d) 26  MCQ  Consider the following statements.	Determine the order of completion of above three proce Round Robin scheduling algorithm with time quantum of 2 (a) P0, P2, and P1 (b) P0, P1, and P2 (c) P1, P0, and P2 (d) P2, P1, and P0  MCQ  Consider five processes P0, P1, P2, P3 and P4 along with time and arrival time are specified in the below table.  Processes  Burst Time (ms)  P0  Arrival Time(ms)  P1  2  3  P2  4  5  P3  6  7  P4  3  10  Find the average turnaround time (ms) of above five processhortest remaining time first scheduling algorithm.  (a) 7.2 (b) 6 (c) 8.5 (d) 5.6  MCQ  Consider five processes P0, P1, P2, P3 and P4 along with time, arrival time, priority (lower number is the higher processed in the below table.  Processes  Burst Time Arrival Priority  (ms)  Time(ms)  P0  11  0  2  P1  28  5  0  P2  2  12  3  P3  10  P4  Find the average waiting time (ms) of all the processer preemptive priority scheduling algorithm.  (a) 28 (b) 29 (c) 32 (d) 26  MCQ  Consider the following statements.  1-FCFS scheduling by its nature is always Non-Preemptive	Determine the order of completion of above three processes using Round Robin scheduling algorithm with time quantum of 2 units.  (a) P0, P2, and P1 (b) P0, P1, and P2 (c) P1, P0, and P2 (d) P2, P1, and P0  Consider five processes P0, P1, P2, P3 and P4 along with their burst time and arrival time are specified in the below table.  Processes Burst Time (ms) P0 6 P1 2 3 P2 4 5 P3 6 7 P4 3 10 Find the average turnaround time (ms) of above five processes using shortest remaining time first scheduling algorithm.  (a) 7.2 (b) 6 (c) 8.5 (d) 5.6  MCQ  Consider five processes P0, P1, P2, P3 and P4 along with their burst time, arrival time, priority (lower number is the higher priority) are specified in the below table.  Processes Burst Time (ms) of above five processes using shortest remaining time first scheduling algorithm.  (a) 7.2 (b) 6 (c) 8.5 (d) 5.6  MCQ  Consider five processes P0, P1, P2, P3 and P4 along with their burst time, arrival time, priority (lower number is the higher priority) are specified in the below table.  Processes Burst Time Arrival (ms) Priority Priority Priority Priority P1 28 5 0 P2 12 3 P3 10 2 11 P4 16 9 4 Find the average waiting time (ms) of all the processes using preemptive priority scheduling algorithm.  (a) 28 (b) 29 (c) 32 (d) 26  MCQ  Consider the following statements.				

	3-Round Robin Scheduling is best suited for interactive Processes 4-Middle Term Scheduler is required when there is absence of long term Scheduler or presence of Long term scheduler with minimal functionality. 5-Switching between threads of same process is inefficient and takes	
	more time as compared to process switching.	
	6-Starvation is a problem with Fixed Priority Scheduling.	
	7-SJF Scheduling results into optimal average waiting time of the	
	processes.	
	Which of the above mentioned statements are true?	
	(a)1,2,3,4 & 7 only	
	(b)1,3,4,5 & 6 only	
	(c)1,3,4,6 & 7 only	
	(d)1,2,4,5 & 6 only	
<u>MCQ</u>	Consider the following statements.	В
	1-FCFS scheduling by its nature is always Preemptive type. 2-A process can directly go from Running state to Ready State 3-Multilevel feedback queue scheduling has simpler algorithm as compared to multilevel queue scheduling. 4-Switching between threads of same process is efficient and takes less time as compared to process switching. 5-Starvation problem can be resolved with aging priority. 6-SJF Scheduling results into large average waiting time of the processes. 7-In Round Robin Scheduling a process is bound to get the CPU attention after a fixed time. Which of the above mentioned statements are false?  (a)1,2,4 & 6 only (b)1,3 & 6 only (c)2,3,6 & 7 only	
MGO	(d)1,3, & 7 only	
<u>MCQ</u>	Consider the following statements.	С
	<ul><li>1-A Short Term Scheduler is in charge of waiting to ready state transition of a process.</li><li>2-A process will not suffer from starvation in Round Robin Scheduling.</li></ul>	
	3-Switching between threads of different processes is same as process switching.	
	4-A single program can give rise to several processes	
	5-The response time and waiting time of the processes are same for FCFS scheduling.	
	6-Dispatch latency is a part of the context switching time	
	7-When processes arrive at the same time, the Preemptive and Non	
	Preemptive version of priority scheduling will result into different waiting time of the processes.	
	Which of the above mentioned statements are true?	

	MCQ	(a)1,2,3,4 & 7 only (b)1,3,4,5 & 6 only (c)2,3,4,5 & 6 only (d)2,4,5,6 & 7 only Consider the following statements.				
		1-A Short Term Scheduler is in charge of waiting to ready state transition of a process.  2-SJF Scheduling results into optimal average waiting time of the processes.  3-Switching between threads of different processes is same as process switching.  4-Middle Term Scheduler is required when there is absence of long term Scheduler or presence of Long term scheduler with minimal functionality.  5-The response time and waiting time of the processes are same for FCFS scheduling.  6-Dispatch latency is a part of the context switching time  7-Process Control Block has a Pointer field to add them to the particular scheduling queue implemented as a linked list  Which of the above mentioned statements are true?  (a)2,3,4,5,6 & 7 only (b)1,3,4,5 & 6 only (c)2,3,4,5 & 6 only				
Q.N o:1( d)	MCQ	(d)2,4,5,6 & 7 only  In a uniprocessor system, there are two concurrent processes A and B as follows:	A			
		Process A:Process B:BeginBeginSeWAIT(S);DI; //Disable InterruptmaRead(x);Read(x);phoIncrease x by 1;Left shift x once;reSIGNAL(S);EI; //Enable InterruptS=1EndEnd;				
		ed int x =3; // x is a global variable  What would be the smallest value of x from all possible values of x after completion A and B?  (A) 4 (B) 5 (C) 6 (D) 7				
	MCQ	In a uniprocessor system, there are two concurrent processes A and B as follows:	D			

T	Drooce A.	Dec	na Di	1	
	Process A:  Begin WAIT(S); Read(x); Increase x by 1; SIGNAL(S); End		//Disable Interrupt		
	Semaphore S=1; unsigned int x =3; // x is a global variable  What would be the sum of all possible values of x after				
	completion A and E (A) 21 (B) 25 (C) 15 (D) None of the above		of all possible values of	x ditei	
MCQ	<u> </u>		em, there are two conc ows:	current	В
	Process A:  Begin WAIT(S); Read(x); Increase x by 1; SIGNAL(S); End		Process B:  Begin DI; //Disable Interrupt Read(x); Left shift x once; EI; //Enable Interrupt End		
	Semaphore S=1; unsigned int x =3;  How many differen completion A and E (A) 2 (B) 3 (C) 4 (D) None of the above	t possil	a global variable ble values of x can be the	re after	
MCQ	In a uniprocessor processes A and B	as follo		current	A
	Process A:  Begin WAIT(S); Read(x); Decrease x by 1; SIGNAL(S); End	Beg DI; Rea	//Disable Interrupt ad(x); t shift x once; //Enable Interrupt		

		,	
		Semaphore S=1; unsigned int x =2; // x is a global variable	
		What would be the smallest value of x from all possible values of x after completion A and B?  (A) 1  (B) 2  (C) 5  (D) 3	
Q.N o:1( e)	MCQ	Semaphore mutex=1; Each process Pi, i = 1, 2,, 9 is coded as follows:     P(mutex);     { Critical Section }     V(mutex);  The code for P10 is as follows:     for j = 1 to 3 do     V(mutex); { Critical Section }     V(mutex);  What is the largest number of processes that can be inside the critical section at any moment?  (a) 1 (b) 3 (c) 7 (d) 10	С
	MCQ	Semaphore mutex=1; Each process Pi, i = 1, 2,, 8 is coded as follows:     P(mutex);     { Critical Section }     V(mutex);  The code for P9 is as follows:     for j = 1 to 2 do     V(mutex); { Critical Section }     V(mutex);  What is the largest number of processes that can be inside the critical section at any moment?  (a) 1 (b) 3 (c) 5 (d) 9	C
	MCQ	Semaphore mutex=1; Each process Pi, i = 1, 2,, 9 is coded as follows:  P(mutex); { Critical Section } V(mutex);	4

	,			
	The code for P10 is as follows:			
	V(mutex);			
	V(mutex);			
	{ Critical Section }			
	V(mutex);			
	What is the largest number of processes that can be inside the critical			
	section at any moment?			
	(a) 1			
	(b) 3			
	(c) 5			
	(d) 9			
MCQ	Semaphore mutex=1;	5		
11100	Each process Pi, $i = 1, 2,, 9$ is coded as follows:	3		
	P(mutex);			
	{ Critical Section }			
	V(mutex);			
	v (mutex),			
	The code for P10 is as follows:			
	V(mutex);			
	V(mutex);			
	V(mutex);			
	{ Critical Section }			
	P(mutex);			
	What is the largest number of processes that can be inside the critical			
	section at any moment?			
	(a) 1			
	(b) 3			
	(c) 7			
	(d) 10			
 I	1 \ /			

### **SECTION-B(Answer Any One Question. Each Question carries 10 Marks)**

<u>Time: 30 Minutes</u> (1×10=10 Marks)

Que	Question
<u>stio</u>	
<u>n</u> <u>No</u>	
<u>Q.N</u> <u>0:2</u>	The Cats and Mice Problem: (10 marks)
312	A number of cats and mice inhabit a house. Your job is to synchronize the cats
	and mice so that the following requirements for the common food dish are
	satisfied:
	If a cat is eating at the food dish, other cats cann't share the food dish at the
	same time. But, if any mouse is eating at the food dish, other mice can share
	the food dish. If any cat see the mice/mouse with the food dish, then the cat

must eat the mice/mouse. No mouse should ever get eaten.

Answer the following for the above "The Cats and Mice Problem"

- i. List all of the synchronization primitives and shared variables that you have used to synchronize the cats and mice and identify the purpose of each one.
- ii. Explain why it is not possible for mice to be eaten by cats under your synchronization technique.

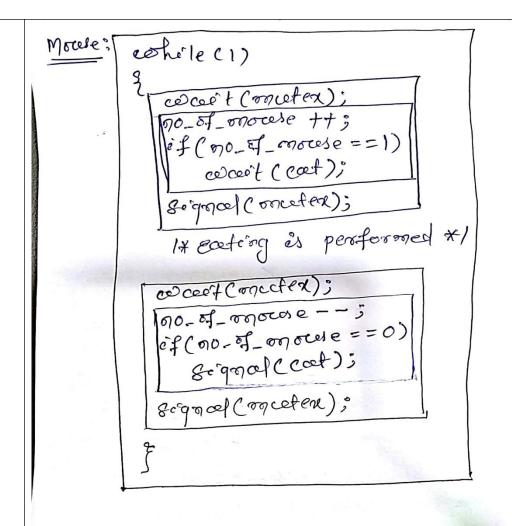
Justify whether it is not possible for cats or mice to starve under your synchronization technique.

<u>Sol</u>

The Cost and Mice problem 1. Meltéple Cots capt est songettageously cie. cot, Cota, ... Cota X

3. Meeltéple onéce can est simpetageously oie. on, on2, ... on, v

3. Doth Coet and onéce are not offorded cie. cot, onocese X 3019 to the cost and onice problem semaphore coet=1; semaphore meetex=1; cot no\_of\_mouse = 0;



a) Which process states diagram would you propose for system which requires neither any I/O operations nor any other process suspension? (2 marks)

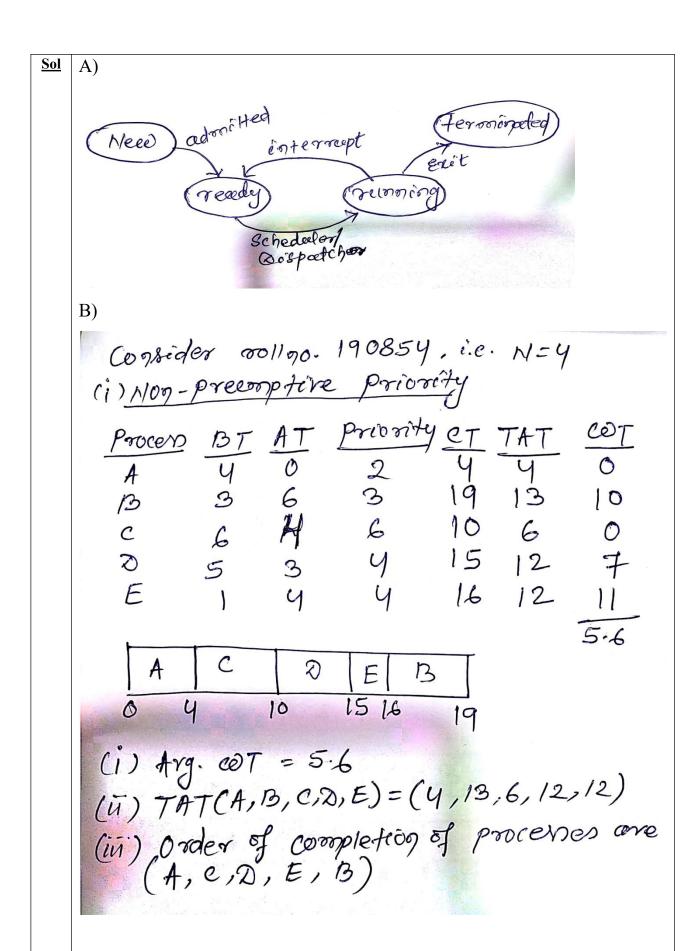
b) Consider process arrival as given below where N = right most significant digit of your Roll No. (ex:- for Roll No. 190854, N=4):

Process	CPU	Arrival	Priority
	Burst	Time	
	Time(ms)		
A	4	0	2
В	3	6	3
С	6	N	6
D	5	3	N
Е	1	4	4

Calculate the following for *priority (non preemptive)* and *round robin* (time quantum = 2 ms) CPU scheduling algorithm:

- i. Average waiting time
- ii. Turnaround time for each process
- iii. Order of completion

(hints:-higher digits indicate higher priority) (8marks)



<u>Q.N</u> <u>0:4</u> Let there is an array of size n, which is used for storing both stack data and heap data. The stack data is stored from the left end of the array, i.e. from 0<sup>th</sup> index, towards right end of the array, and the heap data is stored from the right end of the array, i.e. from (n-1)<sup>th</sup> index, towards left end of the array. In this system, there are 4 kinds of processes such as stack producer, heap producer, stack consumer and heap consumer. The stack producers store the data sequentially one after another from the left to right and the heap producers store the data sequentially one after another from the right to left. The stack consumer consumes the last inserted data into the stack and heap consumer consumes the last inserted data into the heap side. The stack producer and stack consumer will be identified through odd process id(pid), and the heap producer and heap consumer will be identified through odd process id(pid). Write the synchronization method for producer and consumer that satisfies the following:

- Two producer, one belongs to stack and another belongs to heap, can access the array simultaneously.
- Two consumer, one belongs to stack and another belongs to heap, can access the array simultaneously.
- One producer belongs to stack and another another consumer belongs to heap can access the array simultaneously.

One producer belongs to heap and another another consumer belongs to stack can access the array simultaneously. (10 marks)

#### <u>Sol</u>

```
Semaphore empty=n, full=0, mutex_stack=1, mutex_heap=1, count_stack=0, count_heap=0; int st_i=0,hp_i=n-1; int arr[n];
```

L 3/				
Producer	Consumer			
p(empty)	if(pid%2){			
if(pid%2){	p(count_heap)			
p(mutex heap)	p(full)			
arr[hp i]=heap item	p(mutex heap)			
v(mutex heap)	heap receive=arr[++hp i]			
v(count heap)	v(mutex heap)			
}else{	}else{			
p(mutex_stack)	p(count_stack)			
arr[st i++]=stack item	p(full)			
v(mutex stack)	p(mutex stack)			
v(count stack)	stack receive=arr[st i]			
]}	v(mutex stack)			
v(full)				
	v(empty)			

#### Q.N <u>0:5</u>

Consider process arrival as given below where (10 marks)

Z = 11 \* (1+ (right most significant digit of your Roll No % 9)). (Ex:- for Roll No. 190560, M=11 \* <math>(1+(0%9)) = 11)

Process	CPU Burst Time(ms)	Arrival Time
P <sub>1</sub>	30	0
P <sub>2</sub>	40	Z
P <sub>3</sub>	50	10
P <sub>4</sub>	Z	20
P <sub>5</sub>	10	30

Calculate the following for *round robin* (time quantum = 15 ms) CPU scheduling algorithm:

- a) Average waiting time
- b) Turnaround time for each process
- c) Order of completion

**Sol** Consider the example:- for Roll No. 190560, M=11 \* (1+(0%9)) = 11:

Proces	CPU Burst	Arrival Time	Wait Time	TA	Execution
S	Time(ms)			T	Time
<b>P</b> <sub>1</sub>	<del>30</del> <del>15</del> 0	0 15 60	0+30 =30	60	0+15+15+15
P <sub>2</sub>	40 25 10 0	Z=11 45 111	19+51+15=85	125	+
		136			15+11+10+15

P <sub>3</sub>	<del>50 35 20 5</del> 0	10 30 96 126	5+51+15+10=81	131	+15+15+10+
		141	41		5
P <sub>4</sub>	Z=11 0	20 71-	40	51	=141
P <sub>5</sub>	<del>10</del> - 0	30 81	41	51	
			Avg. Wait = $277/5 =$		
			55.4		

P <sub>1</sub>	P <sub>3</sub>	$\mathbf{P}_2$	<b>P</b> <sub>1</sub>	P <sub>4</sub>	<b>P</b> <sub>5</sub>	P <sub>3</sub>	<b>P</b> <sub>2</sub>	P <sub>3</sub>	<b>P</b> <sub>2</sub>	P <sub>3</sub>
										36 141

Q.N (a) The two processes execution part defined within if and else statement of the following code. Assume that the execution of *scanf* statement is delayed for long time. The *printf* statement is completed prior to *scanf* statement. What will be the process state of child process when it will gets terminated? Give a suitable reason. (2 marks)

```
i=fork();
if(i>0){
    scanf("%d",&j);
    wait(NULL);
}else if(i==0){
    printf("ABC\n");
}
```

(b) Consider the set of 4 processes whose priority(lower value becomes more priority), arrival time, and burst time are given below:

Process	Arrival	Priorit y	Burst Time				
No.	Time		CPU Burst	I/O Burst	CPU Burst		
P1	0	2	3	1	2		
p2	1	X	1	4	3		
P3	3	3	2	2	1		
P4	2	у	2	1	2		

Here

y= (Your roll no) 
$$\% 2$$
  
x= ((Your roll no) / 100)  $\% 2$ 

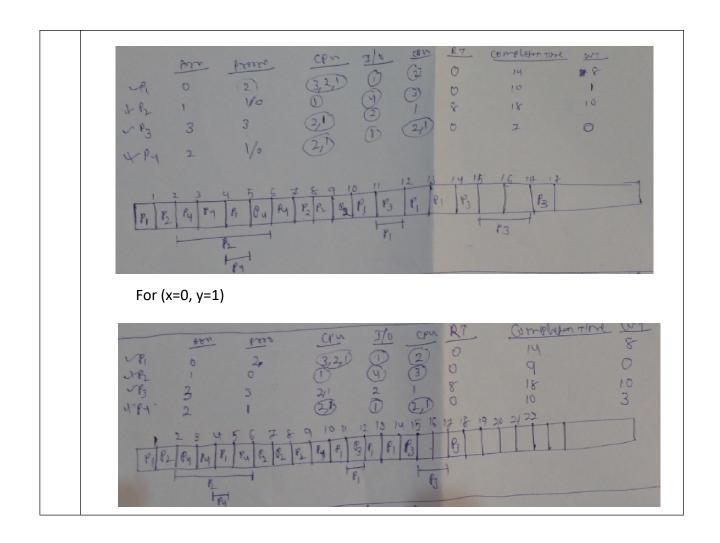
For example, if roll no is 2106653, then x=0 and y=1.

If the OS uses priority based(with preemption) Scheduling, then draw the gantt chart for the whole scheduling and calculate the response time, waiting time, and completion time of each process. (Lower number means higher priority) (8 marks)

**Sol** (a) Zombie process

(b)

For (x=0, y=0), (x=1, y=1), (x=1, y=0)



#### **Controller of Examinations**