BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI – K. K. BIRLA GOA CAMPUS

First Semester 2013-2014

Course Title : OPERATING SYSTEMS **Course No *CS C372 , IS C362, CS F 372 and IS F 372***

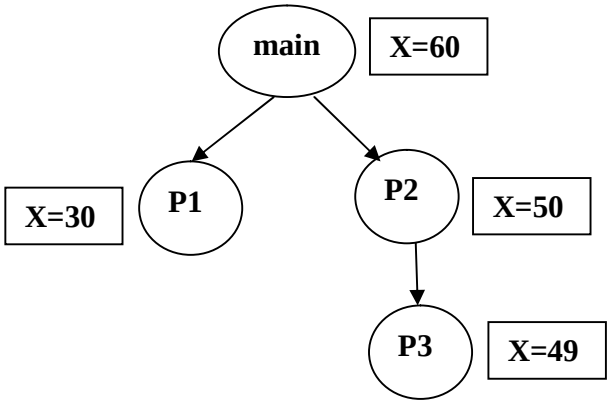
Component : Test I (Regular) **Closed Book Component**

Weightage : 20% **Max Marks: 40** **Date: 17-09-2013**

Question No. 1 **[09 Marks]**

Draw the process tree for the given program and find the final value of variable x for each process.

```
int main()
{
        int x=30;
        if(fork()){
                x – = 20;
                if(!fork()){
                        if(!fork()){
                                x – – ;
                        }
                        x +=40;
                }
                else x += 50;
        }
        while(wait(NULL)!= -1);
        return 0;
}
```

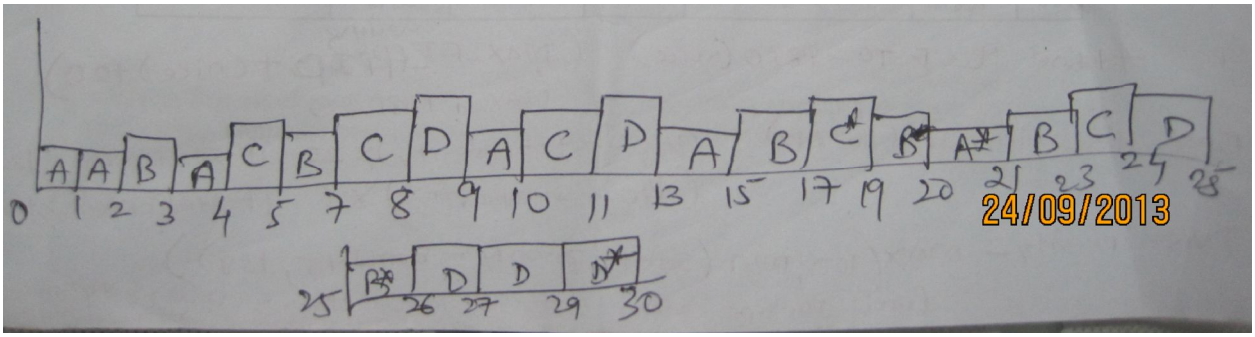


Question No. 2 **[09 Marks]**

Consider 4 processes A, B, C and D in a Uniprocessor system. xPy represents process P goes for x units of I/O operation after every y units of execution. Following table shows arrival time, execution time and xPy for all the processes. Scheduling policy is as follows: Assume there are only 3 queues Q_0 , Q_1 and Q_2 with priorities 0, 1 and 2 respectively. Queues Q_0 and Q_1 follows Round Robin with time quantum 1 and 2 respectively. Queue Q_2 follows FCFS. Process enters in Q_0 initially and after completing I/O operation. If a process is preempted by a process in higher priority queue, preempted process remains in the same queue at same position (i.e at head of the queue) with remaining time quantum. If time quantum of a process expires, process is moved to the next lower priority queue.

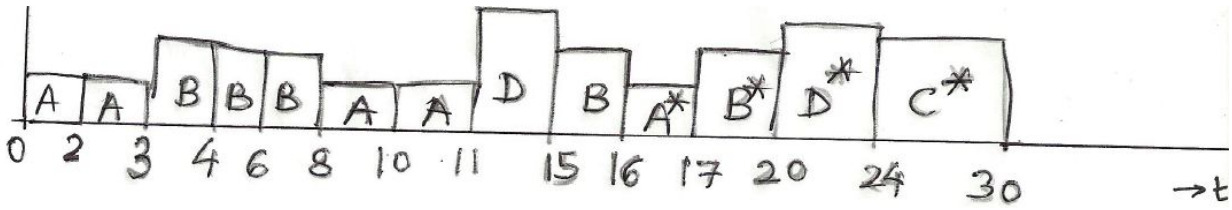
Process	Arrival Time	Execution Time	xPy
A	0	7	$_5A_3$
B	2	9	$_2B_5$
C	4	6	CPU bound
D	8	8	$_1D_4$

Draw the schedule according to Multilevel Feedback Scheduling algorithm.



Question No. 3 **[06 Marks]**

Consider 4 processes scheduled according to shortest remaining time first algorithm whose Gnatt chart is as shown below. Calculate turnaround time of each process and average waiting period by filling the following table.



Process	Arrival time	**Turn-around time**	Execution Period	**Waiting period**
A	0	**17-0=17**	7	**17-7-10=0**
B	2	**20-2=18**	9	**18-9-2=7**
C	4	**30-4=26**	6	**26-6-0=20**
D	6	**24-6=18**	8	**18-8-1=9**
Average Waiting Period				**9**

Question No. 4 **[07 Marks]**

Consider a Linux OS supporting O(1) scheduler.

a) Give equation to calculate Static Priority, Time Quantum and Dynamic Priority.

Static Priority : #define NICE_TO_PRIO(nice) (MAX_RT_PRIO + (nice) + 20)

Base time quantum (in milliseconds)
(140 – static priority) X 20 if static priority <120
(140 – static priority) X 5 if static priority >=120

Dynamic priority =
max (100, min(static priority – bonus + 5, 139))
Bonus is ranging from 0 to 10
Less than 5 (is a penalty that) lowers dynamic priority
Greater than 5 raises dynamic priority

b) Fill the following table and find quantum time allotted to each process and Dynamic priority of all conventional processes

Process	Nice	Avg sleep time(ms)	Bonus	Quantum Time(ms)	Dynamic Priority	Scheduling policy
A	-10	220ms	2	**(140-110) * 20 = 600**	**max (100, min(110 – 2 + 5, 139)) = 113**	SCHED_OTHER
B	13	160ms	1	**(140-133) *5 = 35**	**max (100, min(133 – 1 + 5, 139)) = 137**	SCHED_OTHER
C	-5	280ms	-	**(140-115) * 20 = 500**	**-**	SCHED_RR
D	0	650ms	-	**(140-120) * 5 = 100**	**-**	SCHED_FCFS

Question No.5 **[09 Marks]**

Consider a process transition model with seven states and complete the following table to explain state transitions under the given condition.

I/O	Memory	State	Ready	Ready-Suspend	Blocked	Blocked-Suspend
Yes	**No**	Ready-Suspend	**Mem available**	**-**	**NA**	**NA**
No	**Yes**	Blocked	**i/o completed**	**NA**	**-**	**i/o and mem not available**
No	**No**	Blocked-Suspend	**NA**	**i/o completed**	**mem available but waiting for i/o**	**-**