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THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECX 5235 – Operating Systems

Final Examination – 2009 / 2010 *(No Book Type)*

Date : Friday, 19th of March, 2010 Time : 09:30 – 12:30

INSTRUCTIONS TO CANDIDATES
Answer any five questions. All questions carry equal mark.

1. (a) Consider the table of processes given below. Draw Gantt charts for First Come First Served, Shortest Job Next, Non-preemptive Priority and Round Robin scheduling algorithms. Time is given in milliseconds. [12 marks]

Job	Arrival Time	CPU-Burst Time	Priority
A	0	3	4
B	0	5	1
C	0	2	3
D	6	4	2
E	15	3	3
F	16	2	5
G	16	4	2
H	27	5	4
I	27	2	5
J	27	6	2
K	32	3	1
L	34	4	3
M	35	3	4

(b) Which scheduling algorithm gives the best turnaround time? Show how you determine it. [8 marks]

2. Consider a loosely coupled configuration in multiprocessing environment with four processors.

(a) Draw a block diagram to illustrate this configuration. [4 marks]

(b) Describe three types of information that should be maintained for this system. Indicate who should maintain it. [6 marks]

(c) How would you decide to which processor a new job should be allocated to keep the system well-balanced and resources fully used? State all your assumptions. [10 marks]

3. (a) What are the two levels at which the devices are deallocated by the Device Manager? [2 marks]

(b) What is the job of the I/O traffic controller? State three tasks performed by the I/O traffic controller. [8 marks]

(c) What kind of information does the I/O traffic controller keep in the database it maintains for Channel Control Block, Control Unit Control Block, and Device Control Block? (Hint: use tables to group the information.) [10 marks]

4. (a) Consider the scenario given in table below, where "P" indicates a process and "R" indicated a resource.

Time	Action
1	P2 requests and is allocated R3
2	P4 requests and is allocated R4
3	P3 requests R4
4	P5 requests and is allocated R1
5	P1 requests and is allocated R2
6	P2 requests R2
7	P4 requests and is allocated R5
8	P1 requests R3
9	P3 requests R5
10	P4 releases R4, which is allocated to P3
11	P5 releases R1
12	P3 requests R3
13	P1 releases R2, which is allocated to P2
14	P4 releases R5, which is allocated to P3
15	P2 releases R3, which is allocated to P1
16	P2 releases R2

Use Holt's deadlocks modeling method to analyze the above scenario. Show your work. [10 marks]

(b) Is there a deadlock in the system above? Describe it. [5 marks]

(c) Consider the situation given above in 3.(a). There were several situations when the system was in critical condition. Name these situations and indicate what kind of action occurring next in the system and in what time could have created a deadlock situation. [5 marks]

5. (a) What are the levels in a File Management System between Basic File System and the Device? [4 marks]

(b) Explain how non-contiguous (records) storage allocation method differs from the unblocked, variable-length records storage allocation method. [6 marks]

(c) Draw a flowchart to implement reading to a directory with non-contiguous storage allocation method with linking at the directory level. State all your assumptions. [10 marks]

(a) What are the problems you will have to watch for, when implementing multiprogramming to increase your processor's utilization? [3 marks]

(b) Explain why using positive feedback loops for system monitoring must be implemented with great care. [5 marks]

(c) Show all the steps of your calculations.

i. Mean time between failures (MTBF) is the average time that a unit is operational before it breaks down. If you have bought a terminal with an MTBF of 5040 hours and you are going to use it for 5 hours a day for 28 days a month, how soon can you expect it to break down? [2 marks]

ii. The data obtained from observing a system are given in Figure 6.1. Assume that the system was busy 80% of the time and has completed 93% of all jobs that arrived. (You may round the number of jobs to the closest integer number). Calculate the following for this system:

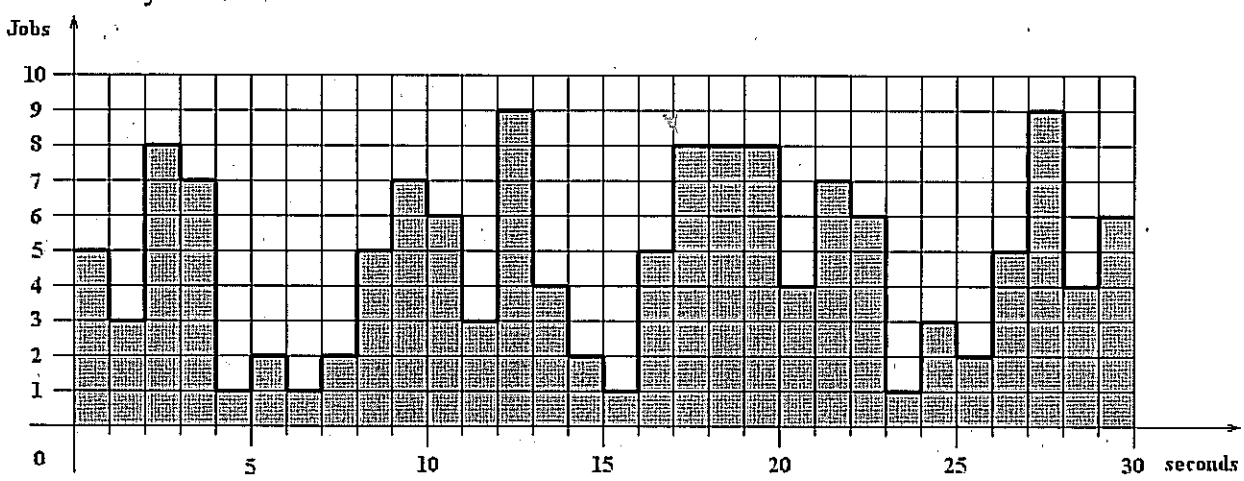

Figure 6.1.

A. What is the throughput of the system? [2 marks]

B. What is the job requirement? [2 marks]

C. What is the utilization of the system? [2 marks]

D. What is the average number of requests in the system? [2 marks]

E. What is the response time of the system, if the user thinking time is zero? [2 marks]

7. (a) What are the three basic functions the job control language's (JCL's) statements can be divided into in OS/390 operating system? Explain them briefly. [3 marks]

(b) What are the nine categories of activities that are handled by the functional area of supervisor management in OS/390 operating system? [9 marks]

(c) What are the three things that the Virtual Storage Manager needs to know to keep track of pages in an address space? [3 marks]

(d) Give the virtual storage layout of the OS/390 operating system. [5 marks]

8. (a) 10h is a Video Services interrupt - installed by the BIOS or operating system; called b software programs. List at least 5 functions executable under this interrupt with the codes. To which register should these codes be assigned to? [6 marks]

(b) What are the functions of the following header files in the ISO C Library? [6 marks]
i. <time.h> ii. <fenv.h> iii. <stdlib.h>

(c) Write a program in C/C++ to check the size of ***Conventional Memory*** of an IBM compatible personal computer with x86 processor? [8 marks]