*Name* : .....

*Roll No.* : .....

*Invigilator's Signature* : .....

**CS/B.Tech(EE)/SEM-5/CS-513/2009-10**

**2009**

# SYSTEM PROGRAMMING AND OPERATING SYSTEM

*Time Allotted* : 3 Hours Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

## GROUP – A

## ( Multiple Choice Type Questions )

1. Choose the correct alternatives for the following : 10 ∞ 1 = 10

i) A thread is a

a) task b) process

c) program d) light-weight process.

ii) What is not a function of the loader ?

a) Relocation b) Allocation

c) Loading d) Translation.

iii) Once a program is compiled, it can be loaded for execution

a) only from compiler generated starting address

b) anywhere in main memory

c) user needs to specify memory address

d) from address '*O*' in main memory.

iv) The system call to start a new process is

a) exec b) fork

c) init d) none of these.

v) 8085 microprocessor supports

a) 8-bit b) 4-bit

c) 32-bit d) 16-bit.

vi) Which of the following remarks about assembler is are true ?

a) Translates mnemonic instructions into machine code

b) design of an assembler is independent of source language

c) Both (a) & (b)

d) none of these.

vii) Memory protection is normally provided by

a) compiler

b) user program

c) operating system medules

d) processor.

viii) A critical section is a program segment

a) which should run in a certain specified amount of time

b) which avoids deadlocks

c) where shared resources are accessed

d) which must be enclosed by a pair of semaphores operations, *P* and *V*.

ix) Which of the following provides an interface from user to operating system ?

a) Kernel b) Shell

c) Microkernel d) Monolithic kernel.

x) Aging is considered to be a solution for

a) deadlock b) external fragmentation

c) thrashing d) starvation.

## GROUP – B

### ( Short Answer Type Questions )

Answer any *three* of the following. 3 ∞ 5 = 15

2. a) What is the difference between a compiler and interpreter ?

   b) Explain briefly the working of microprocessor. 1 + 4

3. Write down the four necessary conditions of deadlock. 5

4. Define the following terms :

   a) Turnaround time

   b) Rotational latency

   c) Thrashing. 5

5. a) What are the functions of operating system ?

   b) What is device driver ? 3 + 2

6. a) What are the disadvantages of an absolute loading scheme ?

   b) What do you understand by spooling ?

   c) Give an example of a monolithic kernel operating system. 2 + 2 + 1

**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following. 3 ∞ 15 = 45

7. a) Explain the working of a two-pass assembler. Mention is advantages and disadvantages.

   b) Given memory partitions of 100 K, 500 K, 200 K, 300 K and 600 K ( in order ). How would each of the first-fit, best-fit and worst-fit algorithms place processes of size 212 K, 417K, 112 K and 426 K ( in order ) ? Which algorithm makes the most efficient use of memory ?

   c) What is the difference between internal and external fragmentation ? 6 + 6 + 3

8. a) How does a relocating loader work ?

   b) What are logical address and physical addresses ?

   c) What is busy waiting ? What are the ways to avoid it ?

   d) For what type of operation is Direct Memory Access ( DMA ) useful ? Justify your answer. 5 + 3 + 4 + 3

9. a) Consider the following snapshot of a system :

| | Allocation | Max | Available |
|---|---|---|---|
| | A B C D | A B C D | A B C D |
| $P_0$ | 0 0 1 2 | 0 0 1 2 | 1 5 2 0 |
| $P_1$ | 1 0 0 0 | 1 7 5 0 | |
| $P_2$ | 1 3 5 4 | 2 3 5 6 | |
| $P_3$ | 0 6 3 2 | 0 6 5 2 | |
| $P_4$ | 0 0 1 4 | 0 6 5 6 | |

Answer the following questions using Banker's algorithm.

i) What is the content of the matrix need ?

ii) Is the system in a safe state ?

iii) If a request from process $p_1$ arrives for (0, 4, 2, 0), can the request be granted immediately ?

b) Consider a disk queue with requests for I/O to block on cylinders in the following order :

98, 183, 37, 122, 120, 17, 65, 67. ( The disk head is intially at cylinder 53 ) SCAN and C-SCAN disk scheduling algorithm. Compare with respect to the above request. ( 2 + 3 + 3 ) + 7

10. a) Consider the following set of processes :

| Process | CPU Burst-time | Priority | Arrival Time |
|---|---|---|---|
| $P_1$ | 10 | 3 | 0 |
| $P_2$ | 1 | 1 ( highest ) | 0 |
| $P_3$ | 2 | 3 | 1 |
| $P_4$ | 1 | 4 ( Lowest ) | 3 |
| $P_5$ | 5 | 2 | 6 |

Draw the Gantt chart using FCFS, SJF ( both preemptive and non-preemptive ), RR ( *ts* = 3 ) & preemptive priority scheduling. Calculate average waiting time in each case.

b) What do you mean by Process State ? Explain with proper diagram.

c) What is PCB ? 8 + 5 + 2

11. a) What is effective access time ? A paging system with the page table is stored in main memory.

i) if memory reference takes 200 ns, 200 how long does a paged memory reference take ?

ii) If we add TLBs and 75% hit is successful, what is the effective memory reference time ? ( Assume that finding page-table entry in the TLBs take zero time, if the entry is there ).

b) What is compaction ? What are its drawbacks ?

c) Mention the advantages and disadvantages of demand paging. ( 1 + 2 + 3 ) + 4 + 5