Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA/SEM-3/MCA-301/2011-12

2011

OPERATING SYSTEM AND SYSTEM SOFTWARE

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 : $10 \times 1 = 10$

   i) Which of the following is not application software ?

   a) Spread sheet b) Word processor

   c) Unix d) Desktop publishing.

   ii) Which of the following schemes suffers from external fragmentation ?

   a) Segmentation

   b) Paging

   c) Paged segmentation

   d) All of these.

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

a) only from the compiler starting address

b) anywhere in the main memory

c) user needs to specify where the compiled code is to be loaded

d) it is loaded starting from address 0 in the main memory.

iv) An assembler translates

a) high level language program to machine level language program

b) assembly level language program to high level language program

c) assembly level language program to machine level language program

d) high level language program to assembly level language program.

v) A compiler translates

a) high level language program to assembly level language program

b) high level language program to machine level language program

c) machine level langauge program to high level language program

d) assembly level language program to high level language program.

vi) IPC stands for

a) Internal Program Controller

b) Internal Process Control

c) Interprocess Communication

d) None of these.

vii) If there are 32 segments, each of size 1K, then the logical address should have

a) 13 bits b) 14 bits

c) 15 bits d) 16 bits.

viii) Which one of the following is not a valid state of a process ?

a) Load b) Blocked

c) Ready d) Running.

ix) Compaction is used to solve the problem of

a) external fragmentation

b) internal fragmentation

c) both of these

d) none of these.

x) The problem of mutual exclusion occurs when

a) processes share resources

b) processes do not share resources

c) all of these

d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. a) What are the necessary and sufficient conditions for deadlock to occur ?

   b) What is thrashing ? 4 + 1

3. Different memory partitions of 150 K, 820 K, 360 K and 450 K (in the given order) are present. Explain how best fit algorithm can be used to place a process of 315 K. What are the advantages and disadvantages of using best fit over worst fit and first fit algorithms ? 2 + 3

4. Explain the working of a two pass assembler.

5. a) What is Process Control Block ? What does it contain ?

   b) What is lexical analysis ? 3 + 2

6. a) What are the tasks of a linker ?

   b) What are the tasks of a loader ? 3 + 2

GROUP – C

(Long Answer Type Questions)

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

7. a) Explain the following :
   i) Waiting time
   ii) Turn around time.

   b) Consider the following set of processes with a CPU burst time and arrival time given in milliseconds :

Process	***Burst time***	***Arrival time***
P1	10	0
P2	5	1
P3	15	1
P4	5	5
P5	20	10

   Draw Gantt chart illustrating the execution of processes using shortest remaining time first and round robin (quantum = 5 ms) process scheduling algorithm. Also calculate the average turn around time and waiting time for each algorithm and hence comment on which of these algorithms is better and why. 5 + 10

8. a) A computer provides each process with 65536 bytes of address space divided into 4096 bytes. A particular program has text size 32768 bytes, data size of 16386 bytes and stack size of 15870 bytes. Will this program fit in the address space ? If the page size were 512 bytes, would it fit ? Give reasons for all of your answers.

   b) Explain with suitable example the segmentation technique. What are the advantages and disadvantages of segmentation ? Can the disadvantages of segmentation technique be removed if paged segmentation is used ? Justify your answer. 7 + 8

9. a) Consider the following snapshot of a system, where the names of the matrices have their usual meanings :

Process	*Allocation*				*Max*				*Available*			
	A	B	C	D	A	B	C	D	A	B	C	D
P1	0	0	1	2	0	0	1	2	1	5	2	0
P2	1	0	0	0	1	7	5	0				
P3	1	3	5	4	2	3	5	6				
P4	0	6	3	2	0	6	5	2				
P5	0	0	1	4	0	6	5	6				

Answer the following question using Banker's Algorithm :

i) What is the content of Need matrix ?

ii) Is the system in a safe state ? Show the steps to arrive at your answer.

iii) If a request from process P2 arrives for (0, 4, 2, 0), can the request by granted immediately ? How ?

b) What are the requirements that a solution to critical section problem must satisfy ? (3 + 4 + 4) + 4

10. a) Consider the following page reference string :

7, 8, 9, 0, 7, 9, 1, 0, 8, 7, 9, 1

Assuming memory consisting of four (4) frames, calculate the hit ratio using (i) First In First Out (FIFO) and (ii) Least Recently Used (LRU) page replacement algorithms. Show each step.

b) What is Belady's anomaly ? Why does it occur in case of one page replacement algorithm only ?

c) How can Access Matrix be implemented ? 8 + 4 + 3

11. a) Briefly describe the indexed file allocation technique. Compare this technique with linked file allocation technique.

b) i) What is Translation Look-aside Buffer (TLB) ? What are the disadvantages of using it ?

ii) Find out effective Memory Access Time with an 80% hit ratio and following access times :

TLB Access Time : 20 ns

MM Access Time : 100 ns

c) What are the different disk scheduling algorithms ? Mention at least four such algorithms. 5 + (2 + 4) + 4