

Subject: OPERATING SYSTEMS AND SYSTEMS SOFTWARE

Time: 3 Hours

Max. Marks: 100

JUNE 2011

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q. 1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions, answer any FIVE Questions, selecting at least TWO questions from each part. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. If the waiting time for a process is p and there are n processes in the memory then the CPU utilization is given by,

- (A) p/n (B) p^n (p raised to n)
(C) $1-p^n$ (D) None of the above

b. If the no of pages in a 32 bit machine is 8kB then what is the size of the page table?

- (A) 8 kb. (B) 16 kB
(C) 4 KB (D) Can't say

c. For what types of operations is DMA useful?

- (A) For large & fast data transfers between memory & I/O devices.
(B) For large & slow data transfers between memory & I/O devices.
(C) For slow & small data transfers between memory & I/O devices.
(D) For small data transfers between processor and I/O device.

d. When a process is rolled out of memory, it loses its ability to use the CPU (at least for a while). Describe another situation where a process loses its ability to use the CPU, but where the process does not get rolled out.

- (A) When an interrupt occurs. (B) When thrashing occurs.
(C) When deadlock occurs. (D) While swapping.

e. Interval between the time of submission and completion of the job is called

- (A) Waiting time (B) Turnaround time
(C) Throughput (D) Response time

- f. The “blocking factor” of a file is
- (A) the number of blocks accessible to a file
 - (B) the number of blocks allocated to a file
 - (C) the number of logical records in one physical record
 - (D) none of the above
- g. An assembler is
- (A) programming language dependent.
 - (B) syntax dependant.
 - (C) machine dependant.
 - (D) complier dependant.
- h. A parser which is a variant of top-down parsing without backtracking is
- (A) Recursive Descend.
 - (B) Operator Precedence.
 - (C) LL(1) parser.
 - (D) LALR Parser.
- i. In a two-pass assembler, the task of the Pass II is to
- (A) separate the symbol, mnemonic opcode and operand fields.
 - (B) build the symbol table.
 - (C) construct intermediate code.
 - (D) synthesize the target program.
- j. The syntax of the assembler directive EQU is
- (A) EQU <address space>
 - (B) <symbol>EQU<address space>
 - (C) <symbol>EQU
 - (D) None of the above

PART A

Answer at least TWO questions. Each question carries 16 marks.

Q.2 a. Explain the following terms (**Any TWO**)

- (i) Batch Operating System
- (ii) Time Sharing System
- (iii) Real Time System.

(4)

- b. What is System Programs? What are the different categories of System programs? **(2+3)**
- c. Define cooperating process? Discuss the two fundamental models of Interprocess communication? Give reasons for providing an environment that allows process cooperation? **(2+2+3)**

Q.3 a. Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here:

P	T(pi)	Arrival Time
0	80	0
1	20	10
2	10	10
3	20	80
4	50	85

- (i) Suppose a system uses RR scheduling with a quantum of 15. Create a Gantt chart illustrating the execution of these processes?
(ii) What is the turnaround time for process p3?
(iii) What is the average wait time for the processes? (2+2+2)
- b. Consider the following system snapshot using data structures in the Banker's algorithm, with resources A, B, C, and D, and process P0 to P4:

	Max				Allocation				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	6	0	1	2	4	0	0	1	3	2	1	1
P1	1	7	5	0	1	1	0	0				
P2	2	3	5	6	1	2	5	4				
P3	1	6	5	3	0	6	3	3				
P4	1	6	5	6	0	2	1	2				

Using Banker's algorithm, answer the following questions.

- (i) What are the contents of the Need matrix?
(ii) Is the system in a safe state? Give reason for your answer.
(iii) If a request from process P4 arrives for additional resources of (1, 2, 0, 0) can the Banker's algorithm grant the request immediately? Show the new system state and other criteria. (2+2+2+4)
- Q.4** a. What is Critical-Section problem? What are the requirements that critical-section problem must satisfy for its solution? (2+3+3)
- b. Discuss the various attributes of a file? What are the methods that help in accessing the information stored in a file? Discuss them. (4+4)
- Q.5** a. Define Memory Allocation. What is the difference between contiguous and non-contiguous memory allocation? (8)
- b. Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order)? Which algorithm makes the most efficient use of memory? (8)

PART B

Answer at least TWO questions. Each question carries 16 marks.

- Q.6** a. Discuss the different fundamental language processing activities? (5)
- b. Discuss the different criteria used to classify the data structures used for Language Processors? (5)

- c. Define Grammar of a language. Identify the different classes of grammar. Explain their characteristics and limitations. (4)

- Q.7** a. What are the problems that may arise during top-down parsing with backtracking? (4)
- b. Write an algorithm to outline the macro-expansion using macro-expansion counter. (4)
- c. What all information's the object module of a program contains? Consider the following assembly program. List all information's that the object module of the program contains. (4+4)

	<u>Statement</u>	<u>Address</u>
	START 500	
	ENTRY TOTAL	
	EXTRN MAX, ALPHA	
	READ A	500)
LOOP		501)
	.	
	.	
	.	
	MOVER AREG, ALPHA	518)
	BC ANY, MAX	519)
	.	
	.	
	.	
	BC LT, LOOP	538)
	STOP	539)
A	DS 1	540)
TOTAL	DS 1	541)
	END	

- Q.8** a. Explain the elements of assembly language programming in detail. (8)
- b. Explain the following: (4+4)
- (i) Two pass translation and Single pass translation
- (ii) Forward references and Cross references
- Q.9** a. Discuss the issues involved that contributes to the semantics gap between a programming language domain and an execution domain? (8)
- b. During a function call compiler takes care of certain points. List those points? (4)
- c. Define interpreter? What are the different components of an interpreter? (4)