B. E. Fifth Semester (Computer Technology) / SoE – 2014 – 15 Examination

Course Code : CT 1302 / CT 302 **Course Name : Operating Systems**

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions are compulsory.
(2) All questions carry marks as indicated.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data wherever necessary.
(5) Illustrate your answers wherever necessary with the help of neat sketches.

1. (A) Solve any **One** :—

(A1) Discuss essential properties of the following types of operating system.

(1) Distributed

(2) Interactive

(3) Timesharing

(4) Network 8(CO1)

(A2) What is operating system ? What are the main differences between operating system for mainframe computer and PCS ? 8(CO1)

(B) Solve any **One** :—

(B1) What is system call ? Explain in brief about fork () system call. 2(CO1)

(B2) Explain in brief about concept of distributed operating system. 2(CO1)

2. (A) Solve any **One** :—

(A1) Consider the following set of processes with length of CPU burst times given in milliseconds :

Process ID	Arrival time	Burst time	Priority
p1	03	13	01
p2	02	01	03
p3	01	05	04
p4	00	04	02
p5	04	08	05

Given Gantts chart, calculate the average waiting time for following CPU scheduling algorithms :

(a) FCFS

(b) SJF

(c) Round Robin (slice = 3)

(d) Priority scheduling algorithm (largest number indicates highest priority) 8(CO2)

(A2) Consider three processes, all arriving at time zero, with total execution time of 10 , 20 and 30 units, respectively. Each process spends the first 20% of execution time doing I/O, next 70% of doing computation and the last 10% of doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorihtm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst.
Assume that all I/O operations can be overlapped as much as possible. Then compute percentage time for which CPU remain Idle. Draw the Gantts chart. 8(CO2)

(B) Solve any **One** :—

(B1) Differentiate between User level threads and Kernel level threads. 2(CO2)

(B2) Explain Single and multithreaded programming. What are the benefits of multithreaded programming in operating system ? 2(CO2)

3. (A) Solve any **One** :—

(A1) Write and discuss solution ot Producer – consumer problem with bounded buffering using semaphores. 8(CO2)

(A2) What is Critical Section Problem (CSP) ? Explain in detail about various solutions to solve this problem. 8(CO2)

(B) Solve any **One** :—

(B1) Consider the methods used by processes P1 and P2 for accessing their critical sections whenever needed, as given below. The initial values of shared Boolean variable S1 and S2 are randomly assigned.

Method used by P1	Method used by P2
While (S1 = = S2) ; {Critical Section} S1 = S2 ;	While (S1 = S2) ; {Critical Section} S2 = not (S1) ;

Then among properties mutual exclusion, progress and bounded, which will be achieved ? Justify your answer. 2(CO2)

(B2) What is monitor in operating system ? How is it used ? 2(CO2)

4. (A) Solve any **One** :—

(A1) Consider the following snapshot of a system.

Maximum Need				
	A	B	C	D
P1	0	6	5	6
P2	0	6	5	2
P3	0	0	1	2
P4	1	7	5	0
P5	2	3	5	6

Allocation				
A	B	C	D	
P1	0	0	1	4
P2	0	6	3	2
P3	0	0	1	2
P4	1	0	0	0
P5	1	3	5	4

Available			
A	B	C	D
1	6	2	0

Answer the following using Banker's Algorithm :

(a) What is the context of matrix Need ?

(b) Is the system in safe state ?

(c) If the request from P1 arrives for (0 , 5 , 2 , 0) can request be granted immediately ? 8(CO3)

(A2) Explain in detail about access list and capability list implementation. 8(CO3)

(B) Solve any **One** :—

(B1) An operating system contains 10 user processes each requiring 3 units of resource R. Then compute the minimum number of units of R such that no deadlocks will ever arise. Justify your answer. 2(CO3)

(B2) Describe in brief about goals of protection. 2(CO3)

5. (A) Solve any **One** :—

(A1) How paging is implemented with TLB ? Also give the derivation for enhancement in Effective memory access time due to usage of TLB. 8(CO4)

(A2) What is Belady's anomaly ? Prove it for memory reference string A , B , C , D , A , B , E , A , B , C , D , E by taking no of frames 3 and 4. Also show that how we overcome it for the same memory reference string. 8(CO4)

(B) Solve any **One** :—

(B1) A process has been allocated 3 page frames. Assume that none of the pages of the process are available in the memory initially. The process makes the following sequence of page references :

1 , 2 , 1 , 3 , 7 , 4 , 5 , 6 , 3 , 4

If optimal page replacement is used, how many page faults occur for the above reference string ? 2(CO4)

(B2) Consider a system with two level paging scheme in which a regular memory access takes 20 nanoseconds, and serving a page fault takes 10 milliseconds. If one page fault is generated for every 10^6 memory access, what is the effective access time for the memory ? 2(CO4)

6. (A) Solve any **One** :—

(A1) Suppose a disk drive has 300 cylinders numbered from 0 to 299. The drive is currently Serving a request at cylinder 127. The queue of pending request in FIFO order is 76 , 94 , 99 , 130 , 187 , 213 , 289 , 295. Starting from the current head position, What is the total distance (in cylinder) that the disk arm moves to satisfy the entire pending request for each of the following disk scheduling algorithms :

FCFS , SSTF , SCAN , LOOK , C – SCAN , C – LOOK 8(CO5)

(A2) A hard disk has 63 sectors per track, 10 platters each with 2 recording surfaces and 100 cylinders. The address of a sector is given as a triple <c , h , s> where c is the cylinder number, h is the surface number and s is the sector number. Thus 0^{th} sector is addressed as <0 , 0 , 0> , the 1^{st} sector is addressed as <0 , 0 , 1> , and so on.
Then answer the following questions :

(a) Compute the sector number for the address <400 , 16 , 29>.

(b) Compute the address for sector number 1039. 8(CO5)

(B) Solve any **One** :—

(B1) Explain in detail about Indexed file organization. 2(CO5)

(B2) Consider an operating system capable of loading and executing a single sequential user process at a time. The disk head scheduling algorithm used is FCFS. If FCFS is replaced by SSTF (Shortest Seek Time First), claimed by the vendor to give 50% better benchmark results, What is the expected improvement in the I/O performance of user programs ? 2(CO5)