Ex/CSE/T/313A/2018

B. E. COMPUTER SCIENCE & ENGINEERING EXAMINATION 2018

THIRD YEAR
FIRST SEMESTER

OPERATING SYSTEM

Time: 3 hours Full Marks: 100

Answer Question no.**1** and any **three (3)** from the rest

1.

a) What is Translation Look-aside Buffer (TLB)?
b) What is the *Hold and Wait* condition of deadlock? How can *this* condition be prevented? What are the possible problems with this prevention technique?
c) Mention the condition under which the following transition would occur in process state diagram: (i) Ready to Run (ii) Run to Blocked/Wait
d) What are the advantages and problems of *Contiguous File Allocation* technique?
e) What is a page table? Mention any two ways of storing/maintaining page information.
f) What is *critical section* problem?
g) What are the requirements for solution to *mutual exclusion* problem?

3+5+3+4+3+3+4=25

2.

a) Consider the following page reference during a given time interval: 52, 64, 17, 85, 20, 11, 2, 3, 20, 17, 4, 20, 11, 2, 3, 64. Using (i) First In First Out (FIFO) and (ii) Least Recently Used (LRU) page replacement strategies, show the contents of memory each time a page is referenced, for number of frames = 4. Compare the number of page hits for both cases and comment on your findings.
b) Distinguish between different types of *fragmentation.*

Q2 continued

c) Consider the following free list entry that shows the starting address of the hole and its size in bytes respectively:
(750, 1200), (2500, 400), (6000, 1100), (9000, 500)
Suppose that the following events occur sequentially:

i. 300 bytes starting at address 450 to be freed,
ii. 1050 bytes to be allocated,
iii. 600 bytes starting at address 7100 are freed,
iv. 400 bytes to be allocated.

Show the free list after the occurrence of each of the events using (i) best-fit hole selection strategy and (ii) first-fit hole selection strategy.
What are the problems with dynamic memory allocation strategies?

(8+2)+4+(2X4+3)=25

3.

a) Define throughput, turnaround time.

b) Consider a system with five processes as shown below with corresponding arrival time and execution time:

Process	Arrival time	Execution time
P_0	0	7
P_1	4	5
P_2	6	8
P_3	10	6
P_4	12	10

Calculate waiting time and turnaround time of each process using (i) *First Come First Served (FCFS)* scheduling and (ii) *Round Robin (RR)* scheduling policy with 3 units of CPU burst. Show the scheduling decisions using Gantt chart. Compare the respective timings and comment.

c) How does *Many to Many* multithreading model work? What are its advantages and disadvantages? How can it be related to *Two Level* multithreading model?

4+(2X4+4)+(3+3+3)=25

4.

a) Disk requests come into the disk driver for cylinders in the order: 52, 28, 76, 115, 97, 23, 48, 70, 68, 120. A seek takes 2 msec per cylinder move. What is the total seek time to access the above requests for (i) *Shortest Seek Time First*

Q4 continued

(SSTF) disk scheduling strategy and (ii) *SCAN* disk scheduling strategy (disk arm is moving towards 91)? Disk arm is initially at cylinder 90.

Hence compare the above mentioned disk scheduling strategies and mention respective advantages and disadvantages.

b) Compare and contrast the *counting* and *grouping* approaches for disk space management.

c) Can *Linked File Allocation* strategy for disk space allocation be used for random access of files? Why / Why not?

d) What information does a *disk inode* contain?

(2X4+6)+4+3+4=25

5.

a) There are 4 resource classes R1, R2, R3, R4 in a system. The number of resource units in R1, R2, R3 and R4 is 8, 8, 10 and 12 respectively. The *current resource allocation* and *maximum requirement* of 4 processes P1, P2, P3 and P4 is respectively shown below:

{P1: [2,0,3,2], P2: [1,1,0,1], P3: [1,2,3,2] and P4: [0,1,2,0]} and {P1: [2,1,3,3], P2: [1,2,0,3], P3: [3,2,4,4] and P4: [2,2,2,2}

(i) Find and comment on the current allocation state.

(ii) Can the request made by P1 for [0,1,0,1] be granted? Justify your answer.

b) What is *circular wait* condition? Are the four conditions for deadlock to hold, completely independent? Justify.

c) How can resources be preempted in case of recovery from deadlock?

d) What is *thrashing*? How can it prevented? Mention and explain a strategy that may prevent thrashing.

(4+4)+5+4+(3+2+3)=25

6.

a) What is meant by *Domain of Protection*? What does *Access Matrix* contain? What is *Capability List*?

b) Is it possible to use binary semaphore for mutual exclusion when there are *m* producers, *n* consumers and bounded buffer? Justify. What happens if the buffer is unbounded? On what conditions do producer and consumer need to wait in case of unbounded buffer?

c) Distinguish between *Public key cryptography* and *Symmetric Key cryptography*. How will you ensure that the correct message has reached the recipient from the actual sender?

9+8+8=25