Ex/CSE/T/313A/2017

Bachelor of Computer Science & Engg. Examination, 2017

(3rd year, 1st semester)

OPERATING SYSTEM

Time: 3 hours

Full Marks: 100

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

1.

a) Compare *Multilevel Feedback Queue* scheduling with *Round Robin* scheduling.

b) What is *race condition*? Explain with a suitable example.

c) Mention the condition under which the following transition would occur in process state diagram: (i) Run to Ready (ii) Blocked/Wait to Suspend

d) How does Indexed file allocation technique alleviate the problem/s of Linked file allocation technique?

e) How does *monitor* differ from *semaphore*?

f) What is *inverted page table*? How is it searched?

g) What will be the problem, if any, when the following code snippet of a process (where *wait*, *signal* and *semaphore s* have the usual meaning/usage with current value of $s = 0$) is executed in a system which also executes other processes that require CS.

While true { ….; signal(s); critical section CS; wait(s); ….}

h) Construct the *capability list* using the following information: <Domain, Object, right-set> as given below:

{D1,O1, read}, {D1, O2, read & execute}, {D1, D3, switch}, {D2,O2, write}, {D2, O3, write}, {D2, O4, execute}, {D2, D1, switch}, {D3,O1, read}, {D3, O3, write}, {D3, D2, switch}

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

2.

a) What are the requirements for solution to *mutual exclusion* problem? Does the following two-process solution satisfy these requirements? Justify your answer.

b) A producer produces items and inserts them into a queue from which a consumer consumes items in Fist In First Out order. Each item requires 2 time quantum to be produced and 1 time quantum to be consumed. The queue is initially empty. If the queue is full when a producer wants to run, the producer will *spin* wait until the queue is not full. If the queue is empty when the consumer wants to run, the consumer will *spin* wait until the queue is not empty. Assume that the producers and consumers will run forever.

Question 2(b) contd. ..

i) Consider the case where there are three producers P1, P2, and P3, and one consumer C1 and all of the processes are runnable starting at time zero. The queue has a maximum size of 3.
If Round Robin (RR) scheduling with time quantum 1 unit is used to execute the processes, how many items will each process have produced and consumed at the end of 16 time quanta? Mention the state of the system and the processes. Assume that the initial ready queue order is P1, P2, P3, C1
ii) Consider the case where there are three producers P1, P2, and P3, and two consumers C1 and C2 and all of the processes are runnable starting at time zero. The queue has a maximum size of 2.
If First Come First Served (FCFS) scheduling is used to execute the processes, how many items will each process have produced and consumed at the end of 10 time quanta? Mention the state of the system and the processes. Assume that the ready queue order is P1, C1, C2, P2, P3, P1, C1, C2,...
For each of the above cases (i) and (ii), justify your answers.

c) What are the contents of *Process Control Block* (PCB)? What is *waiting time*?

(4+6)+(2X5)+(3+2)=25

3.

a) Consider the following page reference during a given time interval: 5, 6, 7, 8, 9, 1, 2, 3, 0, 1, 4, 0, 1, 2, 3, 4. Using First In First Out (FIFO) page replacement strategy show the contents of memory each time a page is referenced for (i) number of frames = 3 and (ii) number of frames = 4. Compare the number of page hits for both cases and comment on your findings.

b) Consider the following free list entry that shows the starting address of the hole and its size in bytes respectively:
(250, 150), (850, 200), (1050, 350), (1500, 100), (1900, 500),
Suppose that the following events occur sequentially:
i. 350 bytes starting at address 500 to be freed,
ii. 850 bytes to be allocated,
iii. 100 bytes starting at address 1600 are freed,
iv. 200 bytes to be allocated.
Show the free list after each of the events have occurred using (i) best-fit hole selection strategy and (ii) worst-fit hole selection strategy.
What are the problems with dynamic memory allocation strategies?

c) Suppose *Valid-Invalid bit* = "I/i" in a page table. What does it signify? What actions are taken? How will you find out *Effective Access Time* in such cases?

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

SSTF= 502

a) Disk requests come into the disk driver for cylinders in the order: 91, 42, 56, 101, 79, 23, 148, 170, 88, 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 (SSTF) disk scheduling strategy and (ii) First Come First Served (FCFS) disk scheduling strategy? Disk arm is initially at cylinder 90.
Hence compare the above mentioned disk scheduling strategies.

b) What is *rotational latency*? How does it affect performance of disk scheduling?

c) Compare and contrast the *counting* and *linked list* approaches for disk space management.

d) What is the maximum file size supported by a file system with 16 direct blocks, single, double, and triple indirection? The block size is 512 bytes. Disk block numbers are stored in 4 bytes.

e) Name at least three common directory structures for multiuser systems.

f) What are *temporal* and *spatial* locality?

g) What is *aging*?

(2X3+3)+3+3+2+3+3+2=25

90 · 91 88 79 101 120 148 170 56 42 23

FCFS = 448 × 2

a) There are 3 resource classes R1, R2 and R3 in a system. The number of resource units in R1, R2 and R3 is 7, 7 and 10 respectively. The current resource allocation and maximum requirement of 3 processes P1, P2 and P3 is respectively shown below:
{P1: [2,2,3], P2: [2,0,3] and P3: [1,2,4]} and {P1: [3,6,8], P2: [4,3,3] and P3: [3,4,4]}
(i) Find and comment on the current allocation state.
(ii) Can the request made by P1 for [1,1,0] be granted? Justify your answer.

b) What are the *Hold and Wait* and *Circular Wait* conditions of deadlock? How can *Circular Wait* condition be prevented? What are the possible problems with this prevention technique?

c) What parameters may be considered for selecting a victim process in case of recovery from deadlock?

d) What information is local to a thread only? Explain any one of the thread scheduling techniques with an appropriate example.

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

a) What does *Access Matrix* contain? What is *Global Table* and how can it be accessed if a user wants to access different files/objects at different times during its lifetime?

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not granted.

7	7	10
− 2	2	3
− 2	0	3
− 1	2	4
2	3	0

P2, P3, P1

Question 6 contd. ..

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	6
P_1	4	3
P_2	7	2
P_3	10	5
P_4	14	2

Calculate waiting time and turnaround time of each process using *Shortest Remaining Time Next (SRTN)* scheduling policy. Show the scheduling decisions using Gantt chart.

c) How does *Many to One* multithreading model work? What are its advantages and disadvantages?

d) What is *RAID?*

e) What are the problems with *Segmentation* memory management technique? How can it be addressed?

(2+4)+8+4+2+5=25