instances]. Suppose at time T0, the following snapshot of the system given bellow: -

PROCESS	ALLOCATION				REQUEST			
	A	B	C	D	A	B	C	D
P_0	1	1	0	1	2	0	0	0
P_1	2	1	0	1	3	0	2	1
P_2	1	0	3	1	4	4	1	3
P_3	2	1	1	0	0	1	0	0
P_4	3	0	3	0	0	0	1	1
P_5	1	1	1	1	3	0	2	4

a) Use the algorithm to find out which processes are in safe state and which processes are in deadlock.

b) If a resource of type-D request is decreased for process P_5 by 2 instances then check whether the above system is in safe state or a deadlock exists.

7. (a) Explain batch, multiprogramming, and multithreading operating system. [4]

(b) Consider a virtual memory system with 8K words and a main memory is of 4K words where each page Size is of 1K words. If the reference string is given like 3, 2, 4, 1, 0, 2, 4, 1, 6, 0, 1, 5, 3, 5, 6, 2, 3, 0, 4, 1 in FIFO order. Use optimal and LRU page replacement algorithm to determine the number Of page faults, where five frames are available in main memory of each page reference Changes. [4]

8. Write short notes on the followings: [4 × 2]

(a) File allocation Methods

(b) Wait For Graph Vs Resource Allocation Graph

*****

AUTUMN END SEMESTER EXAMINATION-2018
5th Semester B.Tech & B.Tech Dual Degree
OPERATING SYSTEM
CS 3009
[For 2017(L.E.), 2016 & 2015 Admitted Batches]

Time: 3 Hours   Full Marks: 60

Answer any Six questions including question No.1 which is compulsory.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. Answer all the questions:- [2 × 10]

(a) Which parameter needs to be updated in the process control block when a process creates a child?

(b) Justify whether starvation can be removed in the highest response ratio next scheduling algorithm or not?

(c) Consider three concurrent processes (P_1, P_2, P_3) with the following initialization:-
Semaphore $S_1 = 0$, $S_2 = 1$, $S_3 = 0$;
P_1: Begin P (S_1); Print("KIIT "); V(S_2);
P_2: Begin P (S_2); Print("CS & IT "); V(S_3);
P_3: Begin P (S_3); Print("UNIVERSITY "); V(S_1);
Write the possible output(s) for the above code.

(d) What is meant by file system mounting?

(e) Justify whether progress satisfies bounded waiting condition for processes competing for critical section or not?

(f) Consider a memory system with the page size of 2kB, primary page table contains 2048 entries and secondary page table contains 256 entries then calculate the number of bits required to represent the size of logical address?

(g) What is dirty bit? What is the necessary of using dirty bit?

(h) A system has 6 identical resources and N processes competing for them. Each process can request two requests. Calculate for which value of N system could lead to a deadlock?

(i) What is claim edge? How it is used to avoid deadlock?

(j) What is SPOOLing?

2. (a) Suppose a disk drive has 300 cylinders, numbered from 0 to 299. The disk drive is Currently serving a request at cylinder 101 and the previous request was at cylinder 210. The queue of pending requests, in FIFO order is: 96, 170, 113, 74, 48, 109, 222, 150, 130, 270, 234. What is the total distance that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms? [4]
    A. Circular Scan (C-Scan)
    B. Shortest seek time first (SSTF)

(b) What is a process? What are different types of process states? Discuss the difference between preemptive & non-preemptive scheduling of processes using process state diagram. [4]

3. (a) Use Round Robin , SRTF algorithm to calculate average wait time, average turnaround time and sequence of completion of the processes with the following data: [4]

Process	CPU	Arrival
P_1	08	01
P_2	04	02
P_3	07	04
P_4	06	00
P_5	06	00
P_6	05	03

Note: Considers the time slice for round robin scheduling algorithm is 2 unit of time.

(b) Explain disk free space management techniques. [4]

4. (a) Consider a multiprogramming system with a variable partition memory, where it uses a free memory list to track available memory. The current list contains entries of 430KB, 550KB, 250KB, 330KB, 520KB, 750KB, and 200KB as free. The system receives requests for multiple processes as like 150KB, 450KB, 550KB, 350KB, 700KB, 500KB and 400KB in order. Discusses the final contain of the following dynamic memory allocation strategies like first fit, best fit, worse fit and suggest the best allocation scheme among all. [4]

(b) What is semaphore? Discuss the difference between WAIT and SIGNAL operation used on semaphore. Explain, how spin lock or busy waiting can be solved in semaphore? [4]

5. (a) Consider a logical memory of a system with logical address space of 512 segments where each of the segment can maximum accommodate up to 128 pages of 8K words in each of pages. If the physical memory consist of 16K blocks of 8K words in each. Find out the maximum number of bits required for physical and logical address? [4]

(b) Compare and contrast the performance of three techniques for allocating disk blocks (contiguous, linked and indexed) for random file access. [4]

6. Write & Explain a deadlock detection algorithm. [8]
If there are six process like (P_0, P_1, P_2, P_3, P_4, P_5) and there are three different types of resources like A [10 instances], B [05 instances], C [08 instances] and D [04