BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : V/ADD**
BRANCH: AIML **SESSION : MO/2025**

SUBJECT: CS362 OPERATING SYSTEMS CONCEPTS

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	How does an OS provide services in areas like, program development, program execution, access to I/O devices, controlled access to files and error detection? Briefly explain.	[5]	1	1
Q.1(b)	Assume that at time 5 no system resources are being used except for the processor and memory. Now consider the following events: A. At time 5: P1 executes a command to read from disk unit 3. B. At time 15: P5's time slice expires. C. At time 18: P7 executes a command to write to disk unit 3. D. At time 20: P3 executes a command to read from disk unit 2. E. At time 24: P5 executes a command to write to disk unit 3. F. At time 28: P5 is swapped out. G. At time 33: An interrupt occurs from disk unit 2: P3's read is complete. H. At time 36: An interrupt occurs from disk unit 3: P1's read is complete. I. At time 38: P8 terminates. J. At time 40: An interrupt occurs from disk unit 3: P5's write is complete. K. At time 44: P5 is swapped back in. L. At time 48: An interrupt occurs from disk unit 3: P7's write is complete. For each time 22, 37 and 47, identify which state each process is in. If a process is blocked, further identify the event on which it is blocked.	[5]	2	3

Q.2 Consider the following set of processes, with the length of the CPU burst time given in milliseconds:

Process	Burst time	Priority
P1	2	2
P2	1	1
P3	8	4
P4	4	2
P5	5	3

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5 all at time 0.

Q.2(a)	Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF(SPN), non-preemptive priority (a larger priority number implies a higher priority), and RR (quantum=2).	[5]	2	3
Q.2(b)	What is the turnaround time and waiting time of each process for each of the scheduling algorithm in part (a)? Which of the algorithms results in the minimum average waiting time (over all processes)?	[5]	2	3
Q.3(a)	Consider a banking system that maintains an account balance with two functions: deposit(amount) and withdraw(amount). These two functions are passed the amount that is to be deposited or withdrawn from the bank account balance. Assume that a husband and wife share a bank account. Concurrently, the husband calls withdraw() function, and the wife calls deposit(). Describe how a race condition is possible and what might be done to prevent the race condition from occurring.	[5]	3	4

PTO

Q.3(b) Consider the following snapshot of a system: [5] 3 5

Threads	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
T_0	0	0	1	2	0	0	1	2	1	5	2	0
T_1	1	0	0	0	1	7	5	0				
T_2	1	3	5	4	2	3	5	6				
T_3	0	6	3	2	0	6	5	2				
T_4	0	0	1	4	0	6	5	6				

What is the content of the matrix *Need*? Is the system in safe state? If yes, then find the safe sequence.

Q.4(a) Given six memory partitions of 100 MB, 170 MB, 40 MB, 205 MB, 300 MB and 185 MB (in order), how would the first-fit, best-fit and worst-fit algorithms place processes of size 200 MB, 15 MB, 185 MB, 75 MB, 175 MB, and 80 MB (in order)? Indicate – if any – requests cannot be satisfied. Comment on how efficiently each of the algorithms manages memory. [5] 4 6

Q.4(b) Consider the following page reference string: [5] 4 4
7, 2, 3, 1, 2, 5, 3, 4, 6, 7, 7, 1, 0, 5, 4, 6, 2, 3, 0, 1.
Assuming demand paging with three frames, how many page faults would occur for the LRU, FIFO, and Optimal replacement algorithms?

Q.5(a) Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 2150, and the previous request was at cylinder 1805. The queue of pending requests, in FIFO order, is 2069; 1212; 2296; 2800; 544; 1618; 356; 1523; 4965; 3681. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms? [5] 4 4

1. FCFS 2. SCAN 3. C-SCAN

Q.5(b) Briefly explain various file allocation methods commonly used by an Operating System along with their advantages/disadvantages in terms of access and storage. [5] 5 2

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