Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Final Examination, Summer 2026

Course Code: SE232; Course Title: Operating System & System Program

Sections & Teachers: 43; IS(A-C), SSR(D), HBM(E,N), SAM(F), MAS(G,H), FJT(I,J), FRN(K,L,M), TR(O)

Time: 2:00 Hrs **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

		A printing company has a shared print queue where employees send documents to be printed. The queue can hold a maximum of 5 print jobs. Employees continuously add new print jobs to the queue, while a printer removes jobs one at a time and prints them. If the queue is full, employees must wait before submitting more jobs. If the queue is empty, the printer must wait until a new job arrives.		
1	a)	**Demonstrate** the importance of synchronization of this problem identifying producer, consumer and shared buffer.	Marks [5]	CLO-2 Level-3
	b)	**Apply** a solution to solve the above process synchronization problem.	Marks [5]	
2	a)	A cloud computing platform is executing four processes (**P1, P2, P3, and P4**) that compete for five exclusive resources (**R1, R2, R3, R4, and R5**), where each resource has only **one instance**. At a certain moment, **P1** holds **R1** and **R5** and is waiting for **R2** to continue execution. **P2** currently holds **R2** but cannot proceed until it acquires both **R3** and **R5**. **P3** has been allocated **R3** and is waiting for **R4**, while **P4** holds **R4** and is requesting **R1** before it can finish. **i) Identify** if there is a deadlock or not in the system through Resource Allocation Graph with proper reasoning. **ii) Illustrate** the corresponding Wait for Graph for this scenario.	Marks [5+2]	CLO-3 Level-4
	b)	There are overall 12 units of A, 10 units of B, 9 units of C in your system and 12 units of D in the system. The system is currently in safe state. Consider the following independent request for additional resources in the current state.	Marks [6]	

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

Analyze If a request from process P4 arrives for (1,1,1,1) can the request be granted immediately? If it can be granted then find out the safe sequence.

	c)	**Outline** the statement "Dynamic Allocation does not face internal fragmentation."	Marks [2]	
3	a)	A graphics design application is running on a computer with limited main memory. The application is much larger than the available RAM, so the operating system does not load the entire application into memory at once. Instead, the application is divided into equal-sized parts, and physical memory is also divided into equal-sized storage units. Only the required parts of the application are brought into memory when needed. **i) Explain** the memory management procedure that has been used in the computer. **ii)** If the required parts are not found in the main memory then determine the issue and **explain** how to handle this issue.	Marks [3+4]	CLO-4 Level-5
	b)	Consider the system has four frames available and the page request string as {7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7} **Compare** the page fault and hit ratio by replacing pages that have not been used in the most recent time.	Marks [4]	
	c)	**Evaluate** the disk scheduling criteria through the algorithm which avoids unnecessary movement of Elevator algorithm and the head changes direction after reaching the final request: Where the initial requests move towards the larger value. Request sequence = {99, 5, 16, 28, 143, 199, 236, 88, 55, 63, 122, 187} Disk range (2-230) 4 1 1 1 6 8 9 3 1 2 5 7 Initial head position = 40;	Marks [4]	