POST GRADUATE DIPLOMA IN COMPUTER APPLICATIONS

(PGDCA_NEW)

PGDCA_NEW/ASSIGN/SEMESTER-I

ASSIGNMENTS

(January – 2026 & July – 2026)

MCS-201, MCS-202, MCS-203, MCSL-204, MCSL-205

SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
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Important Notes

1. Submit your assignments to the Coordinator of your Study Centre on or before the due date.
2. Assignment submission before due dates is compulsory to become eligible for appearing in corresponding Term End Examinations. For further details, please refer to PGDCA_NEW Programme Guide.
3. To become eligible for appearing the Term End Practical Examination for the lab courses, it is essential to fulfill the minimum attendance requirements as well as submission of assignments (on or before the due date). For further details, please refer to the PGDCA_NEW Programme Guide.
4. The viva voce is compulsory for the assignments. For any course, if a student submitted the assignment and not attended the viva-voce, then the assignment is treated as not successfully completed and would be marked as ZERO.

Course Code	**:**	**MCS-203**
Course Title	**:**	**Operating Systems**
Assignment Number	**:**	**PGDCA_NEW(I)/203/Assignment/2026**
Maximum Marks	**:**	**100**
Weightage	**:**	**30%**
Last Date of Submission	**:**	**30th April, 2026 (for January session)** **31st October, 2026 (for July session)**

This assignment has four questions. Answer all questions. Each question is of 20 marks. Rest 20 marks are for viva voce. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide.

Question 1:

Consider the following jobs.

Job#	Arrival time	Run time
A	0	2
B	2	3
C	3	1
D	5	6

a) Using the **FCFS** method, compute the completion times of the above jobs, average turn around time and average waiting time.
b) Using the **SRTF** (Shortest Remaining Time first) method, compute the completion times of the above jobs, the average turn around time and the average waiting time. Note that SRTF is SJF with preemption. (Hint: Completion time - arrival time = turnaround time).
c) Using the Round Robin method (with Quantum = 2), compute the completion times of the above jobs and the average waiting time.

(20 Marks)

Question 2:

a. Explain the Banker's problem. Consider the following snapshot of a system:

	Allocation				**Max**				**Available**			
	A	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following questions using Banker's algorithm:

i. What is the content of the matrix need?
ii. Is the system in a safe state?
iii. If a request from P1 arrives for (0, 4, 2, 0), can the request be granted immediately?

(10 Marks)

b. Consider the following page-reference string:
1, 2, 3, 4, 2, 1, 3, 4, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 4

How many page faults would occur for following replacement algorithms assuming one, two, three, four, five, six or seven frames? Remember that all frames are initially empty, so your first unique pages will all cost one fault each.

i. LRU replacement.
ii. FIFO replacement.
iii. Optimal replacement.

(10 Marks)

Question 3:

a. Multiprocessor systems aim to improve both throughput and application speedup, yet these objectives often conflict with each other. Critically analyze how processor scheduling policies and task allocation strategies in multiprocessor operating systems attempt to balance this trade-off. Illustrate your answer with suitable scenarios where prioritizing one objective adversely affects the other.

(10 Marks)

b. Different multiprocessor interconnection architectures (bus-oriented, crossbar, hypercube, and multistage switch-based systems) exhibit varying scalability and contention characteristics. Compare these architectures from the perspective of scalability, cost, fault tolerance, and communication overhead, and justify which architecture would be most suitable for large-scale parallel applications.

(10 Marks)

Question 4:

a. Modern operating systems increasingly rely on virtual memory techniques to balance performance and resource utilization. Using Windows 10 and Linux as reference case studies, examine how demand paging, working sets, page caching, and memory compression contribute to efficient memory management. Evaluate the trade-offs involved when physical memory is constrained, and discuss how these strategies influence application performance. **(10 Marks)**

b. File system design plays a crucial role in data integrity, performance, and security**.** Drawing from the case studies on Windows (NTFS) and Linux file systems, discuss how directory organization, file metadata handling, access control, and storage management differ in philosophy and implementation. Assess how these differences affect scalability, fault tolerance, and system administration in enterprise environments. **(10 Marks)**