

MASTER OF COMPUTER APPLICATIONS (MCA)

MCA/ASSIGN/SEMESTER-IV

ASSIGNMENTS

(July - 2022 & January - 2023)

MCS-041, MCS-042, MCS-043, MCSP-044, MCSL-045



**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 MCA 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 MCA 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.8

Course Code : **MCS-041**
Course Title : **Operating Systems**
Assignment Number : **MCA(IV)/041/Assign/2022-23**
Maximum Marks : **100**
Weightage : **25%**
Last Date of Submission : **31st October, 2022 (for July, 2022session)**
15th April, 2023 (for January, 2023 session)

This assignment has six questions and carries 80 marks. Answer all questions. 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.

Q1. (15 Marks)

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

Process	Burst time
P1	5
P2	3
P3	4
P4	7
P5	6

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

- Draw four Gantt charts illustrating the execution of these processes using FCFS, SRTN, SJF and Round Robin (quantum=2) scheduling.
- Find the turnaround time, average waiting time, throughput and processor utilization for each of scheduling algorithm mentioned in (a).
- Which of the schedules in (a) results in minimal average waiting time (overall processes)?

Q2. (10 Marks)

Write a program in C to implement Banker's Algorithm to avoid Deadlock. Also explain the code briefly.

Q3. (15 Marks)

Consider the following page-reference string:
1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults would occur for the following replacement algorithms, assuming four frames? Remember all frames are initially empty.

- FIFO replacement
- Least Recently Used replacement
- Optimal
- Least Frequently Used

Mention the merits and demerits of each of the above algorithms.

Q4. (10 Marks)

On a disk with 1000 cylinders, numbers 0 to 999, compute the number of tracks the disk arm must move to satisfy all the requests in the disk queue. Assume the last request serviced was at track 345 and head is moving to track 0. The queue in FIFO order contains requests for the following tracks: 123, 874, 692, 475, 105, 376. Perform the computation for the following disk scheduling algorithms:

(a) FIFO (b) SSTF (c) SCAN (d) LOOK

Q5.

(a) What is the cause of thrashing? How does the system detect thrashing? Once it detects thrashing, what can the system do to eliminate this problem? **(5 Marks)**

(b) Explain in detail how semaphores and monitors are used to solve the Dining-Philosopher's problem. **(10 Marks)**

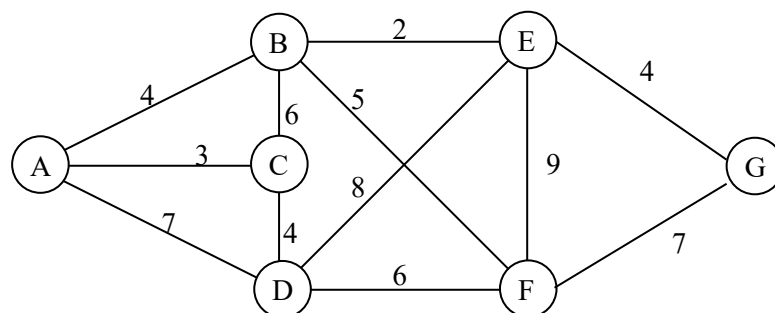
Q6.

Discuss in detail the Process management, Memory management, I/O & File management and Security & Protection in Windows-11 Operating System. **(15 Marks)**

Course Code : **MCS-042**
Course Title : **Data Communication and Computer Network**
Assignment Number : **MCA(IV)/042/Assign/2022-23**
Maximum Marks : **100**
Weightage : **25%**
Last Dates for Submission : **31st October, 2022 (for July, 2022session)**
15th April, 2023 (for January, 2023 session)

Answer all the questions in the assignment which carry 80 marks in total. 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 for the format of presentation.

- Q1.** What is meant by QAM? How is it different from PSK? Draw constellation diagrams of 8-PSK and 16 QAM . **(5 Marks)**
- Q2. (a)** What is Checksum? Write algorithm for Checksum. **(4 Marks)**
(b) Find CRC for the data polynomial $X^9+X^7+X^4+X^2+1$ with the generator polynomial X^3+X^2+1 **(6 Marks)**
- Q3.** Sketch the Manchester and RZ encoding of the following bit stream: **(5 Marks)**
 1011 11 01 01 11
- Q4. (a)** A system uses Slotted ALOHA protocol. In an observation interval, the channel is busy for 90% of the time. Calculate the system throughput. **(6 Marks)**
(b) Write steps involved in working of CSMA/CD. **(5 Marks)**
- Q5.** What is count to infinity problem? Explain, how it can be solved. **(6 Marks)**
- Q6.** Formulate the shortest path problem in a computer network. **(5 Marks)**
- Q7.** Write and apply Dijkstra's Shortest path algorithm to find the shortest path from a source node A to all the other nodes in a graph given below: **(10 Marks)**



- Q8.** With the help of a diagram explain the three phases in TCP's congestion control mechanism. How does the size of a congestion window change in the different phases? **(10 Marks)**
- Q9. (a)** What are the functions of SSL? Discuss the merits of SSL. **(6 Marks)**
(b) Discuss the implementation of Kerberos mechanism. **(7 Marks)**
(c) What are the different features of IpSec? **(5 Marks)**

Course Code : **MCS-043**
Course Title : **Advanced Database Management Systems**
Assignment Number : **MCA(IV)/043/Assign/2022-23**
Maximum Marks : **100**
Weightage : **25%**
Last Dates for Submission : **31st October, 2022 (for July, 2022session)**
15th April, 2023 (for January, 2023 session)

Answer all the questions in the assignment which carry 80 marks in total. 20 marks are for viva voce. You may use illustrations. Place go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

- Q1.** Design a generalization /specialization hierarchy for a Computer Peripheral sales company. The company sells monitors, printers, scanners and UPS. Justify your placement of attributes at each level of the hierarchy. Convert the diagram into tables with integrity constraints for each table. **(6 Marks)**
- Q2.** Explain the following with the help of an example. **(6 Marks)**
 (a) Dynamic SQL
 (b) Query Optimization
- Q3.** What is XML? How does XML differ from HTML? List advantages of XML. **(6 Marks)**
- Q4.** Define the third NF. Justify whether the following student relationship is in the third NF or not? **(5 Marks)**

Student (Rollno, S_name, Department, Year, Hostel_name)

Year → Hostel_name

IF it is not in the third NF, convert it into the third NF.

- Q5.** Define the terms: Serializable and Conflict Serializable. Determine whether the following schedule A is serializable and conflict serializable or not? **(8 Marks)**

Schedule A:

T ₁	T ₂
read (X)	
	write (X)
write (Y)	
	read (Y)
commit	
	commit

- Q6.** What is concurrent transaction? What is the condition for occurrence of conflicting operations in transactions? Give an example illustrating conflicting operations of concurrent transaction. **(6 Marks)**
- Q7.** What is time stamp ordering? Explain timestamp based protocol for serializable schedule. **(6 Marks)**

- Q8.** Define deadlock. How it can be presented? Write an algorithm that checks whether the concurrently executing transactions are in deadlock. **(10 Marks)**
- Q9.** What is Hash-Join? How is hash-join between two relations computed? Explain cost calculation for simple hash join. **(8 Marks)**
- Q10.** What are Semantic databases? Give the features of semantic databases. Discuss the process of searching the knowledge in these databases. **(8 Marks)**
- Q11.** How are implementations of triggers in Oracle different from the standard implementations? **(6 Marks)**
- Q12.** What is clustering technique for data mining? Explain. **(5 Marks)**

Course Code	:	MCS-044
Course Title	:	Mini Project
Assignment Number	:	MCA (IV)/044/Assign/2022-23
Assignment Marks	:	100
Maximum Marks	:	25%
Last Date of Submission	:	31st October, 2022 (for July, 2022session) 15th April, 2023 (for January, 2023 session)

There are five questions in this assignment carrying 80 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 Program Guide for the format of presentation. Assumptions made if any, should be stated.

Background and Project Specifications:

A Hospital proposes to keep the records of its admitted patients using a "Patient Monitoring System". Patient Monitoring System should have a secure login for hospital employees. The services offered by this system should include – the information of Bed and ward of the admitted patients; the information on consulting Doctor of an admitted patient; diagnosis of the patients and medicines to be given; patient billing including rent of the bed, price of the medicine given to the patient, cost of nursing, cost of procedures (e.g., surgery, test etc.) performed on the patient etc.

You may study the requirements for patient monitoring system in more details. Perform the following tasks for the proposed system:

Q1. (5+5 = 10 Marks)

- Which Systems Development Life Cycle (SDLC) will you propose for the specification given above? Explain the proposed SDLC.
- Justify your selection by evaluating suitability of at least two SDLCs.

Q2. (2+2+2+4=10 Marks)

- What would be major costs of the system development?
- What may be the financial benefits of installing such a system?
- Perform a cost-benefit analysis for the proposed software and report its findings.
- List the major tasks and milestones of the Project and make a project schedule. The schedule must include both GANTT and PERT charts. Explain the two charts drawn by you.

Q3. (10+15=25 Marks)

- Study the system and create a software requirement specification. You must identify either the processes or objects while analyzing. During the analysis identify and explain possible input and output of the processes.
- After identifying the requirements, create Analysis Models. You may either use the classical approach and draw Entity relationship diagram and data flow diagrams (DFD's) up to level 2-3; or you may take object-oriented analysis approach and create class diagram, use case diagram, use cases etc.

Q4. (15+10=25 Marks)

- Design the system architecture and the database as per the needs of the system. You must perform normalization on tables up to 3rd normal form. The table design must include Primary and Foreign keys and constraints.

(b) Create the system flow chart or detailed process design and state transition diagrams. Also design the user input screens and output report formats.

Q5.

Design various unit test cases for different testing techniques/strategies.

(10 Marks)

Course Code : **MCSL-045**
Course Title : **UNIX and DBMS Lab**
Assignment Number : **MCA(IV)/L045/Assign/2022-23**
Maximum Marks : **100**
Weightage : **25%**
Last Dates for Submission : **31st October, 2022 (for July, 2022session)**
15th April, 2023 (for January, 2023 session)

The assignment has two parts I and II. Answer all the questions. Each part is for 20 marks. UNIX and DBMS lab record carries 40 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 MCA Programme Guide for the format of presentation. If any assumptions made, please state them.

PART-I: MCS-041

Q1. (5 Marks)

Write the UNIX commands for the following:

- (a) To display the first 10 lines in a given file.
- (b) To kill a particular process with a PID.
- (c) To append the contents of *xyz* after the contents of the *abc* and redirect them to a new *mnp*.
- (d) To print the first difference between any two given files.
- (e) To change the command prompt from \$ to *.
- (f) To grant the permissions of read, write and execute to the *user* and read and write only to the *group* and *others* for all the files in a current directory.
- (g) To direct a standard output to any of the line printer.
- (h) To list all the files in the current directory whose file names starts with *c*.
- (i) To execute some command even after logout.
- (j) To split a file *splittest*, which is containing 20 lines into 5 lines each which are directed to four various files.

Q2.

- (a) Write a shell program to count no. of lines, no. of blank spaces and no. of characters and number of words in a given file by the user. **(5 Marks)**
- (b) Write a shell script to find the day of the week when a date is given. **(5 Marks)**
- (c) Write a shell script to display the largest element in a given 4X4 matrix. **(5 Marks)**

PART-II: MCS-043

Q1.

Consider the following employee database schema:

EMPLOYEE (ESSN, ENAME, DEPT_NO, SALARY)
DEPENDENT (ESSN, DEPEND_NAME, RELATION, DOB)
DEPARTMENT (DEPT_NO, DEPT_NAME, MANAGER)

- (a) Create the appropriate database. **(2 Marks)**

- (b) Perform following queries using SQL: **(5 Marks)**
- (i) Find details of dependents for employee having name AJAY.
 - (ii) Find the name of the manager of the department in which employee with ESSN Code 5078 works.
 - (iii) Find the name of all employees whose age is less than 18 years.
 - (iv) Find the DOB of the son of the employee having employee code ESSN 5078.
 - (v) Find the details of the departments in which the employee having employee code ESSN 5078 has worked.
- (c) Create the procedures for the above queries. **(5 Marks)**
- (d) Write appropriate triggers, exceptions and functions for the above employee database schema. **(8 Marks)**