MASTER OF COMPUTER APPLICATIONS (MCA)

MCA/ASSIGN/SEMESTER-IV

ASSIGNMENTS

(July - 2020 & January - 2021)

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/Assignment/2020-21**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Date of Submission	**:**	**31st October, 2020 (for July, 2020session)** **15th April, 2020 (for January, 2021 session)**

This assignment has six questions, which 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 for the format of presentation.

Q1. Assume you have the following jobs to execute with one processor:

Process	**Processing Time (milli-sec)**
P1	10
P2	09
P3	02
P4	03
P5	11

All the processes arrived at the same time. Calculate the turnaround time, waiting time, average turnaround time, average waiting time, throughput and processor utilization for the above given set of processes shown in the table, with the length of CPU burst time given in milliseconds using FCFS, SJF, RR (with quantum 2) and SRTN scheduling algorithms. Also draw their corresponding Gantt charts. **(20 Marks**)

Q2. What is a critical section problem? Using C programming, write a semaphore based solution for sleeping barber's problem and explain the program. **(10 Marks)**

Q3. What is the need of Page Replacement? Consider the following reference string:

7,0,1,2,0,3,0,4,2,3,0,3,2,1,6,7,0,1,2,4,5,4,3

Find the number of page faults with FIFO, Optimal page replacement and Least Recently Used(LRU) with four frames which are initially empty. Check which algorithm gives the minimum no. of page faults? **(10 Marks)**

Q4. **(a)** Give memory partition of 100K ,500K, 200K, 300K and 600K (in order).How would each of the first fit, best fit and worst fit algorithm place process of 212 K, 417 K, 112K, and 426 K(in order)? Which algorithm makes the most efficient use of memory?

(7 Marks)

(b) What is disk scheduling? Explain the C-SCAN scheduling by giving an example.

(5 Marks)

(c) Explain the FCFS disk scheduling algorithm. Find out the no. of head movements for FCFS for a queue from 0-199 and current header is at 53.

92, 180, 35, 123,16, 121, 60,65 **(8 Marks)**

Q5. Discuss in detail the Process management, Memory management, I/O management and File management for the Android 10.0 Operating System. **(10 Marks)**

Q6. Lamport's Bakery Algorithm provides a decentralised implementation of the "take a number" idea. Write and explain this algorithm for Distributed systems. **(10 Marks)**

Course Code	**:**	**MCS-042**
Course Title	**:**	**Data Communication and Computer Network**
Assignment Number	**:**	**MCA(IV)/042/Assignment/2020-21**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**31st October, 2020 (for July, 2020session)** **15th April, 2020 (for January, 2021 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. **(a)** Define Modulation . What are its advantages? **(5 Marks)**

(b) What is meant by QAM? How is it different from PSK? Draw constellation diagrams of 8-PSK and 16 QAM . **(6 Marks)**

Q2. **(a)** How is Shannon' theorem different from Nyquist's theorem? What is the channel capacity for bandwidth of 3 KHz and signal to noise ratio 30 dB. Show the calculation. **(6 Marks)**

(b) What is the need of bit stuffing? A bit string 01111110000111111110001110 needs to be transmitted at the data link layer. What is the string actually transmitted after bit stuffing ? How is bit stuffing implemented in HDLC? **(5 Marks)**

Q3. Define checksum and write the algorithm for computing the checksum? Given a sequence frame of 10 bits: 1001100101 and a divisor (polynomial) of 1011. Find the CRC **(6 Marks)**

Q4. **(a)** What are the limitations of MACA? How are these limitations overcome in MACAW?
Explain. **(5 Marks)**

(b) How does CSMA/CD work? Write all the steps. Explain the binary exponential backoff algorithm in case of collision. How to calculate backoff time? **(6 Marks)**

Q5. Explain the operation of the distance vector routing protocol. What is the reason of count to infinity problem in distance vector routing protocol?. How is the above problem overcome in link state routing algorithm? **(6 Marks)**

Q6. **(a)** Define and differentiate between flow control and congestion control mechanisms in terms of where they are applied in a packet switched network. What are the two categories of congestion control mechanisms and what policies are adopted by each category to control congestion? **(7 Marks)**

(b) How is congestion controlled in TCP using slow start algorithm? Clearly **(5 Marks)**

show the window adjustment.

Q7. What is the essential property of Fiestel Cipher network? Explain **(6 Marks)**

Q8. What is the utility of a digital certificate? Where is it used? How are these signatures created? What are its components? **(6 Marks)**

Q9. Discuss the features of IPSec. **(5 Marks)**

Q10. How is Silly Window Syndrome created by a receiver? What are the proposed solutions? Discuss. **(6 Marks)**

Course Code	**:**	**MCS-043**
Course Title	**:**	**Advanced Database Management Systems**
Assignment Number	**:**	**MCA(IV)/043/Assignment/2020-21**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**31st October, 2020 (for July, 2020session)** **15th April, 2020 (for January, 2021 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. Consider a small institute in which students register through on-line mode for programmes run by the institute. A student can be a full time or part time . A program can be offered through a normal mode (face to face) or on-line. Every student necessarily registers in at least one programme and at most two programmes. After completion of a program, students are issued a certificate. Assuming suitable attributes, design an EER Diagram for the same.

(a) Draw the EER (extended ER) diagram for the above problem showing all entities, attributes and relationship. Also identify multi-valued and derived attributes. **(6 Marks)**

(b) Draw the appropriate tables and relationship among the tables for the above diagram and normalize the tables up to 3NF. **(6 Marks)**

(c) Include generalization and aggregation features in the diagram, draw their tabular representations and UML class diagram. Explain **(7 Marks)**

(d) Identify weak entity sets in the above diagram if any. Show how will you convert a weak entity set to a strong entity set? What is the need of such task? **(4 Marks)**

(e) Identify multi-valued dependency in the above diagram if any. Justify. **(3 Marks)**

(f) Create an XML schema for the grade card to be issued by the division having details: student id, programme code, course id, grade, program delivery mode, assignments marks, TEE marks. **(3 Marks)**

Q2. What are XML databases? What are the benefits of using XML? What are its applications? Explain. **(6 Marks)**

Q3. Define **cursors, stored procedures and triggers** and write SQL syntaxes for each. What are the advantages and disadvantages of stored procedures? What are the main features of a cursor? **(6 Marks)**

Q4. Explain primary key, foreign key, super key and composite key with the help of an example for each key. Also write the important features of each. **(8 Marks)**

Q5. What are the algorithms that can be used to implement JOIN operation? What is the criteria for selecting a particular join algorithm? Explain Hash Join algorithm and perform its cost calculation **(6 Marks)**

Q6. What is concurrency control? What is the need of applying concurrency control methods in database? Give an example. Write the algorithm of timestamp based ordering protocol and explain through an example. What are the problems with this algorithm and what are the proposed solutions for it? **(8 Marks)**

Q7. How is recovery with concurrent transactions performed? Discuss. **(5 Marks)**

Q8. State the differences between classification and clustering. Write an algorithm of K-Means clustering. Explain the algorithm with the help of an example. **(6 Marks)**

Q9. What are Semantic databases? Give the features of semantic databases. Discuss the process of searching the knowledge in these databases. **(6 Marks)**

Course Code	**:**	**MCS-044**
Course Title	**:**	**Mini Project**
Assignment Number	**:**	**MCA (4)/P044/Assign/2020-21**
Assignment Marks	**:**	**100**
Maximum Marks	**:**	**25%**
Last Date of Submission	**:**	**31st October, 2020 (for July, 2020session)** **15th April, 2020 (for January, 2021 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 book store proposes to develop a "Book Sales Information System". The information system provides secure login to book store employees. The services offered by this system should include - finding the availability of a book in the book store; taking orders from the customers for the books, which are not available; making an invoice for sale for customers; ordering of the books, which are high in demand and stock of those books have reached a low level.

You may study the requirements for such a system in more details. Perform the following tasks for the system given above:

Q1: **(5+5 = 10 Marks)**

(a) Which Systems Development Life Cycle (SDLC) will you propose for the specification given above?

(b) Justify you selection by evaluating suitability of at least two SDLCs.

Q2: **(2+2+2+4=10 Marks)**

(a) What would be major costs of the system?

(b) What may be the financial benefits of installing such a system?

(c) Perform a cost-benefit analysis for the proposed software and report its findings.

(d) 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)**

(a) Study the system and create a software requirement specification. You must identify either the processes or objects while analyzing. During the analysis give consideration to possible input and output of the processes.

(b) 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)**

(a) 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/Assignment/2020-21**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Date of Submission	**:**	**31st October, 2020 (for July, 2020session)** **15th April, 2020 (for January, 2021 session)**

The assignment has two parts A and B. 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.

Write the UNIX commands for the following: **(5 Marks)**

(a) To display the disk usage of the directory and all its files.
(b) To print the newline count, the byte count and the longest line length for any selected file.
(c) To display the current date in the format *mm*/*dd*/*yy* (example: 09/04/09).
(d) To copy all the files containing "a" as starting file name to the directory assign3 using one command.
(e) Change the file permissions to ***read only*** for everyone other than you for a data file.
(f) To execute a task at lowest priority.
(g) Compare two text files and display the differences.
(h) Use grep command to find and display the no. of times a particular pattern given by the user appeared in the file.
(i) Display last 10 lines of ***file1***.
(j) To change the password of the user.

Q2.

(a) Write a series of UNIX commands that will produce a listing of the smallest 3 files (in size) in the current directory whose name starts with "a". **(2 Marks)**

(b) Write a shell program that will search for patterns (i) ***"and"*** (ii) ***"to"*** in the text file ***file1*** and display their count individually. **(3 Marks)**

(c) Write a shell program to count and print the no. of uppercase and lowercase characters in a string given by the user. **(5 Marks)**

(d) Write a shell program to take a file consisting of characters and other symbols as a source file and direct the characters to file ***charc-file*** and other symbols to ***sym-file***. **(5 Marks)**

PART-II: MCS-043

Q1.

Consider a Super-market and perform the following:

(a) Draw an enhanced entity relationship (EER) diagram. **(3 Marks)**

(b) Create the complete database. **(2 Marks)**

(c) Normalize till required normal forms. **(2 Marks)**

(d) Write all the relational schemas. **(1 Mark)**

(e) Write the following queries using SQL: **(4 Marks)**

(i) To display all the products from Hindustan Lever.

(ii) To display all the food processor brands (company-name) available in the super market.

(iii) To display the models and their price for the item FAN, in ascending order of price.

(iv) Create a view of the sales for the manager showing overall performance week-wise.

(f) Create a trigger that prints the daily catalogue on change of a price of any cosmetic item. **(2 Marks)**

(g) Create a trigger whenever there is a new entry (of a new model) in the food processors. Also design a trigger whenever there is a deletion of the record too. **(3 Marks)**

(h) Create a report that shows the overall revenue generated, week-wise. **(3 Marks)**