MASTER OF COMPUTER APPLICATIONS (MCA)

MCA/ASSIGN/SEMESTER-IV

ASSIGNMENTS

(July - 2021 & January - 2022)

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

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THE PEOPLE'S
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SCHOOL OF COMPUTER AND INFORMATION SCIENCES
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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(4)/041/Assign/2021-22
Maximum Marks	:	100
Weightage	:	25%
Last Date of Submission	:	31st October, 2021 (for July, 2021session)
		15th April, 2022 (for January, 2022 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: (20 Marks)

Consider the following set of processes with arrival times and CPU execution times given in milliseconds. A process with a larger priority number has a higher priority. If any assumptions made by you, state them.

Process	Arrival Time	Execution Time	Priority
P1	0	06	1
P2	5	04	2
P3	7	07	5
P4	9	09	3
P5	10	02	4

(i) Draw the Gantt charts illustrating the execution of these processes using the FCFS, SJF, RR and Priority Based Scheduling algorithms.
(ii) Also calculate the average turn around time, average waiting time, processor utilisation and throughput for each of the algorithms mentioned in (i).

Question 2: (20 Marks)

Wine making club problem:

Consider a wine-making club with 8 members and a warehouse of supplies. For a member to make wine, they need to use: 2 Jugs, 1 yeast lock, sweetened fruit juice and wine-making yeast. The initial mixing process requires a mixing station, the fermentation process which requires 4 weeks to produce wine once all the three ingredients have been properly mixed together. The second jug is needed only at the end of the process to decant the wine off the dead yeast. The warehouse contains 2 mixing stations, 6 jugs (10 litre size), 7 yeast locks, 15 containers of 5 litre size of sweetened fruit juice and 20 packages of wine yeast (for 10 litres of wine each). Once a member has finished his/her wine, they all taste the batch before that member starts a new batch.

Write a program that simulates the members of the club making wine. Each member should be represented by a process. Use semaphores for synchronization. Your solution should be written in C or C++. It should be free from deadlock and need not be free from starvation.

Question 3:
(a) Explain the difference between scheduling and allocation of processor resources in a multiprocessor operating system. Identify the counterpart of each, if any, in a uniprocessor operating system.

(10 Marks)

(b) When virtual memory is implemented in a computing system, there are certain costs associated with the technique, and certain benefits. List the costs and benefits. Is it possible for the costs to exceed the benefits? If it is, what measures can be taken to ensure that this does not happen? **(10 Marks)**

Question 4: **(20 Marks)**

Discuss in detail the Process management, Memory management, I/O and File management and Security and Protection in Windows-10 Operating System.

Course Code   :   **MCS-042**
Course Title   :   **Data Communication and Computer Network**
Assignment Number   :   **MCA(IV)/042/Assignment/2021-22**
Maximum Marks   :   **100**
Weightage   :   **25%**
Last Dates for Submission :   **31st October, 2021 (for July, 2021session)**
                                       15th April, 2022 (for January, 2022 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:   Assume there is a noisy channel having a bandwidth of 8 KHz. Signal to noise (S/N) ratio is 20dB. Can it carry 48 kbps data rate? Apply the appropriate formula and show the complete calculations.   **(5 Marks)**

Q2:   **(a)**Write the algorithm for computing the 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 RƵ encoding of the following bit stream: **(5 Marks)**

      1011 00 11 01 01 11

Q4:   **(a)** Discuss the key features of random access protocols (multiple access protocols).   **(5 Marks)**

        (b) Draw and explain the vulnerable period for pure Aloha protocol and obtain a throughput expression.   **(6 Marks)**

Q5:   Describe the hidden and exposed station problems in wireless LAN with the help of diagrams.
        (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)**
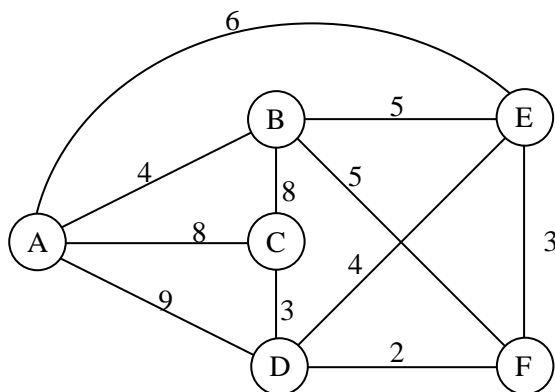
Q8: With the help of a diagram explain the three phases in TCP's congestion control mechanism. How does the size of a congestion window change in the different phases? **(10 Marks)**

Q9: **(a)** What is the utility of a digital certificate? How are these signatures created? **(6 Marks)**

(b) Explain Diffie Hellman algorithm with the help of an example. **(7 Marks)**

(c) What are the different features of IpSec? **(5 Marks)**

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 motor vehicle sales company. The company sells motor cycles, auto, cars and buses.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: Consider the following relations. **(4 Marks)**

Student (**Std id**, name, year of study, basic stipend, dept_no)

dept (**dept_name**, academic_block)

Write SQL queries for the followings:

(a) Select names, year of study and dept_name of all students whose names start with A and their basic stipend is not less than 15000.00
(b) Increase the basic stipend of 3rd year computer science department by 5000.00 per month.

Q3: How does embedded SQL differ from Dynamic SQL. Describe the implementation of cursors and triggers with the help of examples. How are triggers different from the stored procedures?

(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 $\rightarrow$ 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? **(5 Marks)**

Schedule A:

T$_1$	T$_2$
read (X)	
	read (X)
write (Y)	
	write (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: How does Time Stamp based protocols manage concurrent transactions? Write the complete procedure of execution of the protocol. **(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: Write an algorithm for Hash-join.Show cost calculation for sample Hash-join with the help of an example. **(8 Marks)**

Q10: Answer the following questions with represent to advanced databases. **(15 Marks)**

    (i) Horizontal and vertical fragmentation in distributed database.
    (ii) Challenges in designing multimedia database
    (iii) Important features of semantic database.

Q11: How does Oracle manage database security? **(5 Marks)**

Q12: What is classification in context of data mining? **(4 Marks)**

Course Code	:	MCS-044
Course Title	:	Mini Project
Assignment Number	:	MCA (4)/044/Assign/2021-22
Assignment Marks	:	100
Maximum Marks	:	25%
Last Date of Submission	:	31st October, 2021 (for July, 2021session)
		15th April, 2022 (for January, 2022 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 maintains the records of its outpatients using a "OPD Information System". The OPD information system provides secure login to the hospital employees. The services offered by this system include - finding the availability of doctor in a specific OPD shift; booking patient appointments with the doctor; taking the payment from the patients visits the doctor; requesting for additional doctors, in case of emergent situations.

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

Question 1: (5+5 = 10 Marks)

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

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

Question 2: (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.

Question 3: (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 identify and explain 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.

Question 4:   **(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.

Question 5:

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/2021-22
Maximum Marks	:	100
Weightage	:	25%
Last Date of Submission	:	31st October, 2021 (for July, 2021session)
		15th April, 2022 (for January, 2022 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

Question 1:

Write the UNIX commands for the following:

(a) Use the *more* command, and a *pipe* to send the contents of your *.profile* and *.shrc* files to the screen.
(b) Use head and tail in a pipeline to display lines 10 through 20 of a *file1*?
(c) To search the */etc/passwd* file for the lines containing any input string given by the user.
(d) To see the lines in */etc/passwd* that begins with the character "b".
(e) List all the files in the */tmp* directory owned by the user root.
(f) To see a complete listing of all the processes currently scheduled.
(g) Use the *ps* command, and the *grep* command, in a pipeline to find all the processes owned by you.
(h) To force termination of a job whose *process ID* is given.
(i) Sort the */etc/passwd* file, place the results in a file called *paswd*, and trap any errors in a file called *err* with the command.
(j) To sort a text file containing the names of 10 students in *alphabetical order* and place the results in a file called *sortedfile*.

(5 Marks)

Question 2:

(a) Write a shell program to count the number of words, number of characters, number of vowels, number of special symbols, end of line characters and blank-spaces present in a text file. Redirect the output to a file called as *op1*.   **(5 Marks)**

(b) Write a shell script to take username as an argument and check whether s/he has logged in or not for every 15 seconds for 2 minutes.   **(5 Marks)**

(c) Write a shell script to display the number of files and their details in the current directory, whose filenames are starting with the alphabet given as an argument.   **(5 Marks)**

Question 1:

Design a database for maintaining the details of shows and ticketing for the shows of a Multiplex. Now perform the following activities for the system above:

(a)   Create the database for the Multiplex.   **(2 Marks)**

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

     (i)   Find the details of the movies whose shows are full.

     (ii)   Find the details of the movies that had been screened at least one year earlier too.

     (iii)   Find the names of those movies that have an overall sale of 50% of capacity on all   days of screening.

     (iv)   Create a view of the movie for the manager showing overall performance of the day for each movie.

(c)   Create the procedures for the queries (i) to (iii) above   **(3 Marks)**

(d)   Perform the following activities:

     (i)   Create a trigger that prints the daily catalog on change of a movie.   **(2 Marks)**

     (ii)   Create a trigger that increases the price of a specific movie by a certain percentage on a specific weekend.   **(2 Marks)**

(e)   Use the movie poster (picture) as one of the fields in the movie table. Use appropriate data-type for storing it.   **(1 Mark)**

(f)   Create a transaction that finds the total of each movie and prints the overall revenue.   **(3 Marks)**

(g)   Create two different types of users: the first user – a manager who can see reports and change the movie and its timing; and second user who sells tickets.   **(3 Marks)**