

# **MASTER OF COMPUTER APPLICATIONS (MCA)**

**MCA/ASSIGN/SEMESTER-IV**

**ASSIGNMENTS**

**(July - 2018 & January - 2019)**

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



**SCHOOL OF COMPUTER AND INFORMATION SCIENCES  
INDIRA GANDHI NATIONAL OPEN UNIVERSITY  
MAIDAN GARHI, NEW DELHI – 110 068**

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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/2018-19**  
**Maximum Marks** : **100**  
**Weightage** : **25%**  
**Last Date of Submission** : **15<sup>th</sup> October, 2018 (for July session)**  
**15<sup>th</sup> April, 2019(for January session)**

**This assignment has five questions which carries 80 marks. Rest 20 marks are for viva voce. Answer all the questions. You may use illustrations and diagrams to enhance the explanation. Please go through the guidelines regarding assignments given in the Programme Guide.**

**Question 1:**

A time sharing system is to be designed to support a large number of users. List all the considerations which influence the choice of the time slice. Justify each consideration. (5 Marks)

**Question 2:**

- (a) List the conditions under which memory allocation decisions can delay the initiation or scheduling of a program. (6 Marks)
- (b) Consider the following set of processes with arrival time and CPU execution time 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	09	1
P2	2	06	2
P3	3	04	3
P4	3	03	4
P5	6	04	5

- (i) Draw the Gantt charts illustrating the execution of these processes using the FCFS, SJF, Round Robin(with quantum = 2).
- (ii) Also calculate the average turn around time, average waiting time, processor utilization and throughput for each of the algorithms mentioned in (i). (10 Marks)
- (c) Explain the trade-offs involved in choosing the size of a time slice for a round robin algorithm. (4 Marks)

**Question 3:**

Describe the following disk scheduling policies: First Come First Serve (FCFS), Shortest Seek Time First, SCAN, C-SCAN, Look and C-Look. Show the disk arm movement and calculate the number of tracks traversed using all of the policies if the

disk has 200 tracks and the requested tracks, in the order received, are 65, 48, 39, 08, 99, 164, 152, 38, 124. (20 Marks)

#### Question 4:

(a) **The Cigarette-Smokers Problem:** Consider a system with three smoker processes and one agent process. Each smoker continuously rolls a cigarette and then smokes it. But to roll and smoke a cigarette, the smoker needs three ingredients: tobacco, paper, and matches. One of the smoker processes has paper, another has tobacco, and the third has matches. The agent has an infinite supply of all the three materials. The agent places two of the ingredients on the table. The smoker who has the remaining ingredient then makes and smokes a cigarette, signaling the agent on completion. The agent then puts out another two of the three ingredients, and the cycle repeats. Write an interactive C/C++ program to synchronize the agent and the smokers, using semaphores. (5 Marks)

(b) **The Sleeping Barber Problem:** A barbershop consists of a waiting room with  $n$  chairs and the barber room containing the barber chair. If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy but chairs are available, then the customer sits in one of the free chairs. If the barber is asleep, the customer wakes up the barber.

- i. Write a C / C++ program to coordinate the barber and the customers, using semaphores.
- ii. Consider the Sleeping-Barber Problem with the modification that there are  $k$  barbers and  $k$  barber chairs in the barber room, instead of just one. Write a program to coordinate the barbers and the customers.

(5x2 = 10Marks)

#### Question 5:

Discuss in detail the features, Process management, Memory management, I/O Management, File management and Security and Protection in Android Operating System (latest version). (20 Marks)

<b>Course Code</b>	:	<b>MCS-042</b>
<b>Course Title</b>	:	<b>Data Communication and Computer Network</b>
<b>Assignment Number</b>	:	<b>MCA(IV)/042/Assignment/2018-19</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Weightage</b>	:	<b>25%</b>
<b>Last Date of Submission</b>	:	<b>15<sup>th</sup> October, 2018 (for July session)</b>
	:	<b>15<sup>th</sup> April, 2019(for January session)</b>

**This assignment has thirteen questions. 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.**

- Question 1:** (a) What are the main differences between connectionless and connection oriented communication? (3 marks)
- (b) What are the essential differences between packet switching and message switching? Explain with the help of a suitable diagram. (3 marks)
- Question 2:** A system has  $n$ -layer protocol hierarchy. Applications generate message of length  $M$  bytes. At each of the layers, an  $h$  byte header is added. What fraction of the network bandwidth is filled with headers? (5 marks)
- Question 3:** State the Nyquist theorem. For what kind of physical medium it is applicable? Will it work for a noisy Channel? (5 marks)
- Question 4:** Define the throughput expressions of Aloha and Slotted Aloha. Also draw throughput Vs load graphs for the above protocols. (6 marks)
- Question 5:** (a) Explain hidden station and exposed station problems in WLAN protocols with the help of an illustration. What is the limitation of CSMA protocol in resolving the above problems? Explain the use of virtual channel sensing method as a proposed solution. (7 marks)
- (b) Sketch the differential Manchester encoding for the bit stream: 0011111010111. Assume the line is initially in the low state. (2 marks)
- Question 6:** Draw the Ethernet frame format and explain its fields. Is there any limitation on a maximum and minimum frame size of Ethernet frame? Explain. (6 marks)
- Question 7:** How does the Border Gateway. Protocol work? Explain it with the help of a diagram. How does it resolve the *count to infinity problem* that is caused by other distance vector routing-algorithms? (6 marks)
- Question 8:** Draw the header format of TCP and explain the followings fields: ACK bit, RST bit & PSH bit, and Flags. (5 marks)

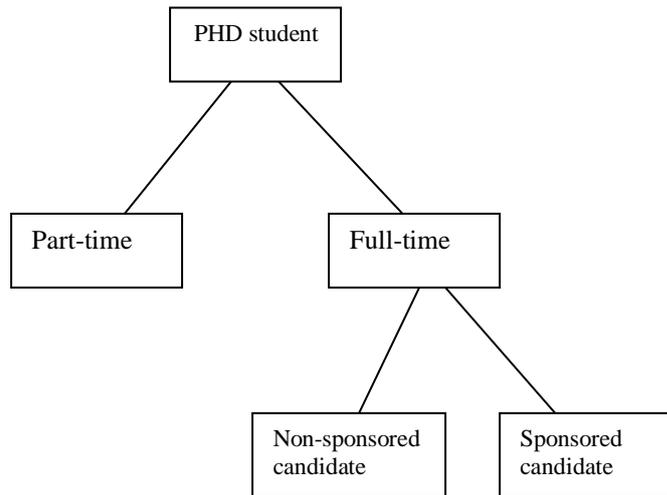
- Question 9:** Explain the window management scheme in TCP through an illustration. (5 marks)
- Question 10:** Discuss the Silly Window Syndrome which cause degradation of TCP performance. What is the proposed solution? Explain. (6 marks)
- Question 11:** Explain the terms: bit rate, baud rate and bandwidth with the help of an example. Also draw modulation schemes for the followings: (i) QPSK (ii) QAM-16 and describe. (6 marks)
- Question 12:** What are the differences between leaky bucket and token bucket algorithm? How is token bucket algorithm is implemented? Explain. (7 marks)
- Question 13:** How does DES work? Explain. (8marks)

<b>Course Code</b>	:	<b>MCS-043</b>
<b>Course Title</b>	:	<b>Advanced Database Management Systems</b>
<b>Assignment Number</b>	:	<b>MCA(IV)/043/Assignment/2018-19</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Weightage</b>	:	<b>25%</b>
<b>Last Dates for Submission</b>	:	<b>15<sup>th</sup> October, 2018 (For July session)</b> <b>15<sup>th</sup> April, 2019 (For January session)</b>

**This assignment has thirteen questions, which carries 80 marks. Answer all the questions. Rest 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.**

- Question 1:** Consider a small training institute in which students register for skilled based program offered by the institute. A program can be full or a part-time or both. Every student necessarily registers in at least one program and at most four programmers. Faculty also can be full time or part time or both. A faculty can conduct not more than 3 courses per semester. (20 marks)
- Draw the EER (extended ER) diagram for the above organization showing all entities, relationship, aggregation, generalization /specialization and convert it into relational schemas
  - Draw the appropriate tables and relationship among the tables for the above diagram and normalize the tables up to 3NF
  - Identify weak entity sets in the above diagram if any. How will you convert a weak entity set to a strong entity set? Illustrate.
  - Identify multivalued dependency in the above diagram.
- Question 2:** Create an XML schema for the list of the courses to be offered in the second semester of MCA and their details (like, consumer code, consumer name, number of credits, assignments makes TEE marks) (5 marks)
- Question 3:** How will you enforce referential integrity constraints in Oracle? Explain with the help of an example? (5 marks)
- Question 4:** Draw a simple Use Case diagram for a library system and explain? (5 marks)
- Question 5:**
- What are triggers and cursors and their uses? Explain with the help of an example for each. (5 marks)
  - Write a trigger that restricts modifying an employee table beyond 2 hrs overtime per day. (5 marks)

**Question 6:** Create and explain an object oriented database for the following UML diagram. Make assumption about attributes and functions. (5 marks)



**Question 7:** What are the parameters for measuring cost for performing a query. Discuss the algorithm and the related cost of performing selection operation? (5 marks)

**Question 8:** Explain SQL related security commands? (4 marks)

**Question 9:** Explain clustering in data mining? (3 marks)

**Question 10:** What the help of a suitable example, explain insertion and deletion anomalies. (4 marks)

**Question 11:** How is the check pointing information used in the recovery operation in case of the system crash in DBMS. (4 marks)

**Question 12:** Consider the following database  
 Employees ( emp-name, streets, city, age)  
 Working( emp-name, department)  
 Designation ( emp-name, designation, salary).

Write the relational algebraic expressions and SQL statements for the following queries:

(a) Find the name, street & cities of all employees working for department  $D_1$  and  $D_2$  as Section Officers and earning salary more then 30000 (3 marks)

(b) Find all the employees who are working as Deputy Registrar and living in the same cities. (3 marks)

**Question 13:** How does PostgreSQL perform storage and indexing of tables? Also discuss the type of indexes in PostgreSQL? (4 marks)

<b>Course Code</b>	:	<b>MCS-044</b>
<b>Course Title</b>	:	<b>Mini Project</b>
<b>Assignment Number</b>	:	<b>MCA (IV)/044/Assignment/2018-19</b>
<b>Assignment Marks</b>	:	<b>100</b>
<b>Maximum Marks</b>	:	<b>25%</b>
<b>Last Date of Submission</b>	:	<b>15<sup>th</sup> October, 2018 (for July session)</b> <b>15<sup>th</sup> April, 2019 (for January session)</b>

**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 Project Synopsis and Project Report management system is to be developed by a University. The synopsis is submitted by the students of the final semester (whose details are expected to be available in student database) at the respective centers in a specified format. At these centers, the information such as name of guide, project title, tools to be used, date of submission of synopsis etc are entered in the database. These synopsis are then sent to evaluators in a bunch of 25 each. The evaluators may accept the synopsis, reject the synopsis or accept the synopsis with modifications. The students are communicated the result of synopsis. Students whose synopsis are accepted or accepted with modifications are given time to complete the project. The project reports are then submitted by such students and due information is recorded about it. The reports are evaluated by the evaluators who also conducts viva of the students on a stipulated date.

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

**Question 1:** (5+5 = 10 Marks)

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

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

- What would be major costs of the system?
- 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. Your schedule must include both GANTT and PERT charts. Explain the two charts drawn by you.

**Question 3:** (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 give consideration to 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.

**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 3<sup>rd</sup> 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:**

(10 Marks)

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

<b>Course Code</b>	:	<b>MCSL-045</b>
<b>Course Title</b>	:	<b>UNIX and DBMS Lab</b>
<b>Assignment Number</b>	:	<b>MCA(IV)/045/Assignment/2018-19</b>
<b>Maximum Marks</b>	:	<b>100</b>
<b>Weightage</b>	:	<b>25%</b>
<b>Last Date of Submission</b>	:	<b>15<sup>th</sup> October, 2018 (for July session)</b> <b>15<sup>th</sup> April, 2019 (for January session)</b>

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) To wait for a specified number of seconds before exit.
- (b) To arrange to print a file on the line printer without making you wait for the command to finish.
- (c) What are the differences among the following three commands?
  - i. `cat file | pr`
  - ii. `pr < file`
  - iii. `pr file`
- (d) To change the command prompt from `$` to `?`.
- (e) To grant the permissions of read, write and execute to the *user* and read only to the *group* and *others* for any file using *chmod*.
- (f) To direct a standard output to any file.
- (g) To print all the filenames in the current directory that doesn't contain the *temp*.
- (h) To list all the filenames that *others* can read and write.
- (i) To split a file *test*, which is containing 100 lines into 25 lines each.
- (j) To display those lines that are common to *file1* and *file2*.

(5 Marks)

#### Question 2:

- (a) Write a shell program to translate all the lower case letters in any text file to the upper case letters. (5 Marks)
- (b) Given the filename by the user as the input, write a shell script to display the first five lines of the file. (5 Marks)
- (c) Write a shell script to display the list of the files whose filename consists of 4 characters (with any file extension) and filename starts with the alphabet *f*. (5 Marks)

## PART-II: MCS-043

### Question 1:

Design a database for maintaining inventory of a retail shop. You are required to perform the following activities for the maintenance of the above:

- (a) Create the database. (2 Marks)
- (b) Write the following queries using SQL: (4 Marks)
  - (i) Find the details of the items whose sales have exceeded Rs. 2,00,000.
  - (ii) Find the details of the six items in terms of numbers/quantity in alphabetical order that have got the maximum sale.
  - (iii) Find the names of those items that have an overall sale of 40% of what have been procured.
  - (iv) Create a view of the items for the manager showing overall performance of the week for each item.
- (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 price of an item. (2 Marks)
  - (ii) Create a trigger that increases the price of a specific item by a certain percentage on a specific weekend. (3 Marks)
- (e) Create a transaction that finds the total items sold per week and prints the overall revenue generated. (3 Marks)
- (g) Create two different types of users: the first user – a manager who can see reports and change the items and its price value and second user who sells these items. (3 Marks)