# MASTER OF COMPUTER APPLICATIONS (MCA_NEW)

ASSIGNMENTS
OF MCA_NEW (2Yrs) PROGRAMME
SEMESTER-III

**(January - 2025 & July - 2025)**

**MCS-224, MCS-225, MCS-226, MCS-227**

**MCSL-228, MCSL-229**



**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 Programme Guide of MCA (2Yrs).

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 Programme Guide of MCA (2yrs).

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-224 |
|---|---|---|
| Course Title | : | **Artificial Intelligence and Machine Learning** |
| Assignment Number | : | **MCA_NEW(III)/224/Assign/2025** |
| Maximum Marks | : | **100** |
| Weightage | : | **30%** |
| Last date of Submission | : | **30th April, 2025 (for January session)** |
| | | **31st October, 2025 (for July session)** |

**This assignment has 16 questions of 5 Marks each, answer all questions. Rest 20 marks are for viva voce. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.**

**Q1:** Compare ANI, AGI and ASI, in context of AI. Also, discuss the major applications of AI.

**Q2:** What is Turing Test? What is the Criticism to the Turing Test?

**Q3:** Compare Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL).

**Q4:** What are Intelligent agents in AI? Briefly discuss the properties of Agents.

**Q5:** Find the minimum cost path for the 8-puzzle problem, where the start and goal state are given as follows:

| 1 | 2 | 3 |
|---|---|---|
| 8 |   | 4 |
| 7 | 6 | 5 |

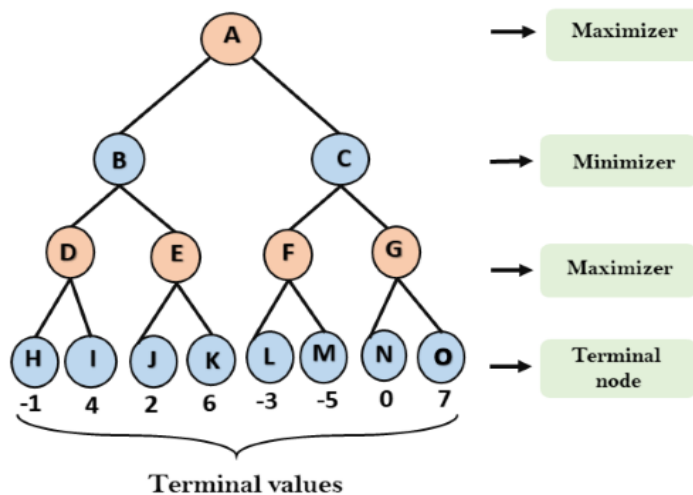| 2 | 8 | 1 |
|---|---|---|
|   | 4 | 3 |
| 7 | 6 | 5 |

Start State                          Goal State

**Q6:** Consider the following Minimax game tree search in which root is maximizing node and children are visited from left to right. Find the value of the root node of the game tree?



Terminal values

**Q7:** Define a frame for the entity date which consists of day, month and year. each of which is a number with restrictions which are well-known. Also, a procedure named compute-day-of-week is already defined.

**Q8:** In a class, three students tossed one coins (one each) for 3 times. Write down all the possible outcomes which can be obtained in this experiment. What is the probability of getting 2 or more than 2 heads at a time? Also find the probability of getting three tails at a time.

**Q9:** Briefly discuss the various Ensemble Methods.

**Q10:** Explain K-Nearest Neighbour (K-NN) classification algorithm with the help of a suitable example

**Q11:** Using the following training dataset, apply Naïve Bayes classification algorithm to find the class of an unknown sample X = < Rainy, Cool, High, False >

| S. No. | Outlook | Temperature | Humidity | Windy | Play Golf/Class |
|--------|---------|-------------|----------|-------|-----------------|
| 0 | Rainy | Hot | High | False | No |
| 1 | Rainy | Hot | High | True | No |
| 2 | Overcast | Hot | High | False | Yes |
| 3 | Sunny | Mild | High | False | Yes |
| 4 | Sunny | Cool | Normal | False | Yes |
| 5 | Sunny | Cool | Normal | True | No |
| 6 | Overcast | Cool | Normal | True | Yes |
| 7 | Rainy | Mild | High | False | No |
| 8 | Rainy | Cool | Normal | False | Yes |
| 9 | Sunny | Mild | Normal | False | Yes |
| 10 | Rainy | Mild | Normal | True | Yes |
| 11 | Overcast | Mild | High | True | Yes |
| 12 | Overcast | Hot | Normal | False | Yes |
| 13 | Sunny | Mild | High | True | No |

**Q12:**  Explain working of SVM algorithm with the help of a suitable example.

**Q13:**  Consider the following set of data points (Year of experience salary). Find the $2^{nd}$ order polynomial $y = a_0 + a_1 x_i + a_2 x_i^2$, and using polynomial regression determine the salary when year of experience is 10.

| Years of Experience (X) | Salary (Y) in Dollar |
|:---:|:---:|
| 1 | 50,000 |
| 2 | 55,000 |
| 3 | 65,000 |
| 4 | 80,000 |
| 5 | 110,000 |
| 6 | 150,000 |
| 7 | 200,000 |

**Q14:**  Write Back Propagation algorithm, and showcase its execution on a neural network of your choice (make suitable assumptions if any)

**Q15:**  Consider the two-dimensional patterns (2, 2), (3, 6), (4, 4), (5, 6), (6, 7), (7, 8), (8, 8) and (9, 10). Using the PCA Algorithm, calculate the primary component.

**Q16:**  Compute the Linear Discriminant projection for the following two-dimensional dataset
X1 = (x1, x2) = {(4,2), (2,1), (2,4), (3,5), (4,5)} and X2 = (x1, x2) = {(9, 9), (6, 9), (9, 6),  (8, 7), (10, 9)}

| | | |
|---|---|---|
| **Course Code** | : | **MCS-225** |
| **Course Title** | : | **Accountancy and Financial Management** |
| **Assignment Number** | : | **MCA_NEW(III)/225/Assign/2025** |
| **Maximum Marks** | : | **100** |
| **Weightage** | : | **30%** |
| **Last date of Submission** | : | **30$^{th}$ April, 2025 (for January session)** |
| | | **31$^{st}$ October, 2025 (for July session)** |

**Note: This assignment has five questions. Answer all questions. 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:** Explain accounting equation and classification of accounts in detail. **(16 Marks)**

**Q2:** Explain construction of Fund Flow Statement with example. **(16 Marks)**

**Q3:** Describe the various items which are shown in the Balance Sheet. Why are adjustment entries required to be made at the time of preparing Final Accounts? Explain any such five adjustment entries with the help of suitable example. **(16 Marks)**

**Q4:** What is inventory? What are the reasons for holding inventory? Explain the traditional techniques of inventory control. **(16 Marks)**

**Q5:** What is Working Capital? Explain factors influencing Working Capital Management. **(16 Marks)**

| Course Code | : | MCS-226 |
|---|---|---|
| Course Title | : | **Data Science and Big Data** |
| Assignment Number | : | **MCA_NEW(III)/218/Assign/2025** |
| Maximum Marks | : | **100** |
| Weightage | : | **30%** |
| Last Dates for Submission | : | **30th April, 2025 (for January session)** |
| | | **31st October, 2025 (for July session)** |

**This assignment has 10 questions of 8 Marks each, 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:** Define the term data science. Describe its applications in two industries of your choice (e.g., healthcare, finance, e-commerce). What role does the data science lifecycle play in managing data projects?

**Q2:** Explain Exploratory Data Analysis (EDA) and its importance. What are the main steps in performing EDA on a new dataset? Describe two methods for detecting outliers and how handling outliers impacts data analysis.

**Q3:** Describe the role of statistical hypothesis testing in data analysis. What are Type I and Type II errors, and how do they affect decision-making? Provide an example of hypothesis testing in a real-world scenario.

**Q4:** Discuss the 4 Vs of big data (Volume, Velocity, Variety, and Veracity). Provide a real-world example of each, explaining how these characteristics create challenges in big data management.

**Q5:** Explain the Hadoop architecture with a focus on HDFS and the master/slave architecture. How do NameNode and DataNodes work together to store and manage large datasets? Provide a basic example of this storage process.

**Q6:** Compare Apache Spark, Hive, and HBase in terms of functionality, data processing methods, and use cases. When would Spark be preferred over traditional MapReduce, and why?

**Q7:** Describe the purpose and functionality of a *Bloom filter* in data stream processing. How does the Bloom filter efficiently check for element presence? Describe the Flajolet-Martin algorithm for cardinality estimation in data streams.

**Q8:** What is the PageRank algorithm, and how is it used in link analysis? Describe the concept of "flow of rank" in PageRank. Explain how the PageRank of a web page is calculated using the flow model.

**Q9:** Discuss the challenges of online advertising and recommendation systems. Explain the concept of collaborative filtering with an example, and discuss the role of clustering in social network analysis.

**Q10:** What is the Random Forest algorithm? Explain how it can be applied to classification problems. Write a program in R to implement a Random Forest classifier on a sample dataset and explain its output.

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|---|---|---|
| **Course Code** | : | **MCS-227** |
| **Course Title** | : | **Cloud Computing and IoT** |
| **Assignment Number** | : | **MCA_NEW(III)/227/Assign/2025** |
| **Maximum Marks** | : | **100** |
| **Weightage** | : | **30%** |
| **Last Dates for Submission** | : | **30th April, 2025 (for January session)** |
| | | **31st October, 2025 (for July session)** |

**This assignment has 16 questions of 5 Marks each, amounting to 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:** What is Cloud Computing ? How Cloud Computing differs from Cluster Computing , Grid Computing ? Explain the characteristics of Cloud Computing. Also, give benefits & applications of Cloud Computing.

**Q2:** What do you understand by the term "Cloud Deployment Model". Explain the following Cloud Deployment Models, with suitable example for each.
- Public Cloud Deployment Model
- Private Cloud Deployment Model
- Community Cloud Deployment Model
- Hybrid Cloud Deployment Model

Also, discuss when it is suitable to use which cloud deployment model

**Q3:** Explain the virtualization environment with the help of suitable diagram and example

**Q4:** Explain the following features of virtualization:
(i) Sharing
(ii) Aggregation
(iii) Emulation
(iv) Isolation

**Q5:** Explain the term Server Level Virtualization. What are the advantages of Server Level Virtualization. List the various Server Level Virtualization techniques used in cloud computing.

**Q6:** What is an Hypervisor? Compare the functionality of Type-1 and Type-2 Hypervisor with the help of suitable block diagram for each, also give advantages and disadvantages of each.

**Q7:** Differentiate between the following:
(i) Full virtualization and Para-virtualization
(ii) Citrix XenServer hypervisors and VMware hypervisors

**Q8:** What is a Resource pool ? Explain Resource pooling architecture. Explain the various types of storage pools available.

**Q9:** What to do you understand by the term Resource Sharing? How the concept of Resource Sharing relates to cloud computing ?

**Q10:** What is Tenancy in context of cloud computing ? Compare Multi-Tenancy model and Single Tenancy model of resource sharing.

**Q11:** Explain the term Resource Provisioning in context of cloud computing. Also, explain the various approaches used for Resource Provisioning. Discuss the problems of Over-provisioning and Under-provisioning.

**Q12:** Explain the term Virtual Machine(VM) sizing. Also, compare the Individual VM based sizing with Joint VM based sizing.

**Q13:** Explain the importance of scaling in cloud computing? How proactive scaling is achieved through virtualization? Write differences between proactive and reactive scaling strategies.

**Q14:** Explain the term Internet of Things (IoT).List and explain the various components used to implement IoT. Give characteristics of IoT. Briefly discuss the following types of IoT:

   (i) Consumer IoT (CIoT)
   (ii) Industrial IoT(IIoT)
   (iii) Infrastructure IoT
   (iv) Internet of Military Things (IoMT)

**Q15:** What are sensors? Give static and dynamic characteristics of sensors. How sensors differs from actuators? Discuss the role of Sensors and Actuators in IoT. Also elaborate, How Machine to Machine (M2M) technology differs from IoT.

**Q16:** What is Edge computing? Discuss the working of Edge computing. Also, describe the relation between Edge computing, Fog computing and Cloud Computing, with the help of a suitable block diagram ?

| | | |
|---|---|---|
| **Course Code** | : | **MCSL-228** |
| **Course Title** | : | **AI and Machine Learning Lab** |
| **Assignment Number** | : | **MCA_NEW(III)/L-228/Assign/2025** |
| **Maximum Marks** | : | **100** |
| **Weightage** | : | **30%** |
| **Last Dates for Submission** | : | **30th April, 2025 (for January session)** |
| | | **31st October, 2025 (for July session)** |

**This assignment has 8 Questions for 40 marks. Answer all the questions. Your Lab Record will carry 40 Marks. Rest 20 marks are for viva voce. You may use illustrations and diagrams to enhance the explanation. Please go through the guidelines regarding assignments given in the programme guide for the format of presentation.**

**Note:** You must execute the program and submit the program logic, sample input and output along with the necessary documentation. Assumptions can be made wherever necessary.

**Q1:** Write a Python Program to implement Breadth First Search. **(5 marks)**

**Q2:** Write a Python Program to implement Min-Max Algorithm. **(5 marks)**

**Q3:** Write a Python Program to implement the Backtracking approach to solve N Queen's problem **(5 marks)**

**Q4:** Write a Python Program to implement A* Algorithm. **(5 marks)**

**Q5:** Write a Python Program to implement Naïve Bayes Algorithm for data classification, choose dataset of your own choice. **(5 marks)**

**Q6:** Write a Python Program to implement Polynomial Regression on a dataset of your own choice. **(5 marks)**

**Q7:** Take a Data set as per your choice, implement and execute on different inputs of K-Means clustering algorithm. **(5 marks)**

**Q8:** Write a Python Program to implement FP tree growth Algorithm on a dataset of your own choice. **(5 marks)**

| | | |
|---|---|---|
| **Course Code** | : | **MCSL-229** |
| **Course Title** | : | **Cloud and Data Science Lab** |
| **Assignment Number** | : | **MCA_NEW(III)/L-229/Assign/2025** |
| **Maximum Marks** | : | **100** |
| **Weightage** | : | **30%** |
| **Last Dates for Submission** | : | **30<sup>th</sup> April, 2025 (for January session)** |
| | | **31<sup>st</sup> October, 2025 (for July session)** |

**The assignment has two sections. Answer all the questions. Each section is for 20 marks. The lab record of the Cloud Computing Lab and Data Science lab carries 20 Marks each. The remaining 20 marks are for viva voce. You may use illustrations, diagrams and screenshots to enhance the explanation. Please go through the guidelines regarding assignments given in the MCA(New) Programme Guide for the format of the presentation. If any assumptions are made, please state them.**

### SECTION-I: Cloud Computing Lab

**Q1:** (4+3+3 = 10 Marks)

(a) Use Google Docs to create a document containing the schedule of MCS-229 practical counselling sessions. Store it on Google Drive and share it with five friends who can view and Comment on it.

(b) Use Google Sheets and create a spreadsheet containing the yearly Salary details of 10 employees of a university under the headings – employee name, yearly basic salary, DA percentage, Provident fund deductions, Income Tax deduction, and net salary. You may use the following formulas for making the spreadsheet:

DA amount = DA percentage * yearly basic salary
Provident fund = 8% of yearly basic salary
Income Tax deduction is computed as:
For yearly basic salary < 5,00,000  tax =0
For yearly basic salary >= 5,00,000 but <10,00,000
tax = 20% of (yearly basic salary – 5,00,000)
For yearly basic salary >= 10,00,000
tax = 1,00,000 + 30% of (yearly basic salary – 10,00,000)
Net Salary = yearly basic salary + DA amount – Provident fund – tax

(c) Use Google Slides and prepare nine slides on the topic "Platform as a Service (PaaS)" in a group of three students by sharing the Google Slides in your group in *edit* mode. Every group member should make three slides each and contribute to the slides of other members of her/his group.

**Q2:** (5 Marks)

Explore JustCloud file storage solutions and cloud storage on AWS. Use only the trial versions.

**Q3:** (5 Marks)

Use Google App Engine to write a program to multiply two matrices. Deploy it on the Google cloud.

## SECTION-II: Data Science Lab

**Q1:**                                                                                   **(2+2+4+2 = 10 Marks)**

The height of 50 students of class X was measured in centimeters. The following table shows this data. Perform the tasks (i) to (iv) using R programming.

| 156 | 155 | 163 | 151 | 141 | 160 | 151 | 131 | 170 | 163 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 165 | 160 | 158 | 168 | 158 | 154 | 162 | 166 | 171 | 141 |
| 161 | 159 | 158 | 156 | 149 | 145 | 168 | 171 | 165 | 145 |
| 166 | 167 | 169 | 156 | 164 | 146 | 155 | 164 | 168 | 172 |
| 156 | 163 | 167 | 157 | 155 | 145 | 171 | 164 | 166 | 195 |

    (i)     Find the minimum and maximum height.

    (ii)    Find the percentage of students whose height is between 160 and 170 Centimeters.

    (iii)   Create and draw the frequency distribution with the help of a relevant graph.

    (iv)   Find the outlier of the data.

**Q2:**                                                                                            **(10 Marks)**

An organisation collected the following data of its employees: "years in employment" and "employee's salary". Use R programming to fit a linear regression line to predict the effect of years in employment on the employee's salary. Also, predict the salary of an employee who is employed for 11 years.

| Employee Number | Years in Employment | Employee Monthly salary in thousand Rs |
| --- | --- | --- |
| 1 | 10 | 149 |
| 2 | 8 | 120 |
| 3 | 12 | 150 |
| 4 | 7 | 110 |
| 5 | 6 | 100 |
| 6 | 5 | 90 |
| 7 | 9 | 130 |
| 8 | 8 | 110 |
| 9 | 3 | 80 |
| 10 | 4 | 85 |