MASTER OF COMPUTER APPLICATIONS (MCA_NEW)

ASSIGNMENTS
OF MCA_NEW (2Yrs) PROGRAMME
SEMESTER-III

(January - 2024 & July - 2024)

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.
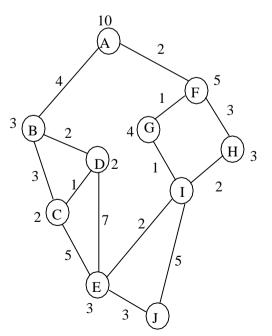
Course Code	:	MCS-224
Course Title	:	**Artificial Intelligence and Machine Learning**
Assignment Number	:	**MCA_NEW(III)/224/Assign/2024**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last date of Submission	:	**30ᵗʰ April, 2024 (for January session)**
		31ˢᵗ October, 2024 (for July session)

This assignment has sixteen questions of 5 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: Classify AI on the basis of the functionalities of AI. Also discuss some important applications of AI.

Q2: Define Supervised, Unsupervised and Reinforcement learning with a suitable examples of each

Q3: Compare Artificial Intelligence, Machine Learning, and Deep Learning.

Q4: Find the minimum cost path for the 8-puzzle problem, where the start and goal state are given as follows:

1	2	3
4	8	-
7	6	5

Start State

1	4	7
-	8	6
2	3	5

Goal State

Q5: Consider the following graph. The numbers written on edges represents the distance between the nodes and the numbers written on nodes represents the heuristic value. Find the most cost- effective path to reach from Noda A to node J using A* Algorithm.

Q6: Discuss the transforming an FOPL Formula into Prenex Normal Form with suitable example. Also, discuss Skolomization with a suitable example.

Q7: Explain Forward Chaining Systems and Backward Chaining Systems with a suitable example for each.

Q8: Prove that following properties hold for fuzzy sets
(i) Commutativity (ii) Associativity (iii) Distributivity (iv) Demorgan's Law

Q9: Briefly discuss the various Ensemble methods.

Q10: What is logistic regression? Explain with the help of a suitable example.

Q11: Explain Decision Tree algorithm with the help of a suitable example.

Q12: Explain Naïve Bayes Classification Algorithm with a suitable example.

Q13: Explain K-Nearest Neighbors classification Algorithm with a suitable example.

Q14: For the given points of two classes red and blue:

Blue: { (1,2), (2,1), (1,-1), (1,-2)}
Red : { (3,1), (4,3), (3,5), (6,3)}

Plot a graph for the red and blue categories. Find the support vectors and optimal separating line.

Q15: Compute the Linear Discriminant projection for the following two-dimensional dataset:
$X_1 = (x_1, x_2) = (4, 2), (2, 2), (3, 2), (3, 5), (3, 4)$
$X_2 = (x_1, x_2) = (8, 7), (9, 6), (7, 7), (9, 8), (10, 9)$

Q16: Explain FP Tree Growth Algorithm with a suitable example.

Course Code	:	**MCS-225**
Course Title	:	**Accountancy and Financial Management**
Assignment Number	:	**MCA_NEW(III)/225/Assign/2024**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last date of Submission	:	**30th April, 2024 (for January session)**
		31st October, 2024 (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: What is accounting? State its objectives and describe the importance of accounting in the business management. Also, explain different accounting standards. **(16 Marks)**

Q2: What is Trial Balance? What is objective of preparing Trial Balance? Explain limitations of Trial Balance. **(16 Marks)**

Q3: With the help of an example explain how to prepare funds flow statement and statement of changes in working capital. **(16 Marks)**

Q4: Explain following Ratios: **(16 Marks)**
   a. Debt to Net Worth Ratio
   b. Proprietary Ratio
   c. Creditors Turnover Ratio
   d. Cash Profit Ratio

Q5: What is Working Capital? Explain different strategies for Working Capital Management. **(16 Marks)**

Course Code	:	**MCS-226**
Course Title	:	**Data Science & Big Data**
Assignment Number	:	**MCA_NEW(III)/218/Assign/2024**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last Dates for Submission	:	**30ᵗʰ April, 2024 (for January session)**
		31ˢᵗ October, 2024 (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: What is Exploratory Data Analysis (EDA) and why is it important in the data science workflow? What are the key components of the data science process?

Q2: Discuss the implications of hypothesis testing results in decision-making. Provide examples of real-world situations where statistical hypothesis testing is commonly used.

Q3: What is data preprocessing, and why is it a crucial step in the data science workflow? Why is it important to identify and handle outliers in a dataset during data preprocessing?

Q4: Discuss the significance of the three Vs (Volume, Velocity, Variety) in the context of big data. Provide examples of each of the three Vs in real-world scenarios. How does MapReduce facilitate parallel processing of large datasets? Explain the functionality of the Map function in the MapReduce paradigm with the help of an example.

Q5: Explain the purpose of Apache Hive in the Hadoop ecosystem. How does Spark address limitations of the traditional MapReduce model?

Q6: Define NoSQL databases and explain the primary motivations behind their development. Provide examples of scenarios where each type of NoSQL database is suitable.

Q7: How does collaborative filtering contribute to enhancing user experience and engagement in recommendation systems? Provide examples of industries or platforms where collaborative filtering is widely used.

Q8: What is a Data Stream Bloom Filter? Explain its primary purpose in data stream processing. Also, introduce the Flajolet-Martin Algorithm and its role in estimating the cardinality of a data stream.

Q9: Describe the role of link analysis in the PageRank algorithm. How are links between web pages interpreted in the context of PageRank?

Q10: Explain the concept of decision trees in classification. Provide an example of building and visualizing a decision tree using R. How can K-means clustering be applied to a dataset in R?

Course Code	:	MCS-227
Course Title	:	**Cloud Computing and IoT**
Assignment Number	:	**MCA_NEW(III)/227/Assign/2024**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last Dates for Submission	:	**30th April, 2024 (for January session)**
		31st October, 2024 (for July session)

This assignment has 20 questions of 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: Define Cloud Computing. List and explain the four categories of cloud deployment models. Differentiate between cluster, grid and cloud computing with respect to its characteristics, physical structure, hardware, resources, applications, networking and scalability features.

Q2: Define resource sharing in cloud computing. What is Tenancy in context of cloud computing? Explain the implementation of single tenancy and multi-tenancy types of resource sharing in cloud computing.

Q3: Define resource pooling in cloud environment. In this context, explain the following:
   a. Server Pool
   b. Storage Pool
   c. Network Pool

Q4: Explain the differences between cloud computing, Fog computing and Edge computing. Draw a block diagram of Cloud-Fog-Edge collaboration and explain all its layers.

Q5: Draw the block diagram of 3-layer architecture of Fog computing and explain all its layers. Also, with the help of a block diagram, explain the 4-levels in Cloud architecture.

Q6: What is a Hypervisor? Compare the functionalities of Type-1 and Type-2 Hypervisors with the help of suitable block diagram for each; also give advantages and disadvantages of each.

Q7: Define virtualization. Explain its underlying abstraction. Also mention the features provided by virtualization environment. Also, describe various Hypervisor based virtualization approaches like full virtualization, para virtualization and hardware assisted virtualization.

Q8: What is Internet of Things (IoT)? What are the characteristics of IoT? List and explain the various components used to implement IoT. Also explain Industrial IoT, Infrastructure IoT and Internet of military things (IoMT) categories of IoT.

Q9: What is scalability in Cloud Computing ? Explain the Proactive Scaling and Reactive Scaling strategies. Also, describe Auto scaling in cloud? Write and explain fixed amount auto scaling algorithm, with the help of a suitable example.

Q10: Explain the following communication protocols with reference to the IoT devices :
   i. IPv6
   ii. MQTT
   iii. CoAP
   iv. XMPP

Q11: Define Load Balancing. Explain the following algorithms with reference to load balancing :
   a. Static algorithm approach
   b. Weighted Round Robin

Q12: Compare Xenserver Vs VMware with respect to the features like Guest O/S support, Backup facility, Thin provisioning, asset management and configuration mapping, dynamic resource allocation and failover, graphics support, licensing, host server management and storage specifications.

Q13: Explain the term VM (Virtual Machine) sizing. Also, discuss the two ways to do VM sizing, give suitable example for each.

Q14: Define a sensor with reference to an IoT device. Explain various characteristics of sensors. Also, mention and explain all classifications of sensors.

Q15: Briefly discuss any two (for each of the sector) Use Cases of IoT in the following sectors:
(a) Agriculture   (b) Transportation

Q16: Discuss the following baseline technologies of IoT:
   i.   Security in IoT
   ii.   IoT Analytics
   iii. IoT Processors
   iv.   IoT Standards and Ecosystems

Q17: Explain the following computing components used in laboratories of IoT/Cloud :
   a. Arduino
   b. Raspberry Pi

Q18: Discuss the following Service Delivery Models of Cloud, with an example for each :
   a.   Platform as a Service (PaaS)
   b.   Infrastructure as a Service (IaaS)
   c.   Software as a Service (SaaS)

Also, explore the features, benefits and relevant use cases for other service models like Security as a Service (SECaaS), Database as a Service (DBaaS), Analytics as a Service (AaaS) and API as a Service (APIaaS).

Q19: "Cloud Computing offers a variety of deployment models, a network connection viewpoint will be used to examine Cloud deployment models and their accessible components." With reference to this statement, discuss the following types of network connectivity:

   a.   Public Inter cloud Networking
   b.   Private Inter cloud Networking
   c.   Public Intra cloud Networking
   d.   Private Intra cloud Networking

Q20: Write short notes on the following:
   a.   Multi homing and its types
   b.   Horizontal scaling in Cloud environment
   c.   Challenges in Cloud computing
   d.   Applications of Edge computing

Course Code	:	**MCSL-228**
Course Title	:	**AI and Machine Learning Lab**
Assignment Number	:	**MCA_NEW(III)/L-228/Assign/2024**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last Dates for Submission	:	**30th April, 2024 (for January session)**
		31st October, 2024 (for July session)

This assignment has 8 Questions. Answer all the questions. Total marks for all the questions are 40 marks. Your Lab Record will carry 40 Marks. Remaining 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. If any assumptions are made, please state them.

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 Depth First Search. **(4 Marks)**

Q2: Write a Python Program to implement Min-Max Algorithm. **(4 Marks)**

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

Q4: Implement logistic regression in Python. Take the data set as input of your choice. **(5 Marks)**

Q5: Take a real time example to implement KNN- classification algorithm in Python. **(5 Marks)**

Q6: Write a Python Program to implement Support Vector Machines for data classification, choose dataset of your own choice **(6 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. **(6 Marks)**

Course Code	:	MCSL-229
Course Title	:	Cloud and Data Science Lab
Assignment Number	:	MCA_NEW(III)/L-229/Assign/2024
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	30th April, 2024 (for January session)
		31st October, 2024 (for July session)

The assignment has two parts I and II Answer all the questions, each part is for 20 marks. The lab records of the Cloud Computing Lab and Data Science lab carry 20 Marks each (a total of 40 marks). Your Lab Record will carry 40 Marks. 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.

PART-I: Cloud Computing Lab

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

(a) Use Google Docs to create your Curriculum Vitae document. Store it on Google Drive and share it with two friends who can view and comment on it.

(b) Use Google Sheets and create a spreadsheet containing the marks of 10 students under the headings – student name, phone, and marks out of 100 in 5 different subjects. Find the students' grades in each subject using the formula below. Also, compute the Cumulative Grade Point Average for each student.
   Cumulative Grade Point Average = Average of Grade Points of all the subjects.
   Grade Points: A-5; B-4; C-3; D-4; E-1.
      The Grades are computed as:
      If marks >= 75 Grade = A;
      If marks <75 and marks >= 60 Grade = B;
      If marks <60 and marks >= 50 Grade = C;
      If marks <50 and marks >= 40 Grade = D;
      If marks <40 Grade = E;

(c) Use Google Slides and prepare nine slides on the topic "Software as a Service (SaaS)" 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)

Write the steps of installing Oracle Virtual Box on a laptop. Also, describe the features of the Oracle Virtual Box.

Q3: (5 Marks)

Use Google App Engine and write a Google app engine program to validate users using username and password and deploy it to Google Cloud.

PART-II: Data Science Lab

Q4:   **(2+2+4+2 = 10 Marks)**

The weights of 50 adults aged 20-35 years, measured in Kilograms, are given below. Perform the tasks (i) to (iv) using R programming.

60	75	63	55	88	65	72	75	88	63
65	60	78	68	78	74	82	66	81	71
69	59	58	78	89	72	68	71	65	85
76	77	69	56	64	76	55	74	68	76
56	63	67	187	75	85	71	64	66	19

(i) Find the minimum and maximum weight.
(ii) Find the percentage of adults whose weight is between 65 and 75 Kilograms.
(iii)Create and draw the frequency distribution with the help of a relevant graph.
(iv)Find the outlier of the data.

Q5:   **(10 Marks)**

The following data were collected on students' Mathematics and Physics scores. Use R programming to fit a linear regression line to predict the effect of Mathematics scores on the Physics scores of a student. Also, predict the Physics score of a student whose Mathematics score is 80.

Student Number	Mathematics Score	Physics Score
1	40	49
2	90	92
3	58	65
4	53	55
5	60	65
6	70	66
7	75	70
8	80	90
9	83	85
10	47	45