MASTER OF COMPUTER APPLICATIONS

Programme Code
For Distance Learning mode: MCA_NEW

ASSIGNMENTS
OF
SEMESTER-III

(January - 2022 & July - 2022)

MCS-224, MCS-225, MCS-226, MCS-227, MCSL-228,

MCSL-229

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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 Programme Guide of Master of Computer Applications (MCA _NEW).

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 Master of Computer Applications (MCA _NEW).

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(III)/224/Assignment/2022**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last date of Submission	:	**31st May, 2022 (for January session)**
		31st October, 2022(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: Differentiate between Artificial Intelligence, Machine Learning and Deep learning.

Q2: Briefly discuss the concept of single agent search and two agent search in Artificial Intelligence.

Q3: Explain A* and AO* search with the help of suitable example.

Q4: Compare and contrast the predicate logic and propositional logic, give suitable example for each. Also write De Morgan's laws for both.

Q5: Discuss the concept of Resolution with the help of suitable example.

Q6: Explain the concept of semantic nets with the help of suitable diagram.

Q7: What do you understand by Bayesian Theory, with reference to its utility in artificial intelligence?

Q8: What are Fuzzy sets? How do they differ from Rough sets?

Q9: Write short notes on following
   a)   Reinforcement Learning   b) Ensemble method

Q10: Differentiate between Supervised learning and Unsupervised learning, give suitable example for each.

Q11: Discuss the concept of Linear regression and its utility in context of machine learning.

Q12: Explain the functioning of neural networks, with the help of suitable diagram.

Q13: Give brief introduction to the concept of feature selection and feature extraction, give suitable example for each.

Q14: What is pattern search? Discuss the Apriori Algorithm for pattern search.

Q15: What do you understand by clustering in context of machine learning? How it differs from classification? List the algorithms used for the purpose of clustering and classification, separately.

Q16: Write Python code to exhibit data classification through K-Nearest Neighbour (K-NN) algorithm.

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.

Question 1: (16Marks)

From the following Trial Balance of Mangat Sahay Associates, prepare Trading and Profit & Loss Account for the year ended 31st December, 2021 and a Balance Sheet as on that date:-

Dr. Balances	Rs.	Cr. Balances	Rs.
Opening Stock	20,000	Sales	3,80,000
Purchases	1,85,000	Purchase Return	5,000
Sales Return	6,000	Discount	5,000
Carriage Inwards	2,500	Sundry Creditors	22,000
Carriage Outwards	1800	Bills Payable	3000
Wages	39,000	Capital	65,000
Salaries	27,600		
Plant & Machinery	1,00,000		
Furniture	8,000		
Sundry Debtors	37,000		
Bills Receivable	1,500		
Cash in Hand	6,400		
Travelling Expenses	5,500		
Lighting	2,500		
Rent and Taxes	6,500		
General Expenses	8,200		
Insurance	1,500		
Drawings	21,000		
	4,80,000		4,80,000

Adjustments:
    (1) Stock on 31st December, 2021 was valued at Rs. 30,000 (Market Value Rs. 40,000).

    (2) Wages outstanding for December, 2021 amounted to Rs. 4,000.

(3) Salaries outstanding for December, 2021 amounted to Rs. 2000.

(4) Prepaid insurance amounted to Rs. 400.

(5) Provide depreciation on Plant and Machinery at 6% and on Furniture at 15%.

Question 2:   **(16 Marks)**

Following are the balance sheets of Sham Sharan limited as on 31st December, 2020 and 2021.

Liabilities	2020 Rs.	2021 Rs.	Assets	2020 Rs.	2021 Rs.
Share Capital	65,000	90,000	Goodwill	3,000	2,500
Reserves	12,000	14,500	Buildings	52000	54,000
P. & L A/c	7,000	11,500	Plant	40,000	41,000
Bank Loan	20,000	---	Stock	19,000	20,000
(Long-term)			Debtors	41,000	40,000
Creditors	40,000	35,000	Cash	---	650
Bills Payable	11,000	9000	Bank		1850
	1,55,000	1,60,000		1,55,000	1,60,000

Taking into account the following additional information, you are required to prepare funds flow statement and statement of changes in working capital.

(a) Dividend paid was Rs. 8, 000/-
(b) Rs.3, 600/- was written off as depreciation on plant and Rs. 3, 000/- on buildings.
(c) Profit on sale of plant was Rs. 3, 000/-

Question 3:   **(3+5+8 Marks)**

What is meant by Accounting? State its objectives and describe the emerging role of accounting in the present business scenario.

Question 4:   **(3+3+10 Marks)**

What do you mean by Inventory Management? What are the main reasons for holding Inventory? Explain the techniques of Inventory management in brief.

Question 5:   **(16 Marks)**
Elaborate in detail:
"The pursuit of wealth maximization as the overall goal of the business reconciles the conflicting interests of the varied stakeholders".

Course Code	:	MCS-226
Course Title	:	Data Science and Big Data
Assignment Number	:	MCA(III)/226/Assignment/2022
Maximum Marks	:	100
Weightage	:	30%
Last date of Submission	:	31st May, 2022 (for January session)
		31st October, 2022(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: What is data science? What are its applications? Define the terms Descriptive, Exploratory and Predictive in the context of data analysis. What is the difference between Causal inference and prediction?

Q2: Explain the following with the help of an example in the context of statistics and Probability:
Conditional Probability, Bayes Theorem, Normal distribution, Central limit theorem and Statistical Hypothesis

Q3: Explain the concept of data pre-processing, data extraction, data cleaning, data curation and data integration with the help of an example of each.

Q4: A class has 25 students. Create a data set of marks of the students in Mathematics out of a maximum of 50 marks. Make the histogram and box plot for this data. Can you draw scatter plots using this data? Give reasons in support of your answer.

Q5: Explain Big data and its characteristics. How is Big data different to relational data? Explain with the help of an example. Define the characteristics of HDFS. Explain purpose of name node, data node and job tracker in this context.

Q6: What is Map-Reduce programming? Explain the map phase, shuffling and sorting and reduce phase with the help of an example of word counting problem.

Q7: Explain the features of Apache SPARK, HIVE and HBASE.

Q8: What are NoSQL databases? How are they different from relational database management system? List the features of any four types of NoSQL databases.

Q9: Explain the Jaccard similarity of sets with the help of an example. What are the ways of finding similarity between two documents? Also, define the term collaborative filtering.

Q10: What is a data stream? How is it different to relational data? List the issues and challenges of handling data streams. What is the role of bloom filter?

Q11: Explain the role of link analysis. Explain a page ranking algorithm with the help of an example. What is link spam? Explain the role of hubs and authorities for finding page rank.

Q12: Explain the process and issues of the following:
Advertising on web, Recommendation system, Mining of social networks.

Q13: Write program using R for the following tasks:

   (i)   Computation of income tax of a vector of size 10, consisting of total annual income of 10 different person. The tax computation should be 10%, if annual income is below 5 lakhs and 20% if it is above 2 lakhs.
   (ii)   Matrix addition, subtraction and multiplication
   (iii)   Finding inverse of a matrix

Q14: Create a sample data of the marks of 20 students in five different subjects using MS-Excel. How can you use this data for programming in R? Write programs using R programming language to create four different plots using this data.

Q15: Write program using R to demonstrate any one of the following:
         chi-square testing or linear regression or logistic regression.
You may choose any sample data.

Q16: Write steps about how R programming language can be used for performing the following analysis task:
(i) classification (ii) clustering (iii) finding association rules

Course Code	:	MCS-227
Course Title	:	Cloud Computing and IoT
Assignment Number	:	MCA(III)/227/Assignment/2022
Maximum Marks	:	100
Weightage	:	30%
Last Date of Submission	:	31st May, 2022 (for January session)
		31st October, 2022(for July session)

This assignment has five questions. All the questions are compulsory and there is no choice. 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: **(10 Marks)**

Cloud Service models like Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (Saas) were discussed in the course. 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).

Question 2:

(a) What do you understand by Resource Virtualization and its underlying abstraction? **(4 Marks)**

(b) Describe various Hypervisor based virtualization approaches like full virtualization, para virtualization and h/w-assisted virtualization. **(6 Marks)**

(c) 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. **(10 Marks)**

Question 3: **(10 Marks)**

Define scaling concept in cloud computing. Explain the following scaling strategies:
  (a) Proactive Scaling
  (b) Reactive Scaling
  (c) Combinational Scaling

Question 4: **(20 Marks)**

Compare and contrast Cloud Computing, Fog Computing and Edge Computing. Briefly discuss two applications for each of Fog Computing and Edge Computing.

Question 5:   **(20 Marks)**

Briefly discuss **any two** (for each of the sector) Use Cases of IoT in the following sectors:

(a) Agriculture
(b) Transportation

Course Code	:	MCSL-228
Course Title	:	AI and Machine Learning Lab
Assignment Number	:	MCA(III)/L-228/Assignment/2022
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	31st May, 2022 (for January session)
		31st October, 2022 (for July session)

This assignment has two Questions, answer all questions. Each Question is of 20 marks. Your Lab Records will carry 40 Marks (20 Marks for each Question). 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.

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: Briefly discuss the concept of Resolution and Unification mechanism in Artificial intelligence. Apply the concept of Resolution to the knowledge/facts given below:

(20 marks)

a)   Whoever can read is literate.
b)   Dolphins are not literate.
c)   Some Dolphins are intelligent.

Use the available knowledge and the concept of resolution to prove the statement given below :

"Some, who are intelligent, cannot read".

Note: Properly showcase the relevant steps involved for Resolution.

Q2: Discuss K-Means algorithm and write the python code to demonstrate the execution of K-Means algorithm on the dataset of your choice   **(20 marks)**

Note: Make necessary assumptions if any.

Course Code	:	**MCSL-229**
Course Title	:	**Cloud and Data Science Lab**
Assignment Number	:	**MCA(III)/L-229/Assignment/2022**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last Dates for Submission	:	**31st May, 2022 (for January session)**
		31st October, 2022 (for July session)

The assignment has two parts A and B. Answer all the questions. Each part is for 20 marks. The lab records of Cloud computing Lab and Data Science lab carries 20 Marks each (total 40 marks). Rest 20 marks are for viva voce. You may use illustrations, diagrams and screenshots to enhance the explanations. Please go through the guidelines regarding assignments given in the MCA(New) Programme Guide for the format of presentation. If any assumptions made, please state them.

PART-I: Cloud Computing Lab

Question 1:   **(10 Marks)**

(a)   Use Google Docs and create a word document of your *lab session schedule* (sample) and store it on Google Drive and provide permissions to *view* the document. Share this document with any four friends.

(b)   Use Google Sheets and create a spreadsheet which contains employees salary information (for 10 employees) and calculate gross and net salary using formulae:

- DA = 10%OF BASIC,   (BASIC means basic salary)
- HRA = 30%OF BASIC,
- PF = 10% OF BASIC IF BASIC<=3000
     = 12% OF BASIC IF BASIC>3000

- TAX = 10% OF BASIC IF BASIC<=1500
       = 11% OF BASIC IF BASIC>1500 AND BASIC<=2500
       = 12% OF BASIC IF BASIC>2500

- NET_SALARY= BASIC + DA + HRA – PF - TAX

(c)   Use Google Slides and prepare a group (of three students) presentation consisting of 15 slides on the topic Cloud Computing (including introduction, models, services and architecture) by sharing the Google Slides PPT along with your group in *edit* mode for contributing by all the three group members.

Question 2:   **(5 Marks)**

Study and Implement *JustCloud* to choose your files, upload them and access them from anywhere.

Question 3:   **(5 Marks)**

Study and implement the features of *ownCloud* which provides universal access to files through web interface.

PART-II: Data Science Lab

Question 1:   **(2+3+5 = 10 Marks)**

The weight of 50 adults in the age group 20-30 years, measured in Kilograms, is given below. Perform the tasks given in (i) to (iii) using R programming.

40	70	61	58	58	50	72	63	51	62
65	60	68	68	78	54	52	60	50	70
60	35	53	58	79	60	62	61	55	65
51	39	45	58	50	65	62	50	72	62
52	65	67	87	45	75	71	52	65	59

  (i) Find the minimum and maximum weight.
  (ii) Find the percentage of students, whose weight is in between 50 and 60 kgs.
  (iii)Represent the frequency distribution with the help of a relevant graph.

Question 2:   **(10 Marks)**

The following data was collected on interest rate of loan and average amount of loan. Use R programming to fit a linear regression line to predict the effect of interest rate on the average loan amount. Also, predict the amount of average loan in case the interest rate falls to 5%.

Year	Interest rate on Loans	Average Loan Amount (INR)
2006	10.30	174610
2007	10.20	174040
2008	10.10	166155
2009	9.50	164825
2010	8.50	164255
2011	7.40	164540

2012	8.40	164540
2013	7.90	161215
2014	7.60	165775
2015	7.50	169005
2016	6.90	178695
2017	7.40	193040
2018	8.00	218690
2019	7.20	245290
2020	6.50	294310
2021	6.00	313310