AIML uth/ Library

Roll No. ..... Total Pages : 03

BT-4/M-23 44218

INTERNET AND WEB TECHNOLOGY
PC-CS-AIDS-208A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Discuss collaboration and communication. How do you create cohesive organization system ? Discuss. 7

   (b) What are the different types of navigation systems ? Discuss designing aspects of elegant navigation system and how do you integrate navigation elements ? 8

2. (a) Elaborate the steps for designing search interface for searching your website. How do you make your search more effective ? 7

   (b) Draw a neat sketch and explore the components of architectural page mock-ups. 8

Unit II

3. (a) How is XHTML better than HTML ? Discuss syntactic difference between XHTML and HTML. Write note on text mark up and images. 7

   (b) What do you understand by HTML tags ? How do you create table and design forms ? 8

4. (a) What are the different levels and style specifications of Cascading Style Sheet (CSS) ? 7

   (b) Discuss CSS list properties, colour properties and conflict resolution. 8

Unit III

5. (a) Write note on object orientation and syntactic characteristics of java script. Explain await keyword and the yield keyword. 7

   (b) How are objects created and modified ? Write example in support to your answer. 8

6. (a) Discuss regular expression in JavaScript. How can it be used for pattern ? Justify your answer. 7

   (b) Write note on functions, constructors and errors in JavaScript. 8

Unit IV

7. (a) Discuss the key features of Python. Write a note on name space, data types and expressions used in Python. 7

(b) What are Dict and List comprehensions in Python ? Differentiate between .py and .pyc files. 8

8. (a) What is the usage of help() and dir() function in Python ? 7

(b) Define class and objects. How do you create class and objects in Python ? 8

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BT-4/M-23 44219

DATABASE MANAGEMENT SYSTEM

PC-CS-AIDS-210A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Describe the relationship between the terms database, data models, and schemas. How are data models characterized ?

   (b) Specify the three-level architecture of a DBMS and explain data independence in the context of this architecture.

2. What is the role of an E-R model in database design ? Explain the basic E-R model concepts of entities and their attributes with the help of an example.

Unit II

3. Answer the following with suitable examples :

   (a) What is a primary key in a relation ?

   (b) Discuss the entity integrity and referential integrity constraints.

   (c) Give one example of each of SQL commands for data definition and for retrieving information from a database.

4. What is the role of foreign key in JOIN operation ? Give the illustration of the following relational algebra operations on a database of your choice :

   (a) SELECT

   (b) PROJECT

   (c) DIVISION

   (d) JOIN.

Unit III

5. Design a relation schema that has updation anomalies. Describe 2nd and 3rd normal forms in terms of removing these anomalies.

6. What is functional dependency ? Show how functional dependencies are used to define normal forms for relation schemas.

Unit IV

7. What is Serializability and what are its benefits in the context of transaction processing ? Explain serializability using a suitable example. Also, describe in brief the main types of serializability in DBMS.

8. What problems and failures can occur in the concurrent execution of transactions in a multiuser system ? What is the effect of timestamp ordering on concurrency ? Also, describe how an optimistic concurrency control technique can be used to control concurrency.

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BT-4/M-23 44220

OPERATING SYSTEM

PC-CS-AIDS-212A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. Enumerate the important functions of Operating Systems. Also, give a classification of operating systems w.r.t. advancements in technology and applications.

2. Give an overview of the Operating system structure along with a brief description of its layered and virtual machine approaches of structure.

Unit II

3. Answer the following questions in brief :

   (a) Distinguish between preemptive and non-preemptive scheduling.

(b) Give a brief description of any one scheduling algorithm of your choice.

(c) What is a thread ? What are its benefits ?

4. Give an overview of the critical section problem and briefly describe the requirements of synchronization mechanisms. Why is there a need for communication between processes ?

Unit III

5. When does a deadlock occur ? Is deadlock prevention different from deadlock avoidance ? Explain any *two* deadlock prevention approaches.

6. Distinguish between the following :

(a) Paging and segmentation

(b) Internal and external fragmentation

(c) Demand paging and page replacement.

Unit IV

7. (a) What is the structure of directories ? Also, describe how indexing is used to access files.

(b) What are the advantages of the Shortest Seek Time First disk scheduling algorithm ? Is it better than the First Come First Served method ? Justify.

8. (a) How is the Direct Memory Access (DMA) concept related to device controllers ? What is 'Interleaving' ?

(b) Describe the issues related to File systems' security and protection.

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BT-4/M-23 44227

MATHEMATICS FOR MACHINE LEARNING
BS-CS-AIML-202M

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Explain the history of Artificial Intelligence. 7.5

   (b) Explain the applications of Data Science in the modern context. 7.5

2. (a) Explain the term Measures of Location. 7.5

   (b) Explain the term Measure of Shape. 7.5

Unit II

3. (a) A bag contains 7 white, 6 red and 5 black balls. Two balls are drawn at random. Find the probability that they will both be white. 7.5

   (b) A problem in mechanics is given to three students A, B, C whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ respectively. What is the probability that the problem will be solved ? 7.5

4. (a) The following table gives the number of accidents that took place in an industry during various days of the week. Test if accidents are uniformly distributed over the week.

Day	No. of accidents
Mon.	14
Tue.	18
Wed.	12
Thu.	11
Fri.	15
Sat.	14

The tabular value of χ^2 at 5% level for 5 d. f. is 11.09. **7.5**

(b) A sample of 20 items has mean 42 units and standard deviation 5 units. Test the hypothesis that it is a random sample from a normal population with mean 45 units. The tabulated value of t at 5% level for 19 d. f. is 2.09. **7.5**

Unit III

5. (a) Using the matrix method, show that the equations $3x + 3y + 2z = 1$, $x + 2y = 4$, $10y + 3z = -2$, $2x - 3y - z = 5$ are consistent and hence obtain its solution. **7.5**

(b) Prove that the Eigen values of a Unitary matrix are of unit modulus. **7.5**

6. (a) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$. 7.5

(b) Find the characteristic equation of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ and hence find its inverse by using Cayley-Hamilton theorem. 7.5

Unit IV

7. Diagonalize the matrix $A = \begin{bmatrix} 3 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 3 \end{bmatrix}$.. 15

8. Compute the singular value decomposition (SVD) of the matrix $A = \begin{bmatrix} 1 & -1 & 3 \\ 3 & 1 & 1 \end{bmatrix}$. 15

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BT-4/M-23 44228

INTELLIGENT SYSTEMS

PC-CS-AIML

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) What is artificial intelligence ? Discuss its applications. 5

   (b) What is an NP-hard problem ? Explain in detail using a suitable example. Differentiate between NP-hard and NP-complete problems as AI. 10

2. Discuss in detail the following AI problems : 15

   (i) Symbolic and sub-symbolic

   (ii) Knowledge base and data driven AI.

Unit II

3. What are the applications of heuristic search techniques ? Discuss the Best First Search, Hill Climbing and Tabu Search algorithms in detail with suitable examples. 15

4. Discuss the following algorithms in detail with suitable examples : 15

(i) Simulated Annealing

(ii) Genetic Algorithm

(iii) Ant Colony Optimization.

Unit III

5. (a) Differentiate between forward chaining and backward chaining. 7

(b) Discuss various rule-based systems in detail. 8

6. Write short notes on the following : 15

(i) Knowledge acquisition,

(ii) Computational intelligence

(iii) Conflict resolution

(iv) Sources of uncertainty

(v) Certainty theory.

Unit IV

7. (a) What is UML ? Design a class diagram of a library management system ? 10

(b) Discuss in brief fuzzy sets and fuzzy logic. 5

8. Discuss the following application areas of AI : 15

(i) Expert System

(ii) Decision Support Systems

(iii) Speech and vision

(iv) Information Retrieval

(v) Semantic Web.

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BT-4/M-23 44232

SOFTWARE ENGINEERING

PC-CS-AIML-212A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Explain, why is incremental development the most effective approach for developing business software systems ? Why is this model less appropriate for real-time systems engineering ? 7

   (b) What are software development paradigms ? Describe each in detail. 8

2. (a) Differentiate between RAD and prototype. 7

   (b) What are the advantages of iterative development ? Compare iterative development with incremental delivery approach. 8

Unit II

3. (a) How are the activity diagrams useful in eliciting the requirements of software system ? 8

   (b) Explain the feasibility studies. What are the outcomes ? Does it have either implicit or explicit effects on software requirement collection ? 7

4. (a) Draw DFD (up to level 4) for software of bank management system. 8

   (b) Assume that you are developing an online railway reservation system. Prepare the Software Requirement Specification (SRS) document for the system. 7

Unit III

5. (a) Describe the process of Translating requirements into design model with a neat diagram. 8

   (b) Write the steps to calculate cyclomatic complexity and illustrate with an example. 7

6. (a) Give a complete template for documentation design specification. 7

   (b) Describe decomposition levels of abstraction and modularity concepts in Software Design. 8

Unit IV

7. (a) What is the importance of software quality assurance in software engineering ? Explain the SQA activities. 8

   (b) Explain the call graph based integration testing process with example. 7

8. (a) Write a note on regression testing. 6

   (b) What are the objectives of Software Maintenance ? Explain in detail maintenance metrics. 9

AIML 6th/ Library

Roll No. ..... Total Pages : 2

46307

BT-6/M-23

HUMAN COMPUTER INTERACTION

Paper : PC-CS-AIML-302A

Time : Three Hours] [Maximum Marks : 75

Note: Attempt *five* questions in all, selecting *one* from each unit. All questions carry equal marks.

UNIT–I

1. Describe the various channels of human Input/Output and memory in the context of human-computer interaction, and how they impact the effectiveness and usability of computer systems and interfaces.

2. Distinguish between :

(a) Deductive and inductive reasoning.

(b) Icons, pointers, menus, and buttons.

(c) WWW and Ubiquitous computing paradigms.

UNIT–II

3. Answer the following questions in brief :

(a) What is interactive design and what is the process involved in it?

(b) How can scenario-based design be utilized in the development and evaluation of interactive systems?

(c) What is the aim of usability engineering?

4. (a) What is Prototyping and what are its advantages? Describe the techniques used in prototyping.

   (b) How are principles, standards, guidelines, and rules used for design recommendations that are intended to improve the design?

UNIT–III

5. How do cognitive models represent human cognition, and what are some examples of cognitive models? Also derive the relationship between hypertext, multimedia, and World Wide Web.

6. Describe Mobile Ecosystem along with its platforms and application frameworks.

UNIT–IV

7. What is the primary focus of Designing good web interfaces for users, and how do Drag & Drop and Direct Selection techniques enhance the usability and effectiveness of web interfaces?

8. What are the differences between overlays and inlays in user interface design, and what are some examples of each type? How do virtual pages differ from overlays and inlays, and when might they be more appropriate for presenting complex information or workflows?

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Total Pages : 2

46308

BT-6/M-23

APPLIED MACHINE LEARNING

Paper : PC-CS-AIML-304A

Time : Three Hours]

[Maximum Marks : 75

Note: The students are required to attempt *five* questions in all, selecting atleast *one* question from each unit.

UNIT–I

1. Discuss the need of data representation in machine learning algorithms. Elaborate the concept of basic linear algebra for machine learning techniques. (5+10)

2. Discuss various assessing metrics for linear regression. Discuss the concept of validation in machine learning algorithms with the help of suitable examples. Discuss the training, validation and testing set distribution. (5+5+5)

UNIT–II

3. Discuss and differentiate between linear and logistic regression. Discuss the gradient descent method for learning in detail. (7+8)

4. Discuss the classification problem in machine learning. Discuss the random forest method of classification. Differentiate between classification and regression. (5+5+5)

UNIT–III

5. Discuss the k-nearest neighbor algorithm detail. Discuss the feature selection and feature transformation methods in detail. (7+8)

6. Discuss the concept of SVM learning model in detail. Discuss the methodology to convert multiclass classification problem into binary classification. (8+7)

UNIT–IV

7. Write short note on : (3x5)
   (a) K - means clustering.
   (b) EM algorithm.
   (c) Principal component analysis.

8. Discuss the principle of unsupervised learning. Discuss the need and method of dimension reduction in machine learning. Discuss the principal component analysis for attribute reduction method. (5+5+5)

Roll No. ..... Total Pages : 3

BT-6/M-23 **46309**

EXPERT SYSTEMS

Paper : PC-CS-AIML-306A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT–I

1. (a) Discuss the following by taking some real time examples :

(i) Constraint propagation.

(ii) Knowledge based deduction system.

(iii) Rule based deduction system. 8

(b) By taking suitable examples, explain the work flow of semantics nets. Also, discuss the problems which are associated with hill climbing. 7

2. (a) Elaborate the main usage and working pattern of Alpha beta pruning and Min-max algorithms. Also, discuss their time-space complexities. 8

(b) Explain the basic strategies which are used during the implementation of Breadth first search and depth first search techniques. 7

UNIT–II

3. (a) A washing machine has a fault. The washing machine mechanic uses an expert system to try to find the solution to the fault.

   (i) What type of expert system it would be?

   (ii) Describe *three* features that should be included in the expert system to make it easy for the washing machine mechanic to use. 8

   (b) What is the role of acquisition module frames? Identify their patterns and usage criterion. Also, discuss the role of diagnosis and debugging in expert systems. 7

4. (a) Discuss the following by taking some real time examples :

   (i) Backward chaining.

   (ii) Interpretation and prediction and their associated rules. 8

   (b) Identify the basic aspects of expert systems. How to represent and organize the knowledge base in expert systems? 7

UNIT–III

5. (a) Explain in detail about knowledge acquisition and meta-knowledge in expert systems.

   (b) How to build different process in the expert systems? Identify the basic technical advantages of using process workflow and knowledge engineering.

6. (a) What is expert system shell? Write a note on tools which are used to develop the expert systems. 8

(b) Discuss the various techniques which may be used for knowledge representation in the expert systems. 7

UNIT–IV

7. (a) Identify the most common pitfalls which are generally triggered during the panning of the expert systems. 8

(b) Define and discuss the basic nomenclature of domain expert. How can you deal with domain expert? What are the key responsibilities of a domain expert? 7

8. (a) Is prospector an example of expert system? Explain various facts and figures associated with the case study of prospector. 8

(b) Recognize the different difficulties which may be encountered during the development of expert systems. 7

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BT-6/M-23 **46310**

SOFTWARE TESTING

Paper : PC-CS-AIML-308A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

UNIT–I

1. (a) Explain Software Testing Process in detail. What are the restrictions for testing process?

(b) Explain the process of SDLC with proper flowchart in detail. (7+8=15)

2. (a) What is test oracles and what is it used for?

(b) Differentiate among Verification and Validation by taking an example. (7+8=15)

UNIT–II

3. (a) What is the scope of Decision table testing? 8

(b) How Equivalence class testing is used? Illustrate with example. 7

4. (a) Why data flow testing is important in testing process? 7

(b) Is path testing a white box testing? Where do we use path testing? 8

UNIT–III

5. (a) Discuss the various levels of testing? 8
   (b) What are different debugging techniques? What is a breakpoint in testing? 7

6. (a) What are the steps involved while performing Regression testing? 8
   (b) How do you identify the risk in testing process? 7

UNIT–IV

7. (a) Explain the software quality assurance. What are the various quality attributes?
   (b) Discuss all the levels of CMM. How does the CMM work? (7+8=15)

8. Write short note on the following :
   (a) Stress Testing.
   (b) Exploratory Testing.
   (c) Adhoc Testing. (5×3=15)

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BT–6/M–23 **46294**

SOFT SKILLS AND INTERPERSONAL COMMUNICATION

Paper–OE–CS–AIDS–302

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all. All questions carry equal marks.

1. 'Silence is also a mode of Communication'. Explain by giving suitable examples. (15)

2. What are the modes of inter-cultural and intra-cultural communication? What are the common barriers in achieving effective inter and intra cultural communication? (15)

3. Assume that you are Avinash Shukla, the Administrative Officer of Auro Consultancy, New Delhi. Write a letter to the Managing Director on the general inefficiency and neglect of duty by some members of the staff. Also suggest some recommendations to overcome the problem for better productivity. (15)

4. You are the DM of the Araria district and have been asked by the Secretary, Home Department, Bihar, to submit a report on the relief work that was under-taken after the devastating flood hit the area. The Ministry sanctioned around 50 crore INR for the relief operations in the district, which was to be spent on free distribution of food, water, medicine, etc. Now prepare an outline of this report. (15)

5. Prepare an outline of a presentation for the Sales Department informing them of the latest reports regarding the sales of the newly launched mobile phone by your company. (15)

6. What measures can be taken up to build strong teams? How can a team leader achieve trustworthiness, openness and transparency among his/her team members? (15)

7. Define leadership. What are the qualities of a successful leader? (15)

8. Write short notes on any *three* :
   (i) Problem solving skills.
   (ii) Interaction within family and interpersonal skills.
   (iii) Significance of self-awareness.
   (iv) Decision making skills. (5×3=15)

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46311

BT–6/M–23

COMPUTER VISION

Paper–PC–CS–AIML–310A

Time : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each unit. All questions carry equal marks.

UNIT–I

1. (a) How corner can be detected from 2D image? Explain in detail. (7)

   (b) What is image Processing? Explain any *two* methods in detail. (8)

2. (a) Explain image Formation sensing using thresholding. (7)

   (b) Write Short notes on image Sampling and Binary image analysis/ (8)

UNIT–II

3. (a) List various edge and Corner detection methods and explain any *one* in detail. (7)

(b) Explain dilation and erosion morphological operations. Also write applications of both. (8)

4. (a) What do you mean by feature descriptor of image? Discuss various similarity measures. (7)

(b) Explain Hough Transforms object recognition method. (8)

UNIT–III

5. (a) How does the Histogram equalization process enhance the image? Explain in detail. (7)

(b) Discuss about the terms CVIP tools, Shape, Color and similarity measures in detail. (8)

6. (a) What is texture? Explain any *one* method used to describe the texture of an image. (7)

(b) What are distance measures? State any *two* properties of a similarity measure. Mention any two examples for dissimilarity measures, with equations. (8)

UNIT–IV

7. (a) State the K-Means algorithm for clustering. Apply K-Means algorithm on the following data set to obtain two clusters : (1, 1), (1.5, 2), (3, 4), (5, 7), (3.5, 5), (4.5, 5) and (3.5, 4.5). (7)

(b) Differentiate supervised, unsupervised, and semi-supervised learning. Justify with example. (8)

8. (a) Explain Gaussian Mixture Model and Hidden Markov Model. Explain with Example. (7)

(b) List various Dimensionality reduction techniques and explain any *one* in detail. (8)
