

Total No. of Questions : 7]

SEAT No. :

PE-4787

[Total No. of Pages : 3

[6520]-1

M.Sc.

COMPUTER SCIENCE

CS-501-MJ: Advanced Operating System

(2023 Credit Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any five questions from question 2 to 7.
- 3) Question 2 to 7 carry equal marks.

Q1) Attempt any Five of the following :

[5 × 2 = 10]

- a) Explain the context of process in UNIX.
- b) What are buffer headers in the buffer cache?
- c) List any four file I/O system calls in UNIX.
- d) What is the use of kill function in signal handling?
- e) Define process states and state transitions in UNIX.
- f) What is the role of fork () system call?

Q2) Attempt the following :

- a)
 - i) Describe the dup and dup2 system calls with their usage. **[4]**
 - ii) Explain the layout of system memory in UNIX/Linux, including regions, pages, and page tables. **[3]**
- b) Explain the file subsystem in UNIX/Linux and its key components. **[5]**

P.T.O.

Q3) Attempt the following :

- a) i) What is the difference between exec and fork system calls? [4]
ii) Explain the behavior of following C program. [3]
- ```
#include <stdio.h>
#include <unistd.h>
int main()
{
 int fds [2];
 char buf[20] = "Hello";
 char read_buf[20];
 pipe (fds);
 write (fds[1], buf, 5);
 read(fds[0], read_buf, 5);
 Printf("Read from pipe: %s\n", read_buf);
 return 0;
}
```
- b) What are inodes ? Explain their role in file management. [5]

**Q4) Attempt the following :**

- a) i) Explain the file management functions link, unlink, remove and rename with example. [4]  
ii) Define a process. Illustrate and explain the state transition diagram of a process in UNIX/Linux. [3]
- b) Write a C program to create a child process using fork, and make the parent process wait for the child to complete execution using wait system call. [5]

**Q5) Attempt the following :**

- a) i) Describe the role of the setjmp and longjmp functions in process environment management. [4]  
ii) Explain the alarm, pause, and sleep functions used in signal handling. [3]
- b) Write a C program to demonstrate a race condition in catching the signals. [5]

**Q6) Attempt the following :**

- a) i) Describe the wakeup algorithm in Unix. How it is used in process scheduling. **[4]**
- ii) Explain the process of swapping in UNIX/Linux. How is swap space allocated? **[3]**
- b) Discuss the significance of open, read, write, and lseek system calls in file handling. **[5]**

**Q7) Write short notes on any two of the following.**

- a) Explain the architecture of the UNIX operating system with a neat diagram. **[6]**
- b) Describe the structure of the buffer pool and explain the scenarios for the retrieval of a buffer. **[6]**
- c) Describe the concept of demand paging and explain the role of the page stealer process. **[6]**



Total No. of Questions : 6]

SEAT No. :

PE-4788

[Total No. of Pages : 3

[6520]-2

First Year M.Sc.

COMPUTER SCIENCE

CS-502-MJ : Artificial intelligence  
(2023 Credit Pattern)(Semester - I)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All Questions are Compulsory.
- 2) Figures to the right indicate full marks.

Q1) Solve any Six of the following :

[6 × 2 = 12]

- a) What is Knowledge Representation.
- b) Enlist the types of Uninformed Search.
- c) Define Forward chaining.
- d) Define heuristic function.
- e) Which search algorithms can solve the Water Jug Problem.
- f) Write any 2 applications of AI.
- g) What is an agent? Enlist types of agents.

Q2) Attempt any Four of the following :

[4 × 3 = 12]

- a) Explain any three real world applications of the water Jug Problem.
- b) Differentiate between A\* and AO\* algorithm.
- c) What are the four properties for knowledge representation.
- d) Describe how Minimax would handle a Tic-Tac-Toe game.
- e) Represent the following statements in predicate logic
  - i) John was a man
  - ii) All Pompeians were Romans
  - iii) For every person x, there exists some person y such that x is loyal to y.

P.T.O.

**Q3) Attempt any Three of the following :**

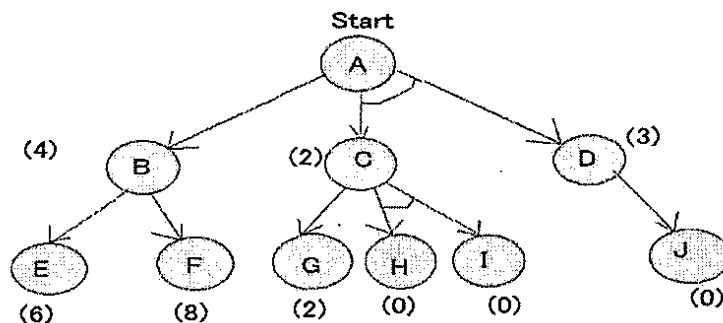
**[3 × 4 = 12]**

- Explain the limitations of Hill Climbing Algorithm.
- Solve  $EAT + THAT = APPLE$  using Constraint Satisfaction.
- Explain Monte Carlo Tree Search algorithm.
- Explain the Unification used for reasoning under predicate logic with example.

**Q4) Attempt any Three of the following :**

**[3 × 4 = 12]**

- Explain the different operators used in Mean Ends Analysis algorithm in detail.
- Explain working of AO\* algorithm using the graph below.



- Explain any two techniques of knowledge representation.
- What is Mental Objects in Artificial Intelligence.

**Q5) Attempt the following :**

- Attempt any TWO of the following :

**[2 × 5 = 10]**

- Define Quantifier. Explain the types of quantifiers used in First Order Logic.
- Given two jugs with capacities of 5 liters and 3 liters and an unlimited water supply, describe the steps required to measure exactly 4 liters of water using these two jugs. Assume that you can fill a jug completely, empty a jug and pour water from one jug into the other.
- Which components are essential for structuring a problem?

- Attempt any ONE of the following.

**[1 × 2 = 2]**

- Give any two techniques or Methods used in Information extraction.
- Explain the purpose of Language Model in AI.

**Q6)** Write a short note (Any Two) :

**[2 × 5 = 10]**

- a) Advantages of BFS.
- b) Alph-Beta Pruning Algorithm.
- c) Semantic Network Representation.



Total No. of Questions : 5]

SEAT No. :

PE-4789

[Total No. of Pages : 2

**[6520]-3**  
**F.Y.M.Sc. (Computer Science)**  
**CS-503-MJ : PRINCIPLES OF PROGRAMMING**  
**LANGUAGES**  
**(2023 Pattern) (Semester - I)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) Question No. 1 is compulsory.
- 2) Solve any *THREE* questions from Q.2 to Q.5

**Q1) Attempt any Five of the following:**

**[5 × 1 = 5]**

- a) What is programming environment?
- b) What is a Elaboration?
- c) List the types of parameters to a subprogram?
- d) Define descriptor?
- e) What is Cambridge Polish notation?
- f) Write advantage and disadvantage of keyword parameters?
- g) What is overloaded Subprogram?

**Q2) Attempt the following:**

**[4 + 4 + 2 = 10]**

- a) Compare between Interpreter and Compiler.
- b) Explain concept of Lazy Evaluation with example.
- c) Explain Design issues of associative arrays.

**P.T.O.**

**Q3) Attempt the following:**

**[4 + 4 + 2 = 10]**

- a) Compare static and dynamic binding.
- b) Explain the semantic models of parameter passing?
- c) Define the following terms
  - i) Formal parameters
  - ii) Actual Parameters

**Q4) Attempt the following:**

**[4 + 4 + 2 = 10]**

- a) Write a note on numeric data type.
- b) Explain the Rectangular and Jagged Array.
- c) What is memorization & promise?

**Q5) Attempt the following:**

**[5 + 5 = 10]**

- a) Explain the concept of Inheritance and Encapsulation with suitable example?
- b) What is subprogram? Explain in detail the design issues for subprograms.



Total No. of Questions : 5]

SEAT No. :

PE-4790

[Total No. of Pages : 2

**[6520]-4**  
**M.Sc. (Computer Science)**  
**CS-510-MJ : ADVANCE DATABASES AND WEB**  
**TECHNOLOGIES**  
**(2023 Credit Pattern) (Semester - I)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) Question No. 1 is Compulsory.
- 2) Solve any three Questions from Q2 to Q5.
- 3) Question 2 to 5 carry equal Marks.
- 4) Figures to the right indicates full marks.

**Q1) Solve any five of the following. [5]**

- a) Define Text overflow
- b) Explain alert in bootstrap.
- c) What is Bootstrap?
- d) What is polyglot programming?
- e) Explain any two features of NoSQL
- f) Explain fieldset form attribute.

**Q2) Attempt the following: [10]**

- a) I) What is CAP theorem. [2]  
II) Give the syntax & purpose of the following form input types. [4]
  - i) Month
  - ii) Password
  - iii) Datetime-local
  - iv) Url
- b) What are the features of key-value database? [4]

**P.T.O.**

**Q3) Attempt the following:** [10]

- a) i) Explain any two transitions. [2]
- ii) Difference between NoSQL and RDBMS. [4]
- b) Explain Bootstrap Utilities with example. [4]

**Q4) Attempt the following:** [10]

- a) i) What is namespace in MongoDB? [2]
- ii) Explain different types of NoSQL database. [4]
- b) Explain advantages and disadvantages of Bootstrap. [4]

**Q5) Attempt any two of the following:** [10]

- a) Consider hospitals in and around Pune. Each hospital may have one or more specializations like Pediatric, Gynaec, Orthopaedic, etc. A person can recommend/provide review for a hospital. A doctor can be associated with one or more hospitals. [5]

Answer the following Queries

- i) List the names of hospitals with gynaec specialization.
- ii) List the names of people who have given a rating of( $\geq 2$ ) for “Jehangir Hospital”.
- b) Write an HTML 5 program for student registration form for college . [5]
- c) Explain the following semantic elements. [5]
  - i) `<section>`
  - ii) `<article>`
  - iii) `<header>`
  - iv) `<nav>`
  - v) `<figcaption>`



Total No. of Questions : 5]

SEAT No. :

PE-4791

[Total No. of Pages : 2

**[6520]-5**  
**M.Sc.**  
**COMPUTER SCIENCE**  
**CS-512-MJ : Cloud Computing**  
**(2023 Pattern) (Semester - I)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1)** Solve Any Five of the following :

**[5]**

- a) Define cloud computing?
- b) What does the acronym XaaS stand for?
- c) What is EBS?
- d) Define the term data security?
- e) Enlist any two Google cloud services?
- f) List the benifits of cloud computing?

**Q2)** Attempt the following :

**[10]**

- a)
  - i) What is data center? **[2]**
  - ii) Compare services provided by cloud SaaS, PaaS, Iaas? **[4]**
- b) Explain security issues in cloud computing? **[4]**

**P.T.O.**

**Q3) Attempt the following :** **[10]**

- a) i) What is disaster recovery in cloud? **[2]**
- ii) Explain detail cloud computing architecture? **[4]**
- b) Explain security governance? **[4]**

**Q4) Attempt the following :** **[10]**

- a) i) Write any two advantage of cloud computing? **[2]**
- ii) Explain virtual machine migration in detail? **[4]**
- b) Describe the amazon cloud services in detail. **[4]**

**Q5) Attempt any two of the following :** **[10]**

- a) Write a short note on Hypervisor? **[5]**
- b) Write difference between physical clusters & virtual clusters? **[5]**
- c) Write a short note on identity and access management? **[5]**



Total No. of Questions : 6]

SEAT No. :

PE-4792

[Total No. of Pages : 2

**[6520]-6**  
**M.Sc. (Computer Science)**  
**CS-514-MJ: C#.NET PROGRAMMING**  
**(2023 Credit Pattern) (Semester - I)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*

**Q1) Solve any six of the following.**

**[6]**

- a) Name any two components of .NET architecture.
- b) What is Garbage Collection'?
- c) Define: Abstract Class?
- d) What is Namespace?
- e) Define: Delegates
- f) What is Array List?
- g) Define: Boxing

**Q2) Attempt any three.**

**[6]**

- a) What is the difference between value types and reference types?.
- b) How do you declare and initialize a two-dimensional array in C#
- c) What are 'Anchor' and 'Dock' properties?
- d) Explain Timer Control.

**P.T.O.**

**Q3) Attempt any two.**

**[6]**

- a) Write short note on DataAdapter.
- b) Explain concept of Dictionary
- c) Explain Form with its properties

**Q4) Attempt any two.**

**[6]**

- a) Explain the purpose of StreamReader and StreamWriter classes in file handling with examples.
- b) Explain the importance of properly closing files in file handling
- c) How does the Global Assembly Cache (GAC) support assemblies?

**Q5) Attempt the following:**

**[6]**

a) Solve any one

**[4]**

- i) Explain the concept of polymorphism in C#. How does method overriding support runtime polymorphism?
- ii) How does a static constructor differ from an instance constructor in C#? Provide code examples.

b) Write note on Rich Textbox

**[2]**

**Q6) Attempt any one.**

**[5]**

- a) What are the advantages and disadvantages of using SDI vs. MDI in software design?
- b) How connected data architecture is implemented in ADO.NET. Explain with sample C# code.



Total No. of Questions : 6]

SEAT No. :

PE-4793

[Total No. of Pages : 2

[6520]-7

**M.Sc. (Computer Science)**

**CS - 531 - RM : Research Methodology  
(2023 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Solve any Six of the following :

**[12]**

- a) Write Meaning of Interpretation?
- b) Write Types of Hypothesis.
- c) What is Sampling?
- d) List out different e-resources for Research.
- e) Define Publication Misconduct.
- f) Define Plagiarism.
- g) What is the significance of report writing?

**Q2)** Attempt any Four of the following :

**[12]**

- a) What are the different methods of data collection?
- b) State the objectives of the Research.
- c) Write the importance of ethics in publication.
- d) Explain the types of plagiarism in detail.
- e) What are types of Reports in Research.

**P.T.O.**

**Q3)** Attempt any Three of the following : **[12]**

- a) Write a short note on Measures of Central Tendency.
- b) State Merits & Demerits of sampling.
- c) Explain Characteristics of Researcher in detail.
- d) What are the Features of Good Research Design.

**Q4)** Attempt any Three of the following : **[12]**

- a) Write short note on pure & Applied Research.
- b) What are the different techniques in interpretation.
- c) Write a short note on Probability Sampling Methods.
- d) State the difference between Questionnaires and Schedules.

**Q5)** Attempt the following : **[12]**

- a) What is Violation of Publication ethics.
- b) Solve any two of the following.
  - i) Explain experimental research with example.
  - ii) Differentiate between Research Methods and Research Methodology.
  - iii) What is Research Problem? What are the techniques involved in defining a research problem?

**Q6)** Write note on the following (any two): **[10]**

- a) Data Analysis.
- b) Report Writing.
- c) Sampling Methods.



Total No. of Questions : 6]

SEAT No. :

PE-4794

[Total No. of Pages : 3

[6520]-21

F.Y. M.Sc.

COMPUTER SCIENCE

CS-551 - MJ : Design and Analysis of Algorithms  
(2023 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All Questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of single memory non programmable scientific calculator is allowed.

Q1) Attempt any FIVE of the following.

[5 × 2 = 10]

- a) Define time complexity and space complexity.
- b) What do you mean by divide and control strategy?
- c) Consider 4 programs with the length 15, 5, 20, 8 respectively are to be stored on a computer tape. Find MRT using greedy method.
- d) What is Principle of Optimality?
- e) What is N-Queen's Problem?
- f) Define P and NP Class.

Q2) Attempt any TWO of the following.

[2 × 6 = 12]

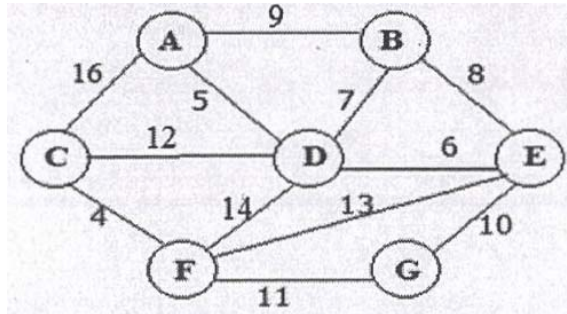
- a) Arrange the following functions in their ascending order of their growth rate :  
 $e^n, \log_e n^n, 3^n, \log_e 3^n, 25n+4$
- b) Sort the following numbers using Merge Sort, Derive its time complexity.  
25, 18, 34, 13, 23, 4, 7, 25
- c) Find Optimal Solution using Greedy Method for the following fractional knapsack instance.  
 $n=5, m=30, (p_1, p_2, p_3, p_4, p_5)=(25, 18, 15, 10, 20)$  and  
 $(w_1, w_2, w_3, w_4, w_5)=(10, 15, 7, 5, 9)$

P.T.O.

**Q3) Attempt any TWO of the following.**

**[2 × 6 = 12]**

- Write an algorithm for binary search algorithm. State its best case, average case and worst case time complexity.
- Find minimum Spanning Tree for the following graph using Prim's Algorithm.



- Find the LCS for the following sequences using Dynamic Programming method.  
 $X = \langle A, C, D, A, B, C \rangle$   
 $Y = \langle C, B, C, D, C \rangle$

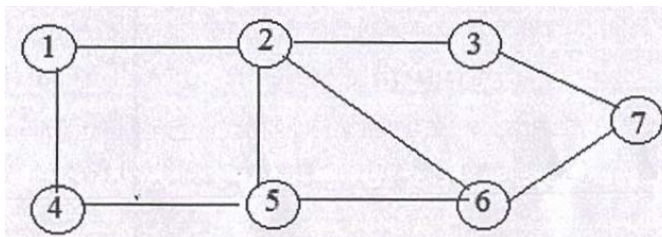
**Q4) Attempt any TWO of the following.**

**[2 × 6 = 12]**

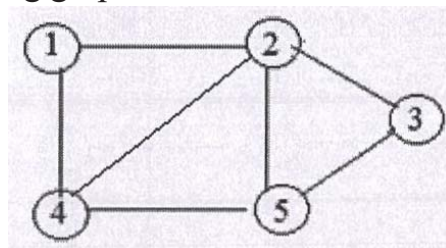
- Define Travelling Salesperson Problem. Solve the following instance of TSP using Dynamic Programming Method.

$$A = \begin{bmatrix} 0 & 12 & 10 & 9 \\ 20 & 0 & 7 & 6 \\ 5 & 10 & 0 & 6 \\ 3 & 7 & 2 & 0 \end{bmatrix}$$

- Apply Breadth First Search and Depth First Search algorithms on the following graph. Consider vertex 1 as start node.



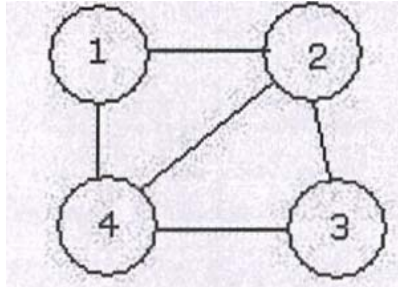
- What is m-colouring problem? Find all possible solutions when the following graph is coloured with exactly 3 colours.



**Q5) Attempt any TWO of the following.**

**[2 × 6 = 12]**

- a) What is the best way to multiply a chain of matrices A1, A2, A3, A4 with dimensions 10×8, 8×5, 5×2, 2×5 respectively using Dynamic Programming Method?
- b) Define Hamiltonian cycle. Find all possible Hamiltonian cycles



- c) Solve the following instance of 0-1 Knapsack problem using LCBB method.  
n=4, P=(10, 10, 12, 18), W=(2, 4, 6, 9) and m=15

**Q6) Attempt any Three of the following.**

**[3 × 4 = 12]**

- a) Define Huffman Coding Problem and give algorithm to find Huffman code.
- b) Differentiate between Dijkstra's Algorithm and Bellman ford Algorithm.
- c) What do you mean by Articulation point? Write algorithm to find all possible articulation point in the given graph.
- d) Define Satisfiability Problem. Write non-deterministic Algorithm for the same.



Total No. of Questions : 6]

SEAT No. :

PE-4795

[Total No. of Pages : 2

[6520]-22

First Year M.Sc.

COMPUTER SCIENCE

CS-552-MJ: Mobile App Development Technologies  
(2023 Pattern) (CBCS) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

**Q1) Attempt any Six of the following :**

[6 × 2 = 12]

- a) What is Mobile App?
- b) Define the term Fragments.
- c) List different types of adapters in android.
- d) Write the use and syntax of Android Toast.
- e) Write different versions of Android OS you know.
- f) Write about Rating bar user control.
- g) List any two phone Gap limitations.

**Q2) Attempt any Four of the following :**

[4 × 3 = 12]

- a) Describe factors in developing Mobile Applications.
- b) Write short note on Manifest File.
- c) Explain any 4 attributes/properties of progress bar.
- d) Describe how events are handling in Android.
- e) Explain JSON parsing in android.

**Q3) Attempt any Three of the following:**

[3 × 4 = 12]

- a) Explain android menus with example.
- b) Explain following files :
  - i) Main activity file.
  - ii) Manifest file.
  - iii) String file.
  - iv) Layout file.
- c) Describe Shared preference in android.
- d) What are broadcast receivers? How is it implemented?

P.T.O.

**Q4) Attempt any Three of the following :**

**[3 × 4 = 12]**

- a) Explain Android Architecture with neat diagram.
- b) What do you understand by PhoneGap plugins?
- c) Write short on android Location-based services.
- d) Write java code to open a new browser window on button click to load given url in edit Text using Implicit intent.

**Q5) Attempt the following :**

**a) Attempt any two of the following :**

**[2 × 5 = 10]**

- i) What is Intent? Explain Explicit vs. Implicit intents with Example.
  - ii) Define android Activity. Explain activity life cycle with diagram.
  - iii) Write a java code for displaying alert dialog box by clicking on button.
- b) Explain any two mobile operating systems you know. **[2]**

**Q6) Write short note : (Any Two)**

**[10]**

- a) Android Styles and Themes.
- b) AsyncTask.
- c) Android Notification



Total No. of Questions : 5]

SEAT No. :

PE-4796

[Total No. of Pages : 2

**[6520]-23**  
**M.Sc. (Computer Science)**  
**CS-553-MJ: SOFTWARE PROJECT MANAGEMENT**  
**(2023 Pattern) (Semester - II)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) Question No 1 is compulsory.*
- 2) Solve any Three questions from Q.2 to Q.5.*

**Q1) Attempt any five of the following.**

**[5 × 1 = 5]**

- a) What is Contract?
- b) List the phases of project life cycle?
- c) What is Change Control Board?
- d) What is CMM?
- e) What is brainstorming?
- f) Define software metrics.

**Q2) Attempt the following.**

**[4 + 4 + 2 = 10]**

- a) Write short note: Resource Management
- b) What is project plan? Explain components of a project plan.
- c) Discuss different techniques of risk identification?

**P.T.O.**

**Q3) Attempt the following.**

**[4 + 4 + 2 = 10]**

- a) Explain project staff acquisition in detail?
- b) What is WBS? Explain different types of WBS
- c) What is quality assurance? Discuss various activities of QA.

**Q4) Attempt the following.**

**[4 + 4 + 2 = 10]**

- a) Explain COCOMO model with example?
- b) Explain the all phases in CMM model?
- c) Discuss PSP/TSP in detail

**Q5) Attempt the following.**

**[5 + 5 = 10]**

- a) What do you mean by a stakeholder? Describe different types of stakeholder?
- b) What are the qualities required for a project manager?



Total No. of Questions : 5]

SEAT No. :

PE-4797

[Total No. of Pages : 2

**[6520]-24**  
**M.Sc. (Computer Science)**  
**CS-560-MJ: FULL STACK DEVELOPMENT-I**  
**(2023 Credit Pattern) (Semester - II)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.

**Q1) Solve any five of the following** **[5]**

- a) What is REPL in context of Node?
- b) Name some of the attributes of package.json.
- c) Write Features of Angular Js.
- d) What is SPA in Angular Js?
- e) What is TypeScript?
- f) Write Difference between '== ' and '=== ' operators

**Q2) Attempt the following** **[10]**

- a) What is the most common use of Node js **[2]**
- b) Which core module is used for file based operation in Node js? Explain any 2 methods **[4]**
- c) What is callback function? Explain call back hell. **[4]**

**P.T.O.**

**Q3) Attempt the following. [10]**

- a) What is string interpolation in Angular js? [2]
- b) What are directives? Explain some of the most commonly used directives in Angularjs application [4]
- c) Write an Angular js display 10 students details in table format using ng-repeat directive. [4]

**Q4) Attempt the following. [10]**

- a) Why do we use Express js? [2]
- b) How would you render plain HTML using Express js? [4]
- c) Explain the different types of HTTP request? [4]

**Q5) Attempt any two following [10]**

- a) What is MEAN Stack? Discuss different technologies that make up MEAN stack. [5]
- b) Create a Simple Web server using Node js. [5]
- c) Write a Simple TypeScript Program to calculate Factorial of Number. [5]



Total No. of Questions : 6]

SEAT No. :

PE-4798

[Total No. of Pages : 2

**[6520]-25**  
**M.Sc. (Computer Science)**  
**CS-562-MJ: WEB SERVICES**  
**(2023 Credit Pattern) (Semester - II)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *All questions are compulsory.*
- 2) *Questions 2 to 6 carry equal marks.*

**Q1) Solve any five of the following** **[5]**

- a) Give the two operating modes of UDDI registry.
- b) What are the different types of web services?
- c) What is resource in REST?
- d) What are the two basic types of service discovery in SOA.
- e) Define Distributed Computing.
- f) What is the use of @Path annotations of Java API for RESTful Web Service (JAX-RS)?
- g) What is mean by <port> element in WSDL?

**Q2) Attempt any 2 out of 3** **[6]**

- a) What are the advantages of Distributing Computing? **[3]**
- b) Differentiate between SOAP and REST. **[3]**
- c) State limitations of UDDI. **[3]**

**P.T.O.**

**Q3) Attempt any 2 out of 3** [6]

- a) Explain different HTTP methods supported by RESTful web services [3]
- b) What are <definition> and <port type> elements in WSDL? Write an example for each. [3]
- c) Explain the Header block of SOAP message in detail. [3]

**Q4) Attempt any 1 out of 2** [6]

- a) Write a short note on WSDL binding. [6]
- b) Describe UDDI data structures and their relationships with diagram. [6]

**Q5) Attempt all** [6]

- a) What is the transport method in SOAP? [2]
- b) Explain the WSDL structural elements [4]

**Q6) Attempt all** [6]

- a) How dose one-way operation differ from a request/response operation [2]
- b) Explain the web-service life cycle. [4]



Total No. of Questions : 5]

SEAT No. :

PE-4799

[Total No. of Pages : 2

[6520]-26

M.Sc.

COMPUTER SCIENCE

CS-564-MJ: ASP.Net Programming  
(2023 Credit Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw suitable diagram if required.

Q1) Attempt any eight of the following :

[8 × 1 = 8]

- a) Write full form of ASP.
- b) Define CLR.
- c) Write any two features of ASP.Net.
- d) Define MVC.
- e) Which compiler is used for ASP. Net?
- f) What is \_asax file?
- g) Write syntax for creating button in asp. Net.
- i) What is session?
- j) What is unit testing?

Q2) Attempt any Four of the following :

[4 × 2 = 8]

- a) Write advantages of ASP. Net MVC.
- b) Write steps to add calendar to ASP Page.
- c) Explain view state and Application state.
- d) Write steps to debug ASP. Net code.
- e) Distinguish between Web forms Vs MVC.

Q3) Attempt any Two of the following:

[2 × 4 = 8]

- a) Explain steps to Deploy website in IIS.
- b) Explain ASP.Net error logging with example.
- c) Explain how ADO.Net works in an application.

P.T.O.

**Q4) Attempt any two of the following :**

**[2 × 4 = 8]**

- a) Explain ASP.Net architecture and its components.
- b) Write ASP.Net Code to upload a file on server of size 10kb.
- c) Write an ASP.Net Code to insert record in student table (Student table- Rollno, Name, Course)

**Q5) Attempt any one of the following :**

**[1 × 3 = 3]**

- a) Explain Server Controls.
- b) Concurrency in ASP.Net



Total No. of Questions : 6]

SEAT No. :

PE-4800

[Total No. of Pages : 2

[6520]-31

**S.Y. M.Sc. (Computer Science)**

**CS - 601 - MJ : SOFTWARE ARCHITECTURE AND DESIGN  
PATTERN**

**(CBCS) (2023 Pattern)(Semester - III)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

**Q1)** Solve any Six of the following :

**[6 × 2 = 12]**

- a) What are the phases of the Unified Process Model?
- b) What is the purpose of an architectural view?
- c) Define architectural style and list four common styles.
- d) Define Bridge.
- e) Name any four behavioral patterns.
- f) What is a creator?
- g) How do frameworks increase productivity for developers?

**Q2)** Attempt any Four of the following :

**[4 × 3 = 12]**

- a) How can software structure be classified?
- b) Describe the pipes and filters architectural style with an example.
- c) Briefly describe the Catalog of design patterns.
- d) Explain the factory design pattern with an example.
- e) State various benefits of high cohesion in GRASP?

**P.T.O.**

**Q3)** Attempt any Three of the following : **[3 × 4 = 12]**

- a) Describe the different types of design patterns.
- b) Explain the singleton design pattern with an example.
- c) Describe the spring MVC framework in detail.
- d) Explain the Bean life cycle with a diagram.

**Q4)** Attempt any Three of the following : **[3 × 4 = 12]**

- a) Describe the phases of the Unified Process model.
- b) Why is software architecture important?
- c) What are the various properties of design patterns?
- d) Explain the command structural pattern.

**Q5)** Attempt any Three of the following : **[3 × 4 = 12]**

- a) Explain the layered architectural style with an example.
- b) Describe the Observer design pattern with an example.
- c) State various benefits of bow cohesion in GRASP?
- d) Describe the interpreter model of software architecture style.

**Q6)** Attempt any Two of the following : **[2 × 5 = 10]**

- a) Explain architectural styles based on:
  - i) Data abstraction and object - oriented organization.
  - ii) Event - based implicit invocation.
- b) What is polymorphism and how is it used in programming?
- c) Describe the Abstract factory design pattern with an example.



Total No. of Questions : 6]

SEAT No. :

PE-4801

[Total No. of Pages : 2

[6520]-32

M.Sc.

COMPUTER SCIENCE

CS-602-MJ: Machine Learning

(2023 Credit Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagram must be drawn whenever required.

Q1) Solve any six of the following :

[12]

- a) What are the key components of machine learning?
- b) Write any two differences between supervised and unsupervised learning.
- c) List any two features selection techniques.
- d) What is the role of cross-validation in machine learning?
- e) List out the libraries of python which support ML.
- f) State MAE and RMSE as regression evaluation method.
- g) What is an ROC-AUC curve used for in classification.

Q2) Attempt any Four of the following :

[12]

- a) Discuss the Gaussian mixture model (GMM) for clustering and its advantages.
- b) Describe logistic Regression and its application in binary classification.
- c) What is Ridge Regression? How it is different from Lasso?
- d) Write a note on the K-Nearest Neighbors (KNN) algorithm.
- e) Define the terms underfitting and overfitting.

Q3) Attempt any three of the following:

[12]

- a) Explain partitioning-based clustering and the K-means algorithm.
- b) What is the Elbow method for finding the optimal number of clusters?
- c) Describe the Principal Component Analysis (PCA) technique.
- d) Write a note on Gradient Boosting in ensemble learning.

P.T.O.

**Q4) Attempt any three of the following :** [12]

- a) Discuss the applications of Reinforcement learning in real life.
- b) Compare Artificial Neural Networks (ANN) with convolutional Neural Networks (CNN)
- c) Describe the concept of Backpropagation in multilayer perceptrons.
- d) Explain Association rules in ML?

**Q5) Attempt the following :** [12]

- a) Solve any two of the following.
  - i) Perform Agglomerative algorithm on the following data and plot a dendrogram using complete linkage approach.

| Items          | P <sub>1</sub> | P <sub>2</sub> | P <sub>3</sub> | P <sub>4</sub> | P <sub>5</sub> |
|----------------|----------------|----------------|----------------|----------------|----------------|
| P <sub>1</sub> | 0              |                |                |                |                |
| P <sub>2</sub> | 9              | 0              |                |                |                |
| P <sub>3</sub> | 3              | 7              | 0              |                |                |
| P <sub>4</sub> | 6              | 5              | 9              | 0              |                |
| P <sub>5</sub> | 11             | 10             | 2              | 8              | 0              |

- ii) Discuss the advantages and disadvantages of supervised learning.
  - iii) Discuss dimensionality reduction techniques with suitable examples.
- b) Write about Q-Learning with an example.

**Q6) Write a note on the following. (Any two) :** [10]

- a) What is the confusion matrix? How is it used to evaluate classification models?
- b) Write a note on Deep Learning Vs. Machine learning.
- c) Analyze the following transaction dataset to find frequent itemsets (Lets assume minimum support=3) using the Apriory algorithm.

| T.ID | Items                 |
|------|-----------------------|
| T10  | {Milk, Bread}         |
| T12  | {Milk, Bread, Butter} |
| T13  | {Bread, Butter}       |
| T14  | {Milk, Bread}         |



Total No. of Questions : 5]

SEAT No. :

PE-4802

[Total No. of Pages : 2

**[6520]-33**  
**S.Y. M.Sc.**  
**COMPUTER SCIENCE**  
**CS-603-MJ: Internet of Things**  
**(2023 Credit Pattern) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from question No.2 to Question No. 5.*
- 3) *Questions No.2 to 5 carry equal marks.*

**Q1)** Attempt any five of the following : **[5]**

- a) What is Ethernet?
- b) What is WSN?
- c) Define data enrichment.
- d) What do you mean by activators?
- e) State short range wireless communication technology.
- f) What is the function of GPIO pins of RPi.
- g) What is smart card?

**Q2)** Attempt the following : **[10]**

- a) Draw and explain three layers IoT architecture. **[4]**
- b) What is RFID? Explain working of RFID. **[4]**
- c) What is MQTT protocol? **[2]**

**Q3)** Attempt the following : **[10]**

- a) What are the features of RPi and describe any two Libraries of RPi. **[4]**
- b) Explain in detail different MAC protocol. **[4]**
- c) Explain the following function w.r.t. Arduino. (Any 2) **[2]**
  - i) Pin Mode ()
  - ii) Digital write ()
  - iii) AnalogRead ()

**P.T.O.**

**Q4) Attempt the following :** **[10]**

- a) Explain in detail SaaS and IaaS. **[4]**
- b) Write a program using Arduino to measure distance between two object using ultrasonic sensor. Also draw Interfacing diagram. **[4]**
- c) Give Advantages of E-health monitoring. **[2]**

**Q5) Attempt the following :** **[10]**

- a) Explain any five security challenges in IoT? **[5]**
- b) Draw and explain different components of IoT? **[5]**



Total No. of Questions : 5]

SEAT No. :

PE-4803

[Total No. of Pages : 2

[6520]-34

**M.Sc. (Computer Science)**

**CS-610-MJ: FULL STACK DEVELOPMENT - II  
(2023 Credit Pattern) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.

**Q1) Solve any five of the following.**

**[5]**

- a) Define a Subject in RxJS.
- b) What is a decorator in TypeScript?
- c) How do you send a JSON response in Express.js?
- d) What is Mongoose in MongoDB?
- e) What is NgRx?
- f) List the tool for end to end testing in web applications

**Q2) Attempt the following:**

**[10]**

- a)
  - i) What is an aggregation pipeline in MongoDB? **[2]**
  - ii) Write a note on RxJS. **[4]**
- b) Explain body parsing and validation work in Express.js. **[4]**

**Q3) Attempt the following:**

**[10]**

- a)
  - i) What is the role of a service in Angular. **[2]**
  - ii) Explain schema validation and middleware in Mongoose with example **[4]**
- b) What are utility types in TypeScript? Explain its types. **[4]**

**P.T.O.**

**Q4) Attempt the following:** [10]

- a) i) Explain method decorator in TypeScript? [2]
- ii) Explain Cross-Site Scripting (XSS) and Cross-Site Request Forgery (CSRF). [4]
- b) How does the event loop handle multiple requests-simultaneously? [4]

**Q5) Attempt any two the following:** [10]

- a) Explain the concept of custom life-cycle hooks in Angular. [5]
- b) Explain Data encryption at rest and in transit in the context of MongoDB [5]
- c) Describe how the OnPush change detection strategy works and how it optimizes performance [5]



Total No. of Questions : 5]

SEAT No. :

PE-4804

[Total No. of Pages : 2

**[6520]-35**  
**M.Sc. (Computer Science)**  
**CS -612 - MJ: DEVOPS FUNDAMENTALS**  
**(2023 Credit Pattern) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Question 1 is compulsory.*
- 2) *Solve any Three questions from Q.2 to Q.5.*

**Q1) Attempt any Five of the following:**

**[5 × 1 = 5]**

- a) What are the goals of DevOps?
- b) Which command is used to add an individual file or groups of files to git tracking?
- c) What is MAVEN repository
- d) Define the term data bags in chef
- e) What is DevOps Configuration Management
- f) Define the term GroupId
- g) Define POM

**Q2) Attempt the following:**

**[4 + 4 + 2 = 10]**

- a) Describe various features and capabilities in Agile
- b) Explain Maven build life cycle phases.
- c) Explain the working of git pull

**Q3) Attempt the following:**

**[4 + 4 + 2 = 10]**

- a) Compare between CVCS and DVCS
- b) Explain the cookbook and receipes in chef.
- c) Define the term
  - i) Push
  - ii) Commit

**P.T.O.**

**Q4) Attempt the following:**

**[4 + 4 + 2 = 10]**

- a) Define Github.Explain in detail about basic Commands in GitHub
- b) Compare between Docker and Virtual Machines
- c) Explain the features of DevOps tools

**Q5) Attempt the following:**

**[5 + 5 = 10]**

- a) Explain tool stack implementation in DevOps
- b) Explain Servers and Nodes Chef Configuration Concepts.



Total No. of Questions : 4]

SEAT No. :

PE-4805

[Total No. of Pages : 2

**[6520]-36**  
**M.Sc. (Computer Science)**  
**CS - 614 MJ: SOFT COMPUTING**  
**(2023 Credit Pattern) (Semester - III)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) All questions are compulsory.*
- 2) Figures to the right side indicate full marks.*
- 3) Draw the diagrams wherever necessary.*

**Q1) Solve any five of the following.**

**[5]**

- a) What is a neural network?
- b) How does fuzzy logic differ from traditional binary logic?
- c) Write any two applications of neural networks.
- d) Define fuzzy logic.
- e) What are the basic Genetic Algorithm Operators?
- f) What is a crisp set?

**Q2) Attempt any two of the following:**

**[10]**

- a) Explain the structure of an Artificial Neuron with a diagram. **[5]**
- b) Explain supervised and unsupervised learning with proper examples. **[5]**
- c) Explain properties of fuzzy sets with proper examples. **[5]**

**P.T.O.**

**Q3) Attempt any two of the following:** [10]

- a) Explain the architecture of Perceptron with a neat labelled diagram. [5]
- b) What is CNN? Explain its architecture. [5]
- c) Find max-min and max-product compositions fuzzy relations R and S which are given below. [5]

$$R = \begin{bmatrix} 0.1 & 0.5 \\ 0.8 & 0.4 \end{bmatrix} \quad S = \begin{bmatrix} 0.9 & 0.6 \\ 0.1 & 0.7 \end{bmatrix}$$

**Q4) Attempt any two of the following:** [10]

- a) Explain the structure of biological neuron with a neat labelled diagram. [5]
- b) Draw and explain the flowchart of Genetic Algorithm. [5]
- c) Explain Backpropagation learning algorithm. [5]

