

Total No. of Questions : 7]

SEAT No. :

PD3658

[Total No. of Pages : 2

[6486]-101

First Year 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) Q.1 is compulsory.
- 2) Solve any Five questions from Q.2 to Q.7.
- 3) Questions from Q.2 to Q.7. carry equal marks.

Q1) Attempt any five of the following:

[5×2=10]

- a) Explain lseek function with syntax.
- b) What is an inode? Explain structure of regular file?
- c) What is signal? State features of signal?
- d) Explain sticky bit.?
- e) What is page fault and demand paging?
- f) Differentiate named and unnamed pipe?
- g) Explain file types?

Q2) Attempt the following:

[12]

- a) State buffer header? Explain structure of buffer pool. **[4]**
- b) Explain following system calls: **[3]**
 - i) link()
 - ii) exec()
- c) What is process and explain state transition diagram of process. **[5]**

P.T.O.

- Q3) Attempt the following [12]**
- State and explain getrlimit and setrlimit [4]
 - Explain any two scheduler Related system call. [3]
 - Explain the behavior of following program [5]
- ```
#include<signal.h>

main()
{
 extern catcher();
 signal(SIGINT,catcher);
 kill(0, SIGINT);
}

catcher(){
}
```
- Q4) Attempt the following. [12]**
- Explain the architecture of Unix OS? [4]
  - Justify-No Process can preempt another process executing in kernel [3]
  - Write a C program to demonstrate race condition in catching signals.[5]
- Q5) Attempt the following. [12]**
- State and explain the data structure used for demand paging [4]
  - Write a short note on swapping concept. [3]
  - What is atexit() function ? Write a C program to demonstrate the used of atexit() System call. [5]
- Q6) Attempt the following. [12]**
- Explain advantages and disadvantages of buffer cache? [4]
  - Explain kill and raise function? [3]
  - Write a program to show the behavior of fork () and wait () function.[5]
- Q7) Attempt any two of the following. [12]**
- Explain the scenarios of process creation and process termination. [6]
  - Write a C program to print size and type of file. [6]
  - Explain layout of the kernel. [6]
- ★ ★ ★

Total No. of Questions : 6]

SEAT No. :

**PD3659**

[Total No. of Pages : 2

**[6486]-102**

**M.Sc. - I (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.*
- 3) *Draw a neat diagrams wherever necessary.*

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

**[6×2=12]**

- a) What is knowledge and data?
- b) Explain AI benefits.
- c) Define Backward chaining.
- d) List AI applications.
- e) Describe any two characteristics of problem.
- f) What Classical Planning in AI?
- g) What is Intelligent Agent?
- h) List any four Search Algorithms in AI.

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

**[4×3=12]**

- a) Explain Water Jug Problem in detail.
- b) Describe the A\* algorithm.
- c) Discuss in brief the various issues in Knowledge Representation.
- d) Explain the MINIMAX procedure.
- e) Consider the following statement and Convert to FOPL and prove that,
  - i) John likes all kind of food
  - ii) Apple and vegetable are food
  - iii) Anil eats peanuts and still alive

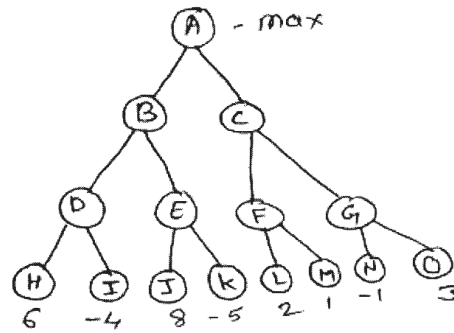
**P.T.O.**

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

- a) Explain Hill Climbing Algorithm in detail.
- b) Explain Monte Carlo Tree Search technique.
- c) Define Constraint Satisfaction problem. Solve SEND+MORE=MONEY using Constraint Satisfaction.
- d) Represent each of the following sentences in FOL (First-Order Logic)
  - i) Everyone loves Mary.
  - ii) Everyone who sees Mary loves Mary.
  - iii) Every student who loves Mary is happy.
  - iv) Every boy who loves Mary hates every boy who Mary loves.

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

- a) Explain Mean Ends Analysis algorithm in detail.
- b) Apply Alpha-Beta Pruning algorithm for following Search.



- c) Describe any two approaches of representing knowledge.
- d) Explain Mental and Modal Object logics.

**Q5)** a) Attempt any two of the following : **[2×5=10]**

- i) What is Hierarchical Planning? Explain in detail.
- ii) Explain First-Order-Logic with example.
- iii) State components using which Problem can be formatted?
- b) Attempt any one of the following. **[1×2=2]**
  - i) Define Search Strategy terminology.
  - ii) Explain Language Model in AI.

**Q6)** Write a short note. (Any two) **[2×5=10]**

- a) Automated planning
- b) AO\* Algorithm
- c) Information Extraction



Total No. of Questions : 5]

SEAT No. :

**PD3660**

[Total No. of Pages : 2

**[6486]-103**

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

**CS-503-MJ : PRINCIPLES OF PROGRAMMING LANGUAGES**

**(2023 Credit 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.

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

**[5×1=5]**

- a) What is imperative type of language? Name any 2 languages which are Imperative?
- b) What is Heterogeneous array?
- c) What data Encapsulation concept is in object oriented programming?
- d) What is Method overloading?
- e) What is the use of strlen() function. Give Syntax.
- f) What is dynamic binding?

**Q2)** Attempt the following.

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

- a) Explain the Entry controlled & Exit controlled loops. **[4]**
- b) What is Heap Based Allocation. **[4]**
- c) What will be output of following code? Justify. **[2]**

```
void call(int,int,int);
int main() { int a=10;
 call(a, a++, ++a);
 return 0;
}
void call(int x,int y,int z) {
 printf("%d %d %d", x,y,z); }
```

**P.T.O.**

**Q3) Attempt the following.**

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

- a) What is Multilevel Inheritance? Explain in detail the implementation of multilevel inheritance. **[4]**
- b) What are the ways to implement parameter passing method? Explain in detail the use of parameter passing methods in various programming languages. **[4]**
- c) Explain the short circuit Evaluation with example. **[2]**

**Q4) Attempt the following.**

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

- a) Explain the array slice & jagged array with example. **[4]**
- b) What is a dangling pointer? Explain solutions to the dangling pointer problem? **[4]**
- c) Give difference between enum & union. **[2]**

**Q5) Attempt the following.**

**[5+5=10]**

- a) What so you understand by the terms 'semantics of a call' and 'semantics of a return' in case of simple subprogram? What do you mean by the activation record and activation record instance. **[5]**
- b) What is Generic subroutines? Explain Generic methods in JAVA. **[5]**



Total No. of Questions : 5]

SEAT No. :

**PD3661**

[Total No. of Pages : 2

**[6486]-104**

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

**CS - 510 - MJ : ADVANCE DATABASE 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 Q.2 to Q.5.
- 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) What does NoSQL stand for? Name one example of a NoSQL database.
- b) What is the primary advantage of NoSQL over relational databases?
- c) What is data distribution in NoSQL databases?
- d) What is the purpose of semantic elements in HTML?
- e) Does Neo4j support ACID transactions.
- f) What is a key-value database?

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

- a) i) Differentiate between a collection and a document in MongoDB. [2]  
ii) How does the <progress> element work in HTML? Explain with an example, including relevant attributes. [4]
- b) Explain the different types of CSS borders and how the border-radius property is used to create rounded corners. Provide examples. [4]

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

- a) i) Explain how MongoDB's design supports scalability and high availability. [2]  
ii) What are 2D transforms in CSS? Explain rotate(), scale(), and translate() with examples. [4]
- b) What is Bootstrap, and why is it widely used in web development? Explain its advantages. [4]

**P.T.O.**

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

- a) i) How does the <header> element contribute to web page structure? [2]  
ii) Explain the display flexbox utility in Bootstrap. How does it improve layout flexibility? Provide an example. [4]
- b) Discuss the use of Bootstrap tables, What are the different table classes available? Provide an example. [4]

**Q5) Attempt any TWO of following questions. [10]**

- a) Explain the role of the transition-property in CSS transitions. How does it define the animated properties? Provide an example. [5]
- b) Explain The Document Data Model in MongoDB. How does it differ from relational tables? [5]
- c) Write an HTML5 program for students registration for college admission and also apply CSS3. [5]



Total No. of Questions : 5]

SEAT No. :

**PD3940**

[Total No. of Pages : 1

**[6486]-105**

**First Year M.Sc. (Computer Science)  
CS-512-MJ: CLOUD COMPUTING  
(2023 Credit 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) Q.2 to Q.5 carry equal marks.

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

- a) Define cloud computing?
- b) What is PaaS?
- c) What is AMI?
- d) What is Multitenancy?
- e) List out different Amazon cloud storage services?
- f) List benefits of cloud computing?

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

- a) i) What is docker in containerization. [2]  
ii) Compare services PaaS, SaaS, IaaS? [4]
- b) Explain security issues in cloud computing. [4]

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

- a) i) What is multi factor Authentication? [2]  
ii) What is Load balancing? Explain any one type in detail? [4]
- b) Explain the steps for migrating application to cloud. [4]

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

- a) i) Write any 4 advantages of cloud computing. [2]  
ii) What are benefits & challenges of cloud security monitoring? [4]
- b) Write a short note on Amazon S<sub>3</sub> cloud services? [4]

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

- a) Write any 5 cloud computing applications? [5]
- b) What is Hypervisor & Explain its types? [5]
- c) Write a short note on IAM in cloud? [5]



Total No. of Questions : 6]

SEAT No. :

**PD3662**

[Total No. of Pages : 2

**[6486]-106**

**First Year 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) Write any two characteristics of C#.
- b) Is overriding of a function possible in the same class in C#?
- c) Define: Dataset?
- d) What is CLR?
- e) What will be the output of the following C# code?using System;  
class Program {  
static void Main(string[] args) { Console.WriteLine(true && false);  
}  
}
- f) What is namespace?
- g) What is MDI?

**Q2)** Attempt any three of the following.

**[6]**

- a) Explain boxing and unboxing with example.
- b) List the properties of checkBox and explain any one with example.
- c) What are 'Anchor' and 'Dock' properties?
- d) Write a string data type with example in C#.

**P.T.O.**

**Q3) Attempt any two of the following. [6]**

- a) Explain Features of .Net.
- b) Write a program of creating file by using FileStream class.
- c) Write a string data type with example in C#.

**Q4) Attempt any two of the following. [6]**

- a) What is assembly? Explain types of assembly.
- b) Define implicit conversion with example.
- c) Explain flow control statements in C# with example.

**Q5) Attempt the following. [6]**

- a) Solve any one. [4]
  - i) Explain classes in C# with program example.
  - ii) How connected data architecture is implemented in ADO.NET. Explain with sample C# code.
- b) Explain array in detail with example. [2]

**Q6) Attempt any one of the following. [5]**

- a) Write a program that determines selection of Radio Button.
- b) Write a C# program to list files in a directory.



Total No. of Questions : 6]

SEAT No. :

[Total No. of Pages : 2

**PD3663**

**[6486]-107**

**First Year M.Sc.**

**COMPUTER SCIENCE**

**CS-531-RM: Research Methodology  
(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 side indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

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

**[12]**

- a) Define Research.
- b) State any two advantages of sampling.
- c) List the criteria of good research.
- d) Define the term Null-hypothesis.
- e) List any two plagiarism detection tools.
- f) What is exploratory research design?
- g) State conflict-of-interest.

**Q2) Answer any four of the following.**

**[12]**

- a) List different methods of data collection. Explain observation method in detail.
- b) Write a note on measure of central tendency.
- c) Define research problem and describe the necessity of formulating research problem.
- d) Describe the precautions of writing a research report.
- e) Write a short note on formulative research.

**Q3) Answer any three of the following.**

**[12]**

- a) Explain research process with suitable diagram.
- b) Describe in detail primary and secondary literature resources.
- c) Explain features of good research design.
- d) Write a note on predatory journals and publication.

**P.T.O.**

**Q4)** Answer any three of the following. **[12]**

- a) Write a short note on non-probability sampling.
- b) What is sampling? Write the aims of sampling.
- c) Define publication misconduct. Explain problems that leads researcher to unethical behaviour.
- d) Differentiate between research methods and research methodology.

**Q5)** Attempt the following:

- a) Solve any two of the following. **[10]**
  - i) Explain open access initiatives in detail.
  - ii) Write a short note on experimental research design.
  - iii) Write the different steps in writing a research report.
- b) What is literature review? **[2]**

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

- a) Descriptive Research.
- b) Importance of ethics in publication.
- c) Significance of report writing.



Total No. of Questions : 6]

SEAT No. :

**PD3664**

[Total No. of Pages : 3

**[6486]-201**

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

**CS-551-MJ : DESIGN AND ANALYSIS OF ALGORITHMS**

**(2023 Credit 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.*
- 4) *Assume suitable data, if necessary.*

**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]**

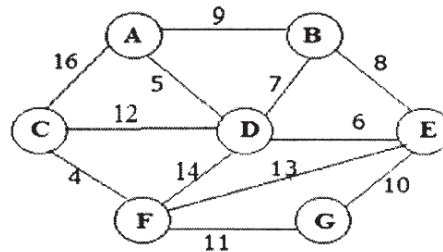
- a) Arrange the following functions in their ascending order of their growth rate :  
 $e^n, \log_e n^n, 3^n, \log_e 3^n, 25n + 4$
- b) Sort the following numbers using Merge Sort.  
25, 18, 34, 13, 23, 4, 7, 25
- c) Find Optimal Solution using Greedy Method for the following fractional knapsack instance.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

**P.T.O.**

**Q3)** Answer 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.  
 $X = \langle A, C, D, A, B, C \rangle$   
 $Y = \langle C, B, C, D, C \rangle$

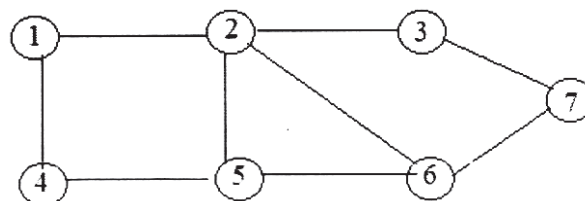
**Q4)** Attempt any two of the following.

**[2×6=12]**

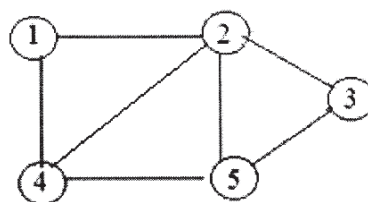
- Define Travelling Salesperson Problem. Solve the following instance of TSP using Dynamic Programming Method.

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

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



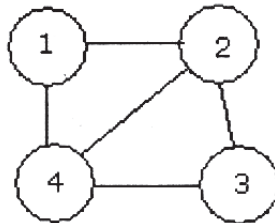
- What is m-colouring problem? Find all possible solutions when the following graph is coloured with exactly 3 colours.



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

**[2×6=12]**

- a) What is the best way to multiply a chain of matrices  $A_1, A_2, A_3, A_4$  with dimensions  $10 \times 8, 8 \times 5, 5 \times 2, 2 \times 5$  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 problem for the same.



Total No. of Questions : 6]

SEAT No. :

**PD3665**

[Total No. of Pages : 2

**[6486]-202**

**M.Sc.-I**

**COMPUTER SCIENCE**

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

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *All the 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.**

**[12]**

- a) List the different mobile operating systems.
- b) How can you access phone call functionality in Android?
- c) Define the purpose of Android Alarms.
- d) What is the use of the Alert Dialog in Android?
- e) Write any two methods used to access Location-based services in android.
- f) What is the role of phone Gap Accelerometer?
- g) Write any two applications of Android.

**Q2) Answer any four of the following.**

**[12]**

- a) Write short note on Manifest Files.
- b) Write any two features of Android operating systems.
- c) Write the properties of Spinner control.
- d) Name any two Android UI controls and their purposes.
- e) Describe concept of Phone Gap Plugins.

**P.T.O.**

**Q3) Answer any three of the following. [12]**

- a) Describe any four factors in developing mobile apps.
- b) Discuss multithreading in Android. How does AsyncTask help in background processing?
- c) What are services? Explain service life cycle with diagram.
- d) Write short note on Android Gestures.

**Q4) Answer any three of the following. [12]**

- a) Explain the concept of Event Handling in Android.
- b) Explain the concept of Content providers. How are they created and used in Android apps?
- c) Describe Phone Gap Applications.
- d) Compare native, web, and hybrid applications with their advantages, disadvantages.

**Q5) Answer the following. [10]**

- a) Solve any two of the following.
  - i) Explain Activity life cycle with diagram and example.
  - ii) Discuss different types of layouts in Android with examples. How do they differ in behavior?
  - iii) Explain the types of menus in Android and how to implement them using XML and Java.
- b) Differentiate between Implicit and Explicit Intents. [2]

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

- a) Android Architecture with diagram.
- b) Android styles and themes.
- c) Rating Bar Control.



Total No. of Questions : 5]

SEAT No. :

**PD3666**

[Total No. of Pages : 2

**[6486]-203**

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

**CS 553 MJ : SOFTWARE PROJECT MANAGEMENT**

**(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 Question 5 carry equal marks.*

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

**[5×1=5]**

- a) How to calculate CPI and SPI.
- b) Write any two types of Power?
- c) What are contents of Risk Register?
- d) What is Project charter?
- e) How to calculate communication channels? Explain with an example.
- f) What is Resource Loading?

**Q2)** Attempt the following.

- a) What is role of Change control board? Explain in brief. **[4]**
- b) Explain organizational structure in project Management. **[4]**
- c) What are type of risks? Write example of market risk. **[2]**

**Q3)** Attempt the following.

- a) What is Work Breakdown Structure? Explain with an example. **[4]**
- b) Explain Maslow's theory of need of hierarchy. **[4]**
- c) Differentiate between AOA and PDM. **[2]**

**P.T.O.**

**Q4)** Attempt the following.

- a) What are tools for activity sequencing? Explain each one in brief. [4]
- b) What are the common elements of Project Management Plan? [4]
- c) Define fault and failure in software Metrics. [2]

**Q5)** Attempt the following.

- a) What is CMM? Explain five levels of CMM Model. [5]
- b) What are the main processes included in project quality management. [5]



Total No. of Questions : 5]

SEAT No. :

**PD3667**

[Total No. of Pages : 2

**[6486]-204**

**First Year 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 AngularJS?
- b) What is the purpose of the spread syntax in JavaScript?
- c) List two advantages of using Typescript over plain JavaScript.
- d) Name some of the attributes of package.json.
- e) List types of streams in Node JS.
- f) Why do we use ExpressJS?

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

- a) i) Discuss different technologies that make up MEAN stack. [2]  
ii) What are arrow functions in ES6, and how do they differ from regular functions. [4]
- b) What are services in AngularJS? Explain any one service with example.[4]

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

- a) i) Demonstrate the Destructuring assignment for an object and an array. [2]  
ii) Create a Simple Web server using Node js. [4]
- b) What is Core module? Explain with example. [4]

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

- a) i) What is type narrowing, and how does it work in TypeScript? [2]  
ii) Explain Streams in Node JS. Explain any two types of streams.[4]
- b) Explain routing with example in Express JS. [4]

**P.T.O.**

- Q5)** Attempt any two of the following: **[10]**
- a) Explain the concept of the event loop in Node.js. **[5]**
  - b) Write an AngularJS display 10 student's details in table format using ng-repeat directive. **[5]**
  - c) Explain middleware in ExpressJS with example. **[5]**



Total No. of Questions : 6]

SEAT No. :

**PD3668**

[Total No. of Pages : 2

**[6486]-205**

**First Year 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 question are compulsory.*
- 2) *Questions 2 to 5 carry equal marks.*
- 3) *Figures to the right indicates full marks.*

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

**[5]**

- a) What is a Web Service?
- b) What is the main purpose of WSDL in web services?
- c) Write any two advantages of Web Services.
- d) List any two advantages of RESTful web service.
- e) What is stored in a UDDI registry?
- f) What is the purpose of service discovery?

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

**[2×3=6]**

- a) Describe the structure of a SOAP message with an example.
- b) Differentiate between Enquiry API and Publishing API in UDDI.
- c) List and Explain any three limitations of WSDL.

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

**[2×3=6]**

- a) How is error handling performed in SOAP?
- b) Describe the structure and function of a UDDI registry.
- c) Explain any Five key elements of Restful Web Services.

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

**[1×6=6]**

- a) Write a web method in Java that accepts a contact number, validates it (10 digits, numeric, starts with 7-9), and returns "Valid Contact Number" or "Invalid Contact Number" accordingly.
- b) How would you create a simple RESTful web service in Java using JAX-RS (Jersey framework) that responds with a "Hello, World!" message when accessed via a GET request at the endpoint /hello?

**P.T.O.**

**Q5) Attempt the following:** [6]

- a) Briefly explain how SOAP web services are developed using Java. [2]
- b) Create a web Service method to find factorial of input number. [4]

**Q6) Attempt the following:** [6]

- a) List any four Java tools or frameworks used to build RESTful web services. [2]
- b) Describe the process of describing and discovering RESTful services.[4]



Total No. of Questions : 5]

SEAT No. :

**PD3669**

[Total No. of Pages : 2

**[6486]-206**

**First Year 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) *Neat diagrams must be drawn wherever necessary.*

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

**[8]**

- a) What is the purpose of the ASP.NET framework?
- b) Define a validation control.
- c) What is CTS?
- d) Define Master Page in ASP.NET.
- e) What is the purpose of the Web.config file?
- f) What is error handling in ASP.NET?
- g) Define website deployment.
- h) Define Grid View Control
- i) What is Application State?
- J) What is the purpose of a button control in ASP.NET?

**Q2)** Attempt any four.

**[8]**

- a) Explain ASP.NET error logging.
- b) Explain the difference between ViewState and SessionState.
- c) What are the key features of ASP.NET MVC?
- d) What is a Dataset
- e) Describe the working of a RadioButton List control with an example.

**Q3)** Attempt any four.

**[8]**

- a) List different types of validation controls in ASP.NET.
- b) Write a short note on the Master Page.
- c) What is caching.
- d) How does the Common Language Runtime (CLR) work in ASP.NET?
- e) Explain the Connection and Command Object.

**P.T.O.**

**Q4)** Attempt any two.

**[8]**

- a) Explain ASP.NET Architecture
- b) Compare Client-side and Server-side validation in ASP.NET.
- c) Explain ADO.NET working

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

**[3]**

- a) Explain the difference between HTML controls and Web Server controls in ASP.NET
- b) What is Page Level Tracing in ASP.NET?



Total No. of Questions : 6]

SEAT No. :

**PD3670**

[Total No. of Pages : 2

**[6486]-301**

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

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

**PATTERN**

**(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.*

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

**[6×2=12]**

- a) State the role of RUP in the real world.
- b) Define Software architecture.
- c) Define construction phase with example.
- d) Define pattern and design pattern.
- e) When we use facade design pattern?
- f) List any 4 GRASP principles.
- g) What is the spring framework?

**Q2)** Attempt any four of the following.

**[4×3=12]**

- a) Why software architecture is important?
- b) What is abstraction in software architecture?
- c) How pattern interact in selected framework? Explain inbrief.
- d) List participants and structure of observer design pattern.
- e) Explain Low coupling GRASP.

**P.T.O.**

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

**[3×4=12]**

- a) Write a short note on blackboard model.
- b) Give different types of behavioral patterns describe any two in detail.
- c) Explain spring framework Architecture with suitable diagram.
- d) Explain role of framework in software architecture and design pattern.

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

**[3×4=12]**

- a) Explain process unified process/Rational unified process.
- b) Describe architecture structures and views.
- c) What is intent of state pattern? Explain with java example.
- d) Explain adapter design pattern with example.

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

**[3×4=12]**

- a) Explain repositories with example.
- b) Describe intent and applicability of command design pattern.
- c) Describe
  - i) Controller
  - ii) Polymorphism
  - iii) Pure Fabrication
  - iv) Creator
- d) Explain Heterogeneous Architecture

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

**[2×5=10]**

- a) Explain open and closed layered architecture.
- b) Write a short note on High Cohesion and Indirection along with examples.
- c) Write a note on creation design pattern with java example.



Total No. of Questions : 6]

SEAT No. :

[Total No. of Pages : 2

**PD3671**

**[6486]-302**

**S.Y. 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 diagrams must be drawn wherever necessary.*

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

**[12]**

- a) What is FL Score?
- b) Define RNN?
- c) What is underfitting?
- d) List data cleaning steps.
- e) What is learning? List it's types.
- f) Define agglomerative clustering?
- g) Explain the term exploitation?

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

**[12]**

- a) What is activation function? Explain any two.
- b) Explain types of data.
- c) Explain Principle Component Analysis (PCA)
- d) What is bagging?
- e) Differentiate between deep learning and machine learning.

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

**[12]**

- a) Explain convolution neural network in detail.
- b) Evaluation methods for classification algorithms explain in detail.
- c) Write note on Q learning.
- d) Discuss advantages and disadvantages of unsupervised machine learning.

**P.T.O.**

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

- a) Explain Random Forest Algorithm in detail.
- b) What is Baye's Theorem? Discuss how it is useful in a machine learning context.
- c) Find frequent item set using Apriori Algorithm with min\_sup= 3.

| Transaction ID | Item Set   |
|----------------|------------|
| T <sub>1</sub> | A, B, C, D |
| T <sub>2</sub> | A, B, C    |
| T <sub>3</sub> | A, B, D    |
| T <sub>4</sub> | C, D, E    |
| T <sub>5</sub> | A, D, E    |

- d) What is Optimizer? Explain different Optimizers.

**Q5)** Attempt the following :

- a) Solve any two of the following : **[10]**
  - i) Write a short note on support vector Machine Algorithm.
  - ii) Differentiate agglomerative and divisive clustering.
  - iii) Explain important elements of reinforcement learning.
- b) Write an applications of association rule. **[2]**

**Q6)** Attempt the following. (any two) **[10]**

- a) Write short note on Backpropogation.
- b) Draw dendrogram for the followig dataset using single linkage.

| Customer | Age |
|----------|-----|
| A        | 7   |
| B        | 10  |
| C        | 15  |
| D        | 22  |
| E        | 28  |

- c) How is KNN different from K-means clustering?



Total No. of Questions : 5]

SEAT No. :

**PD3672**

[Total No. of Pages : 2

**[6486]-303**

**Second Year 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) Question No.2 to 5 carry equal marks.

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

**[5]**

- a) Define data dissemination.
- b) What language is a typical arduino code based on?
- c) What is embedded system?
- d) List the components of IoT.
- e) List four categories of MAC protocol.
- f) What are the applications of IoT?

**Q2)** Attempt the following.

**[10]**

- a) State the features of Raspberry Pi and characteristics of Internet of Things. **[4]**
- b) Explain any two communication technologies in detail. **[4]**
- c) Explain IoT Architecture with the help of block diagram. **[2]**

**P.T.O.**

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

- a) Explain wireless sensor networks and participatory sensing technology.[4]
- b) Explain physical and logical design of IoT. [4]
- c) Write difference between Saas and Paas. [2]

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

- a) What are benefits and challenges of cloud computing platforms and services. [4]
- b) Explain how Authenticating and Encrypting Arduino data. [4]
- c) What is MQTT and how does it work in IoT. [2]

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

- a) Write a program using Arduino to measure distance between two object using, Ultrasonic sensor and also draw the interfacing diagram. [5]
- b) How IoT can be used in home automation system. [5]



Total No. of Questions : 5]

SEAT No. :

**PD3673**

[Total No. of Pages : 2

**[6486]-304**

**Second Year 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) *Q.1 is compulsory.*
- 2) *Solve any three questions from 2 to 5.*
- 3) *Q2 to Q5 carry equal marks.*

**Q1) Solve Any Five of the following:** **[5]**

- a) What is an Observable in RxJS?
- b) What are utility types in TypeScript?
- c) Which middleware is used in Express.js to parse JSON request bodies?
- d) What does the populate() method do in Mongoose?
- e) List the tool for unit testing in web applications.
- f) Define lazy loading in Angular.

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

- a)
  - i) What is Advanced Routing? Explain its types. **[2]**
  - ii) Demonstrate generics in TypeScript with suitable example. **[4]**
- b) Explain Data encryption at rest and in transit in the context of mongoDB. **[4]**

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

- a)
  - i) Explain the difference between promises and async/await in Node.js? **[2]**
  - ii) Explain authentication and authorization in a database context of mongoDB. **[4]**
- b) Explain State management with NgRx **[4]**

**P.T.O.**

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

- a) i) Explain HTTPS. [2]  
ii) Explain schema validation and middleware in Mongoose with example. [4]
- b) What is middleware in Express.js, and how is it used for request processing and error handling? [4]

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

- a) Explain the concept of custom life-cycle hooks in Angular. [5]
- b) Explain the role of the event loop and non-blocking I/O in Node.js with examples. [5]
- c) Describe how the OnPush change detection strategy works and how it optimizes performance. [5]



Total No. of Questions : 5]

SEAT No. :

**PD3674**

[Total No. of Pages : 2

**[6486]-305**

**S.Y. 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 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) State any two goals of DevOps
- b) What is Git?
- c) What is an attribute in Chef?
- d) What is the docker container?
- e) What is GroupId?
- f) What is docker hub?
- g) What is YUM?

**Q2)** Attempt the following.

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

- a) Explain Docker Architecture with diagram.
- b) What is ChatOps? How does ChatOps fit into the DevOps process?
- c) What is the role of Chef Server in the configuration process?

**Q3)** Attempt the following.

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

- a) Explain various phases of DevOps Life Cycle?
- b) State the various steps how git is used in Command Line.
- c) What is Configuration Management?

**P.T.O.**

**Q4)** Attempt the following.

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

- a) What are cookbook and recipes in Chef? Explain in detail.
- b) Write differentiation between Centralized Version Control System and Distributed Version Control System.
- c) How git pull works?

**Q5)** Attempt the following.

**[5+5=10]**

- a) Explain in detail Continuous Integration and Continuous Delivery (CI/CD).
- b) Explain the phases of Maven Build Life Cycle.



[6486]-306

**Second Year M.Sc. (Computer Science)**  
**CS - 614 - MJ : SOFT COMPUTING**  
**(Rev. 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 indicate full marks.
- 3) Draw the diagrams wherever necessary.

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

- a) Define neural network?
- b) What is a membership function in fuzzy sets?
- c) Write the advantages of neural networks.
- d) State the applications of fuzzy logic.
- e) What is mutation in genetic algorithms?
- f) Define fuzzification.

**Q2)** Attempt any two of the following: **[10]**

- a) Compare and contrast BNN and ANN. **[5]**
- b) Explain feedforward and feedback neural networks. **[5]**
- c) Let  $x = \{x_1, x_2\}$ ,  $y = \{y_1, y_2\}$ , and  $z = \{z_1, z_2, z_3\}$ .

Consider the following fuzzy relations: **[5]**

$$\tilde{R} = \begin{matrix} & \begin{matrix} y_1 & y_2 \end{matrix} \\ \begin{matrix} x_1 \\ x_2 \end{matrix} & \begin{bmatrix} 0.7 & 0.5 \\ 0.8 & 0.4 \end{bmatrix} \end{matrix} \text{ and } \tilde{S} = \begin{matrix} & \begin{matrix} z_1 & z_2 & z_3 \end{matrix} \\ \begin{matrix} y_1 \\ y_2 \end{matrix} & \begin{bmatrix} 0.9 & 0.6 & 0.2 \\ 0.1 & 0.7 & 0.5 \end{bmatrix} \end{matrix}$$

Find max-min composition and max product composition

P.T.O.

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

- a) What are Self-Organizing Maps (SOM)? Describe the algorithm for SOM. [5]
- b) Explain supervised and unsupervised learning. [5]
- c) Consider the two fuzzy sets A & B, the following theoretical operations for A and B where ... [5]

$$A = \{0.2, 0.3, 0.4, 0.5\} \text{ and } B = \{0.1, 0.2, 0.2, 1\}$$

Find

- i)  $A \cup B$
- ii)  $A \cap B$
- iii)  $A^c$
- iv)  $A - B$
- v)  $B - A$

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

- a) Write a note on Convolution Neural Network (CNN). [5]
- b) Explain the applications of Genetic Algorithm. [5]
- c) Explain the Gradient Descent Algorithm in Neural Network. [5]

