

(b)	Discuss the various issues of the code generator with examples	
(c)	A company is developing a new compiler for a high-performance computing language. Discuss the different approaches to front-end optimization in compilers. How would you prioritize optimizations at the lexical, syntactic, and semantic analysis stages to improve the performance of generated code?	

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END SEMESTER EXAMINATION 2024

Name of the Course: B. Tech (CSE)

Semester: VI

Name of the Paper: Compiler Design

Paper Code: TCS 601

Time: 3 Hours

Maximum Marks: 100

Note:-

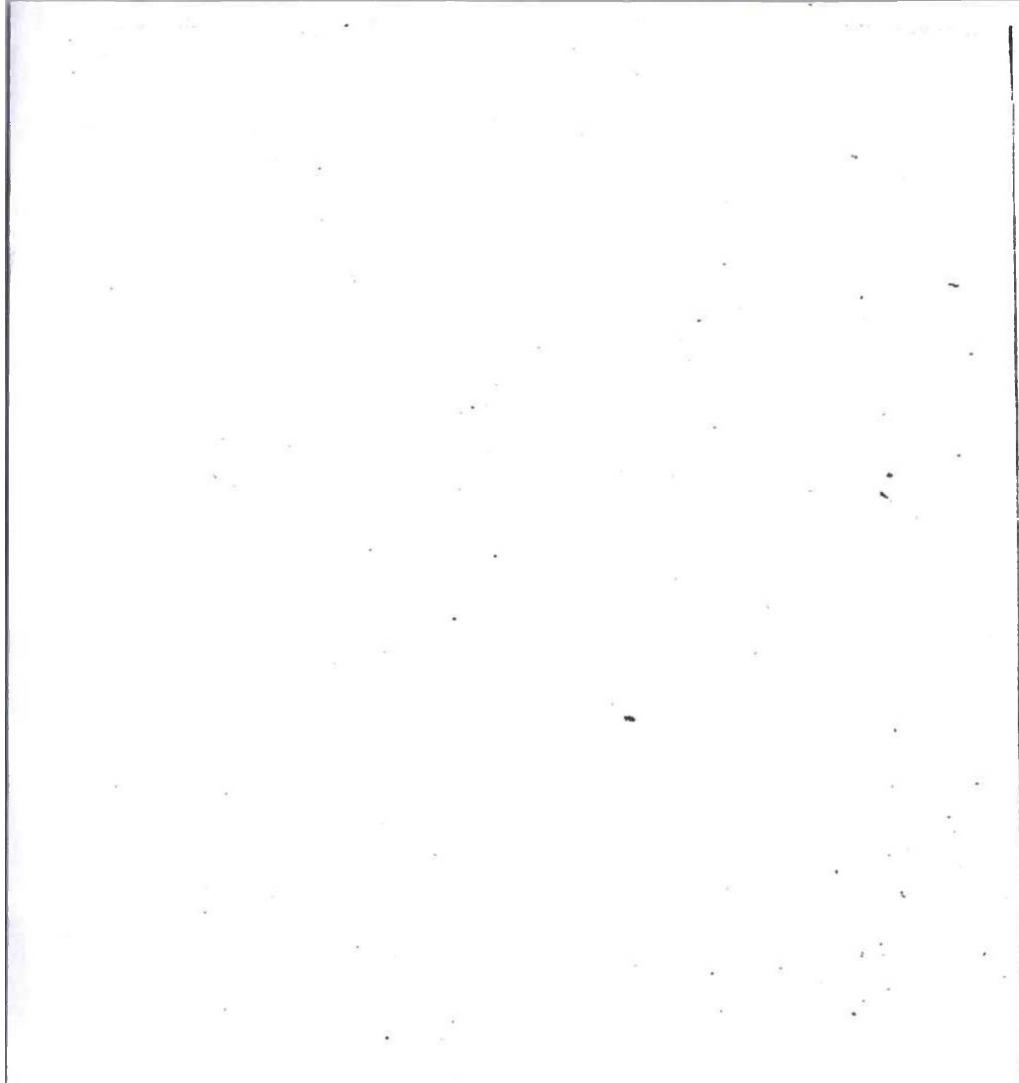
- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a, b & c in each main question
- (iii) Total marks in each main question is twenty.
- (iv) Each question carries 10 marks

Q1	(20 marks)	CO1
(a)	Contrast the responsibilities of the front-end and back-end of a compiler. Provide examples of tasks handled by each, such as parsing and semantic analysis in the front-end, and optimization and code generation in the back-end. How would you design a modular compiler to allow for easy swapping of front-end and back-end components?	
(b)	A team is developing a lexical analyzer for a new programming language using the LEX tool. Describe the role of a lexical analyzer in a compiler. How does input buffering play a crucial role in efficient token recognition? Provide a step-by-step explanation of how LEX specifications are used to recognize tokens.	
(c)		

	<p>iii. Construct LL(1) parsing table for the Grammar G1</p> <p>iv. Parse the input: if id if id else id using the LL(1) parsing table and the grammar G1</p>	
(c)	<p>Check whether the given grammar is LALR or not</p> <p>$S \rightarrow ABC$</p> <p>$A \rightarrow aA \epsilon$</p> <p>$B \rightarrow bB \epsilon$</p> <p>$C \rightarrow cC d$</p>	
Q3	(20 marks)	
(a)	<p>Construct the SDD for Binary to Decimal and Octal to Decimal conversion, and illustrate with examples.</p>	CO3
(b)	<p>You are part of a team designing a new programming language called "LangX." The language is aimed at providing efficient memory usage and flexible parameter handling. As a lead developer, you need to make critical decisions regarding storage allocation strategies and parameter-passing mechanisms for LangX. Consider the design of "LangX" and discuss the following:</p> <ul style="list-style-type: none"> i. Describe how stack allocation works in LangX, including the management of stack frames during function calls and returns. ii. Discuss the advantages and disadvantages of stack and heap allocation in the context of LangX's design goals and runtime environment. 	
(c)	<p>Compare the following:</p> <ul style="list-style-type: none"> i. S-Attributed Definitions vs L-Attributed Definitions ii. Top-down parsing vs Bottom-up parsing 	

max = A[i][j];

(c)	Write a short note on: i. Peephole optimization with examples ii. Use of Backpatching in three-address code generation	
Q5	(20 marks)	
(a)	<p>List the rules to construct basic blocks. Construct basic blocks and flow graph for the given three address code</p> <pre>total = 0 k = 0 L1: if k >= 25 goto L2 temp1 = k > 10 temp2 = k % 2 temp3 = k % 5 temp4 = temp2 == 0 temp5 = temp3 == 0 temp6 = temp4 temp5 temp7 = temp1 && temp6 if temp7 goto L3 goto L4 L3: temp8 = total + k * 5 total = temp8 goto L5 L4: temp9 = total - (k + 5) total = temp9 L5: k = k + 1 goto L1 L2:</pre>	CO5 & CO6



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END SEMESTER EXAMINATION 2024

Name of the Course: B.Tech
 Name of the Paper -Computer Networks -I

Semester: VI
 Paper Code: TCS604

Time: 3 Hours

Maximum Marks: 100

Note:-

- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a, b & c in each main question
- (iii) Total marks in each main question are twenty.
- (iv) Each question carries 10 marks

Q1	(20marks)	
(a)	How do cookies contribute to enhancing the user experience on websites by preserving their states, and what challenges accompany their use?	
(b)	Create a finite state machine (FSM) illustrating the reliable data transfer protocol (rdt2.1), and explain how it manages garbled acknowledgments and negative acknowledgments when operating over an unreliable channel.	
(c)	Host A is sending data to host B over a full duplex link. A and B are using the sliding window protocol for flow control. In the context of the Go-Back-N error control strategy ($N=4$), considering that every 6th packet transmitted is lost, and the requirement is to send 10 packets, how many transmissions will be necessary to ensure successful delivery from A to B (assuming that no ACKs from B ever get lost) ?	CO1/(c) 6
Q2	(20 marks)	
(a)	What are the main fields found in the TCP header, and what is the purpose of each field? Explain the significance of the Sequence Number and Acknowledgment Number fields in the TCP header.	
(b)	Suppose that TCP's current estimated values for the round trip time (Estimated RTT) and deviation in the RTT (Dev RTT) are 360 msec and 16 msec, respectively. Suppose that the next two measured values of the RTT are 390 msec and 260 msec respectively. Compute TCP's new value of Dev RTT, Estimated RTT, and the TCP timeout value after each of these two measured RTT values is obtained. Use the values of $\alpha = 0.125$, and $\beta = 0.25$.	CO2
(c)	Consider the figure given below. Assuming TCP Reno is the protocol being used, determine the sequence numbers for the following scenario:	

- triple duplicate ACK or by a timeout?
- (iv) After the 22nd transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?
- (v) What is the initial value of ssthresh at the first transmission round?
- (vi) What is the value of ssthresh at the 18th transmission round?
- (vii) What is the value of ssthresh at the 24th transmission round?
- (viii) During what transmission round is the 70th segment sent?
- (ix) Assuming a packet loss is detected after the 26th round by the receipt of a triple duplicate ACK, what will be the values of the congestion window size and of ssthresh?
- (x) Suppose TCP Tahoe is used (instead of TCP Reno), and assume that triple duplicate ACKs are received at the 16th round. What are the ssthresh and the congestion window size at the 19th round?

Q3	(20 marks)	C03
(a)	Illustrate the structure and functionality of the IPv4 header, emphasizing the significance of each field in facilitating packet forwarding and routing processes. Additionally, explore the limitations inherent in IPv4.	
(b)	<p>Suppose we have a datagram with the following characteristics:</p> <ul style="list-style-type: none"> • Total length of the original datagram: 3000 bytes • MTU (Maximum Transmission Unit) of the network: 1000 bytes <p>Calculate the Number of fragments required, Fragment size, More Fragment (MF) Flag and Fragment Offset, Total length value of each fragment.</p>	
(c)	Describe the DHCP message exchange process between a client and a server, including the role of DHCPDISCOVER, DHCPOFFER, DHCPREQUEST, and DHCPACK messages.	
Q4	(20 marks)	CO4
(a)	What is Network Address Translation (NAT), and what problem does it solve in networking?	
(b)	<p>An organization is assigned the block of addresses starting with 203.0.113.0/24. The organization wants to distribute these blocks to different departments as follows:</p> <ol style="list-style-type: none"> The first department has 50 employees, each needing 8 addresses. The second department has 20 employees, each needing 4 addresses. 	

203.100.0.0/16. The administrator wants to create 1024 subnets.

- (i) Find the subnet mask required.
- (ii) Find the number of addresses in each subnet.
- (iii) Find the first and last allocatable addresses in the 1st subnet.
- (iv) Find the first and last allocatable addresses in the 27th subnet.

- (c) Discuss the difference between a network address, broadcast address, and host addresses within a subnet.

Note for the question paper setters:

- Question paper should cover all the COs of the course.

END Term Examination – 2024

Name of the Course: B.Tech CSE

Semester: 6th

Name of the Paper: Image Processing and Computer Vision

Paper Code: TCS 691

Time: 3 Hours

Maximum Marks: 100

Note:-

- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a, b & c in each main question
- (iii) Total marks in each main question are twenty.

Q1

(20 marks)

- a) How one can differentiate between image processing and image analysis and computer vision? Also comment on “Captured image is never best resolution and best quality image”.
- b) If two images have the same content but one has added random noise (variations in pixel intensity), could their histograms still be identical? Discuss the possibility and provide justification with a suitable example.
- c) Describe real-world scenarios where arithmetic and logic operations are employed in digital image processing. Also show the processing of arithmetic and logic operation by considering 5x5 image matrix.

CO1,
CO2**Q2**

(20 marks)

- a) How image averaging is used to enhance the image? Design an algorithm/ Pseudo code for obtaining the average of four images of same size in transform domain.
- b) How low pass and high pass filters work in image processing? Which method is effectively works for image smoothness in spatial domain? Explain and justify your answer.
- c) How Hough transforms in image processing is utilized to enhance the images. Discuss with a suitable example.

CO2,
CO3**Q3**

(20 marks)

- a) How feature extraction helpful to identify the human activity using computer vision approach? Design and discuss a framework using deep learning approach to develop automatic activity recognition for any real time application.
- b) Discuss the process of image-fusion using deep learning in medical images with a suitable framework.
- c) Why Laplacian method is utilized to enhance the image quality? Provide an explanation and demonstrate the potential differences by considering 7x7 image Matrix.

CO3,
CO4**Q4**

(20 marks)

- a) What are the effects of applying median filter to the noisy image? Consider a 5x5 image matrix and perform median filtering.

- b) Image segmentation separates objects from the background. How do single thresholding and double thresholding differ in their approach? Discuss the strengths and weaknesses of each using an example image.

CO4,
CO5

- c) Perform the Huffman code for below image Matrix to obtain the average code length.

1	3	2	0	1
3	1	1	0	1
2	0	0	1	0
1	0	0	1	0
1	1	0	0	0

Q5

(20 marks)

- a) Consider a 7x7 grayscale image with pixel intensities ranging from 0 to 255, apply k-means clustering with k = 2. Initialize the cluster centers as [100, 200], and provide the final cluster centroids after convergence.

- b) What is the primary purpose of using convolutional layers in CNNs for computer vision tasks? How do pooling layers play an important role in CNN architectures for computer vision? Discuss the different pooling techniques (e.g., max pooling, average pooling) and their impact on the resulting feature maps. Provide an explanation and demonstrate the potential differences by considering 7x7 image Matrix.

CO5,
CO6

- c) Consider a 6x6 binary image as given below where 1 represents a foreground object and 0 represents the background. Perform erosion with a 3x3 structuring element where all elements are 1s. What is the resulting image after erosion? How much has the foreground object shrunk in terms of the number of pixels?

0	1	0	0	1	0
1	1	0	1	1	0
0	1	0	0	1	0
1	1	0	1	1	0
0	1	0	0	1	0
1	1	0	1	1	0

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END SEMESTER EXAMINATION Jun - 2024

Name of the Course: B.Tech CSE

Semester: 6th

Name of the Paper: DevOps on Cloud

Paper Code: TCS 651

Time: 3 Hours

Maximum Marks: 100

Note:-

- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a, b & c in each main question
- (iii) Total marks in each main question are twenty.
- (iv) Each question carries 10 marks
- (v) Support your answers with typical block diagrams and architecture

Q1	(20marks)	CO 1,2
(a)	Explain the core concepts of DevOps and its significance in modern software development.	
(b)	List and describe the phases of the Software Development Life Cycle (SDLC). Additionally discuss the fundamental principles of Agile Framework?	
(c)	Compare and Contrast DevOps and Agile methodologies, highlighting their key principles and practices.	
Q2	(20 marks)	CO 1,2,3
(a)	Discuss version control and explain its importance in software development.	
(b)	Describe the basic concepts of Git and its role in version control. Outline the main stages of the Git workflow?	
(c)	Define Jenkins, and how does it contribute to Continuous Integration in software development?	
Q3	(20 marks)	CO 2,3
(a)	Discuss Continuous Deployment, and how does it streamline software delivery?	
(b)	List the primary benefits of continuous testing in software development projects?	
(c)	Discuss Selenium and its purpose in software testing.	
Q4	(20 marks)	CO 3,4,5
(a)	Compare and Contrast containers and virtual machines (VM). Highlight their key advantages and disadvantages. Support your answer with typical block diagrams.	
(b)	Discuss Docker and outline its key features. Additionally, Describe the components of the Docker ecosystem and their functionalities. Support your answer with appropriate diagram.	
(c)	How does Docker facilitate application deployment and scalability in modern IT environments?	
Q5	(20 marks)	CO 4,5,6
(a)	Discuss Kubernetes and explain its purpose in container orchestration.	
(b)	Discuss the main components of a comprehensive monitoring strategy in a DevOps environment?	
(c)	Compare and Contrast Ansible and Puppet in terms of configuration management capabilities.	



Roll No. :

END SEMESTER EXAMINATION JUNE 2024

Name of the Program: B. Tech (BioTechnology)

Semester: VI

Name of the Course: Fundamental of Statistics and AI

Course Code: TCS 421

Time: 3 hrs

Max. Marks: 100

Note:

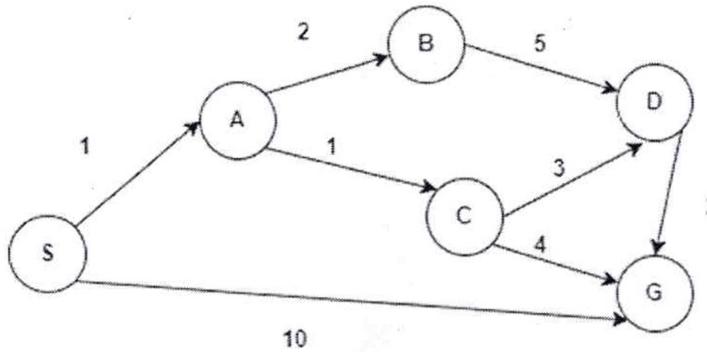
- (i) Answer **all questions** by choosing *any two sub questions*.
- (ii) Each **sub-question** carries 10 marks.

Q1 (20 marks)		
(a) Give distinct examples of Search techniques in AI that are Brute Force, Greedy and Heuristic, giving your reasons. AND Explain, what is Intelligent Agent in AI.		CO3
(b) Give any Four different ways of defining AI. With block diagram outline typical AI Engine.		CO2
(c) Find the path to reach the goal node (3) from the start node (7) by applying Depth First Search and Cheapest Path First Search, separately.		CO3
Q2 (20 marks)		
(a) Explain and Describe the Types of AI in detail, giving an example for each type.		CO4
(b) Explain the functions in PEAS description, give real-world example that explains these functions.		CO3

- (c) Apply A* for the given graph to search the goal node. Consider Start Node = S and Goal Node = G, Table below gives the heuristic w.r.t goal node.

CO3

S	A	B	C	D	G
6	7	8	4	6	0



Q3 (20 marks)

- (a) Discuss Turing Test and give two real-world applications.
 (c) Explain big data using the 5 V's AND Outline the big data architecture with Hadoop
 (b) Explain what Data Science means AND describe the role of Data Scientist

CO2
CO4
CO5

Q4 (20 marks)

- (a) Define the following with 1 example for each term: (i) Correlation, (ii) Random variable, (iii) Variance, (iv) Sample Mean
 (b) Explain and compare Probability and Statistics for role in Data Science, give one use case for each point of comparison.
 (c) Showcasing real-world example like online Product reviews for e-commerce providers like Amazon or Flipkart; justify Big data and back-end analytics. Also, explain the role of 5 V's in Big data.

CO3
CO4
CO5

Q5 (20 marks)

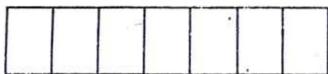
- (a) Illustrate the properties of Probability mass function, Distribution Function and Probability density Function. Give two examples for each of these statistical functions.
 (b) Given the following data points depicting weight = W and length = L for Salmon obtain linear Regression model of L in terms of W .

CO2
CO3

L	10	12	16	18	19	21	25
W	22	44	50	52	59	48	51

- (c) Consider problem solving in healthcare which pertains to determining the efficacy of drug using parameter S in clinical trial comprising of stage 1, stage 2, stage 3 and stage 4 for - men, women and children participants. Reason and depict search path to estimate the overall efficacy of clinical trial.

CO4



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Roll No. Paper Code: ~~TCS 629~~ TCS 629

End Semester Examination December 2024

Name of the Course: B.Tech. Semester: 6TH Course Code: TCS 629

Paper Name: Artificial Intelligence

Time: 3 Hours Maximum Marks: 100

Note:

- (i) Answer all the questions by choosing any Two of the sub questions.
- (ii) Each question carries 10 marks.

CO1/CO3/CO4 (2X10=20 Marks)

- Q1. a. How to define a problem as state space search? Discuss it with the help of an example. Give an explanation on the difference between strong AI and weak AI?
b. Check the validity of the following implications.
 $P \rightarrow (Q \rightarrow R)$ equivalent to $(P \rightarrow Q) \rightarrow (P \rightarrow R)$
c. Define Horn clause, goal clause, dual Horn clause, Horn formula, definite clause. ~~Q1~~

CO1/CO2/CO6 (2X10=20 Marks)

- Q2. a. Explain the filmore's case grammar with help of sentence "Ram opened the door with the key" and "The door was opened by Ram with the key."
b. Assume that you want to provide a solution for language translation. Which natural language processing techniques you want to implement. Discuss in detail.
c. Write a prolog program to generate factorials of a given number.

(2X10=20 Marks)

- Q3. a. Convert to predicate logic. CO3

1. Some boys are intelligent.
2. Either It is a weekday or it is a weekend.
3. Everyone loves himself.
4. If it is snowing then the roads are slippery.
5. Everyone loves everyone except himself.
6. It is sunny and it is not raining.

- b. What is the Turing Test in artificial Intelligence? Explain. CO5

- c. Write a note on Bayes' theorem and Bayesian Networks in Artificial intelligence. A doctor is aware that disease meningitis causes a patient to have a stiff neck, and it occurs 80% of the time. He is also aware of some more facts, which are given

as follows: CO3

1. The Known probability that a patient has meningitis disease is 1/30,000.
2. The Known probability that a patient has a stiff neck is 2%.

What is the probability that a patient has disease meningitis with a stiff neck?

(2X10=20 Marks)

Q4. a. If two fuzzy sets A and B are given with membership functions $\mu_A(x) = \{0.2, 0.4, 0.8, 0.5, 0.1\}$ $\mu_B(x) = \{0.1, 0.3, 0.6, 0.3, 0.2\}$ Then the value of μ — will be $A \cap B$, A union B , A bold Union B , A bold Intersection B ? $U = \{1, 30, 6, 3, 2, 10\}$. CO4

b. What is the idea of heuristics search in AI. Explain with suitable examples. CO5

c. Name and describe the main features of Genetic Algorithms (GA). CO4

(2X10=20 Marks)

Q5. a. Write a note on MYCIN and DART? Provide instances that are appropriate to illustrate its usefulness in various fields. CO6

b. Derive a parse tree for the sentence "Bose loves the fish", where the following rules are used: CO4

S → NP VP

NP → N

NP → DET N

VP → V NP

DET → the

V → loves

N → Bose/fish

c. Consider the problem of finding the shortest route through several cities, such that each city is visited only once and in the end return to the starting city (the Travelling Salesman problem). Suppose that in order to solve this problem we use a genetic algorithm, in which genes represent links between pairs of cities. For example, a link between London and Paris is represented by a single gene 'LP'. Let also assume that the direction in which we travel is not important, so that LP = P L. CO5

- i) How many genes will be used in a chromosome of each individual if the number of cities is 10?
- ii) How many genes will be in the alphabet of the algorithm?

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Roll No.

Paper Code: TCS 672

ODD END SEMESTER EXAMINATION DECEMBER – 2024

Name of the Course: B.Tech Semester: V1th
Name of the Paper: Deep learning with Keras & TensorFlow Paper Code: TCS-672

Time: 3 Hours

Maximum Marks: 100

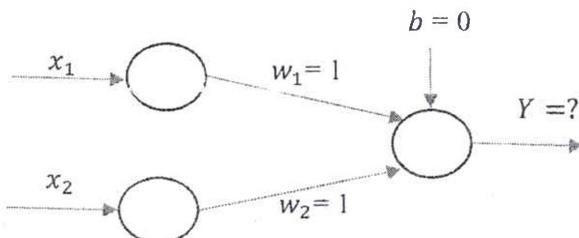
Note:

- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a, b & c in each main question.
- (iii) Total marks in each main question are twenty.
- (iv) Each question carries 10 marks.

Q 1)

(2X10=20 Marks) (CO1, CO2)

- (a) Suppose you train the following neural network classifier where activation function is sigmoid ($\sigma(x) = \frac{1}{1+e^{-x}}$) and the target variable $Y = \{0,1\}$ is a Boolean variable. Suppose after training, the parameters are $w_1 = 1$ and $w_2 = 1$ and the bias, $b = 0$.



Then classify the given points:

- i) $(x_1 = 1, x_2 = 1)$
- ii) $(x_1 = 0, x_2 = -1)$
- iii) $(x_1 = -2, x_2 = 1)$
- iv) $(x_1 = 2, x_2 = -3)$

- (b) Analyze the future trends and directions of deep learning research. What are some emerging areas of interest, and how are they shaping the future of artificial intelligence and machine learning?
- (c) Describe some common challenges associated with training deep neural networks, and how do they impact model performance and convergence?

Q 2)

(2X10=20 Marks) (CO2, CO3)

- (a) Discuss some common applications of autoencoders in real-world scenarios, particularly in the fields of computer vision and natural language processing.
- (b) What are activation functions in the neural network? Give one example of non-linear activation function and one example of linear activation function.

(c) How do Recurrent Neural Networks (RNNs) differ from traditional feedforward neural networks, and what are the key components of an RNN architecture?

Q 3) (2X10=20 Marks) (CO1, CO2)

- (a) Explain how momentum helps speed up the learning process and avoid getting stuck in tricky spots during training.
- (b) How do you design a deep neural network? Discuss the key considerations and steps involved in designing a deep neural network architecture.
- (c) What are the key architectural components of an autoencoder, and how do they contribute to the overall reconstruction process?

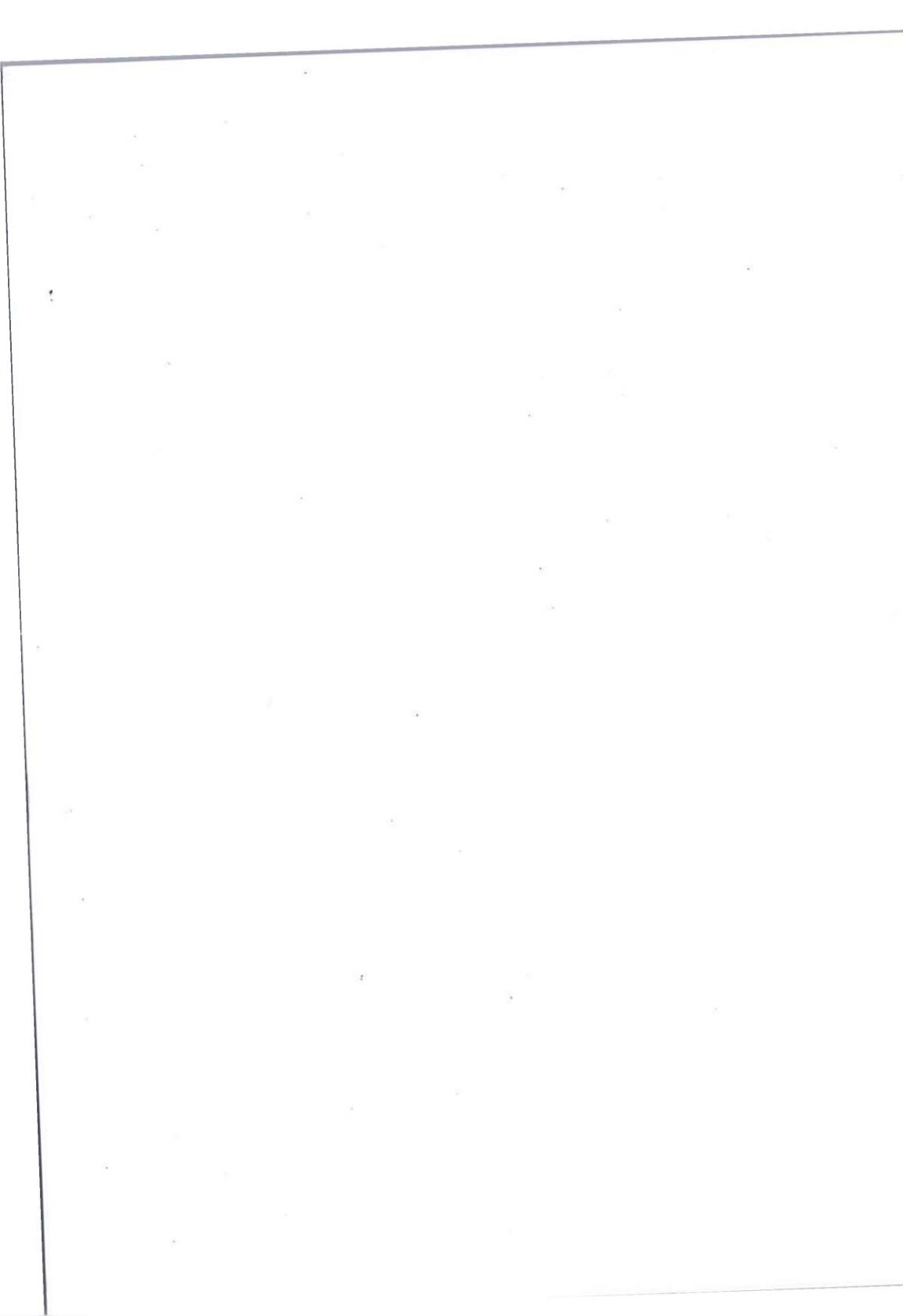
Q 4) (2X10=20 Marks) (CO2, CO5)

- (a) Discuss the differences between gradient descent, stochastic gradient descent, and mini-batch gradient descent in terms of optimization efficiency?
- (b) What are some potential drawbacks of using a fixed learning rate schedule in optimization algorithms for deep learning?
- (c) Explain the concept of transfer learning in the context of deep learning. How does transfer learning leverage pre-trained models to improve performance on new tasks?

Q 5) (2X10=20 Marks) (CO4, CO6)

- (a) Explain the forward pass of a convolutional neural network using a block diagram with the following configuration. (Write appropriate value of ?? in the following configuration.)
 1. If the input size of image is (32 X 32 X 1).
 2. Layer One: 6 filters of size (5 X 5); Stride = 1; Padding = 0
 3. Average Pooling: Filter size is (2 X 2); Stride = 2
 4. Layer Two: 16 filters of size (5 X 5 X ???); Stride = 1; Padding = 0
 5. Average Pooling: Filter size is (2 X 2); Stride = 2
 6. Layer Two: Fully connected layer (Size = ???)
 7. Layer Three: Fully connected layer (Size = 80)
 8. SoftMax Layer for 20 categories.
- (b) Discuss the ethical considerations and societal implications of deep learning technologies. How can deep learning models be biased, and what measures can be taken to mitigate bias in AI systems?
- (c) Define Artificial Neural Network (ANN). How does it mimic the human brain's functioning?

*****END*****



Roll No.: SFT

EVEN END SEMESTER EXAMINATION-2024

Name of the Course: Bachelor of Technology

Semester: VI

Name of the Paper: Big Data Analytics

Paper Code: TCS-642

Time: 3 Hours

Maximum Marks: 100

Note:

- (i) All Questions are compulsory.
- (ii) Answer any two sub-questions among a, b & c in each main question.
- (iii) Total marks in each main question are twenty.
- (iv) Each question carries ten marks

Q1		(20 marks)
a)	Define Big Data and Big Data analysis. Explain how Big Data analysis differs from traditional data analysis techniques. Describe the key characteristics of Big Data often summarized by the "Five Vs". Provide an example of how each characteristic presents itself in a real-world context.	
b)	Define what is meant by "streams" in the context of data processing. Discuss the importance of stream processing in today's data-driven environments compared to batch processing. Discuss at least two types of data stream processing techniques.	CO1
c)	Explain the significance of sampling and describe various techniques used for sampling data in a stream. Describe what is meant by filtering in stream processing. Discuss different methods of filtering streams.	
Q2		(20 marks)
a)	Define descriptive analytics and describe its role in business decision-making. Explain how descriptive analytics is used to summarize past events and data points. Provide an example of how descriptive analytics can be applied in a real-world business scenario.	CO1 and CO2

b)	What is data collection phase in big data analytics? Explain types of consumer data, with example. <u>Difference between Qualitative and Quantitative data.</u>	
c)	Define customer analytics and discuss its importance in enhancing customer experience and engagement. Describe how businesses use customer analytics to derive insights about consumer behavior, preferences, and trends. Discuss at least 5 customer analytics tool.	
Q3		(20 marks)
a)	Define SQL and list the four basic types of SQL commands, providing a brief description of what each type is used for in database management. Illustrate each type with a simple example query that demonstrates its practical use.	
b)	Define what is meant by “filtering data” in the context of data processing. Explain different methods and techniques used to filter data in database management systems. Describe the fundamental differences between operational databases and analytic databases.	CO2
c)	Describe the architecture of NoSQL databases and explain how they are better suited or specifically designed to handle not just structured but also semi-structured and unstructured data. Deliver examples of different types of NoSQL database and how each type manages these varieties of data.	
Q4		(20 marks)
a)	Compare and contrast SQL and NoSQL databases in terms of their suitability for structured, semi-structured, and unstructured data. Discuss the criteria that should be considered when choosing between SQL and NoSQL solutions for different data management needs.	CO3 and CO4
b)	Compare the ACID compliance of traditional RDBMSs with the BASE properties commonly found in NoSQL databases. Discuss the trade-offs between CAP theorem in the context of big data.	
c)	Detail the architecture of HDFS, focusing on its main components. Discuss how redundancy is handled in HDFS and the role of block replication.	

	<p>Discuss how HDFS achieves fault tolerance and high data throughput by its design and operational mechanisms.</p>	
Q5	<p style="text-align: right;">(20 marks)</p> <p>a) Identify and explain the key components of a MapReduce job, including the Mapper, Reducer, Combiner, Partitioner, and Shuffle and Sort phases. Describe the role of each component in processing data.</p> <p>b) Define Apache Hive and explain its primary use as a data warehousing solution on top of Hadoop. Discuss the role of HiveQL (Hive Query Language), how it simulates standard SQL commands.</p> <p>c) Explain what Apache Flume is and its role in the Hadoop ecosystem. Detail how Flume is used for aggregating and moving large amounts of log data to the Hadoop Distributed File System (HDFS). Discuss the architecture of Flume, including the concepts of sources, channels, and sinks.</p>	
		CO5 and CO6

Roll No.

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EVEN END SEMESTER EXAMINATION- 2024

Name of the course: B. Tech CE-SPL

Semester: VI

Name of the paper: Cyber Threat Analysis

Paper code: TCS630

Time: Three Hours

MM: 100

Note:

- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a, b & c in each main question.
- (iii) Total marks in each main question are twenty.
- (iv) Each question carries 10 marks.

Q1	(20 Marks)	CO2,
(a)	Describe the following general security requirements. Availability, integrity, and access control.	
(b)	Why do we need to go for the development of information security policy? What are the different steps required for Information security policy development?	
(c)	What are the different sources of vulnerabilities? Investigate the process of vulnerability assessment using a figure.	
Q2	(20 Marks)	CO6
(a)	Demonstrate how the following scans of the NMAP tool work through their syntax. Aggressive scan, version scan, and stealthy mode.	
(b)	Why do we need to perform the security requirement specification? What are the different steps of a security requirement specification?	
(c)	How would you compare the following intrusion detection techniques? Signature-based detection, anomaly-based detection, and specification-based detection.	
Q3	(20 Marks)	CO3
(a)	Investigate scenarios where the following security mechanisms can be deployed. Authentication exchange, traffic padding, and notarization.	

(b)	How would you compare the following types of authentications? (i). Peer entity authentication and data origin authentication. (ii). 2-factor user authentication and 3-factor user authentication.	
(c)	Demonstrate the procedure of security auditing. Why it is essential to conduct security auditing.	
Q4	(20 Marks)	CO4
(a)	Explain the following types of social engineering attacks. Baiting, honey trap, and whaling.	
(b)	Demonstrate the working procedure of advanced persistent threats (APT) using a figure. What are the different techniques available to mitigate these attacks?	
(c)	How would you compare the stored cross-site scripting (XSS) attack and the reflected XSS attack?	
Q5	(20 Marks)	CO5
(a)	Describe the following techniques of vulnerability detection and analysis. Data flow analysis, model checking, and dynamic taint.	
(b)	Demonstrate the procedure of fuzzing using a figure. Write down the differences between mutation-based fuzzer and protocol-based-fuzzer.	
(c)	What is the motivation behind the SQL injection (SQLi) attack? How can this attack be prevented?	

End of Question Paper

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End Semester Examination, 2024

Name of the Course: Bachelor of Technology (B. Tech)

Semester: VI

Name of the Paper: Information Retrieval and
Natural Language Processing

Code: TCS 627

Time: 3 Hours

Maximum Marks: 100

Note:

- (i) All questions are compulsory.
- (ii) Answer any **two sub questions** among a, b & c in each main question
- (iii) Total marks in each main question are **twenty**.
- (iv) Each question carries **10 marks**.

Q1	(20 marks)
(a) Identify the basic steps involved in Natural Language Processing	CO1
(b) Explain how ambiguity in language influences the complexity of NLP tasks.	CO2
(c) Compare and contrast the strengths and weaknesses of SpaCy and NLTK libraries for various NLP applications.	CO3
Q2	(20 marks)
(a) Enumerate the methods in Python for web scraping relevant to NLP data collection.	CO1
(b) Outline the implementation steps for the Bag of Words model.	CO2
(c) Evaluate the significance of inflectional and derivational morphemes in linguistics for NLP tasks.	CO3
Q3	(20 marks)
(a) Describe the process of POS tagging and Named Entity Recognition using SpaCy.	CO1
(b) Construct a baseline for Parts-of-Speech tagging and Named Entity Recognition tasks.	CO2
(c) Evaluate the performance of Naive Bayes Classifier using confusion matrix for text classification.	CO3
Q4	(20 marks)
(a) Assess the effectiveness of deep learning techniques compared to linear classifiers in text classification tasks.	CO3
(b) Illustrate the process of query expansion and its impact on information retrieval performance.	CO5
(c) List and describe examples of text classification applications in real-world scenarios	CO1

Q5		(20 marks)
(a)	Compare and contrast the use of average precision (AP) and normalized discounted cumulative gain (nDCG) as evaluation metrics for information retrieval systems.	CO3
(b)	Synthesize the practical issues encountered in evaluating information retrieval systems, including statistical significance testing and pooling techniques.	CO4
(c)	Analyze the techniques for feedback in information retrieval systems, including web crawling and indexing, to optimize document ranking in web search.	CO6

End Semester Examination June 2023-24

Name of the Course: B.Tech (CSE)

Semester: VI

Name of the Paper:

Paper Code: TCS 620

DATA MINING FOR SMART STRUCTURES
AND SYSTEMS

Time: 3 Hours

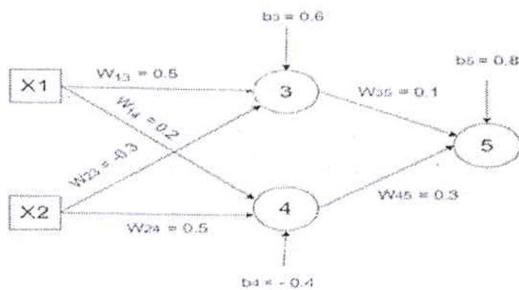
Maximum Marks: 100

Note: -

- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a,b & c in each main question
- (iii) Total marks in each main question are twenty.
- (iv) Each question carries 10 marks

Q1	(20 marks)	CO1 CO2 CO3																															
(a)	Describe in detail data warehouse architecture and its components with neat sketch.																																
(b)	List out the differences between OLTP and OLAP.																																
(c)	Discuss attributes types and Consider the following data set for analysis includes only one attribute X: $X = \{24, 22, 32, 59, 99, 59, 76, 83, 21, 95, 57\}$ (a) What is the mean of the data set X? (b) What is the median? (c) Find the standard deviation for X. (d) Find the variance for X.																																
Q2	(20 marks)	CO5																															
(a)	Explain how Support Vector Machine can be used for classification of linearly separable data.																																
(b)	Consider the following training set having three different attributes namely x ₁ , x ₂ , x ₃ :																																
<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">X1</th><th style="text-align: center;">X2</th><th style="text-align: center;">X3</th><th style="text-align: center;">Class</th></tr> </thead> <tbody> <tr><td style="text-align: center;">-1</td><td style="text-align: center;">1</td><td style="text-align: center;">1</td><td style="text-align: center;">Negative</td></tr> <tr><td style="text-align: center;">5</td><td style="text-align: center;">1</td><td style="text-align: center;">0</td><td style="text-align: center;">Positive</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">2</td><td style="text-align: center;">1</td><td style="text-align: center;">Negative</td></tr> <tr><td style="text-align: center;">-4</td><td style="text-align: center;">-1</td><td style="text-align: center;">0</td><td style="text-align: center;">Negative</td></tr> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">1</td><td style="text-align: center;">Positive</td></tr> <tr><td style="text-align: center;">9</td><td style="text-align: center;">2</td><td style="text-align: center;">1</td><td style="text-align: center;">Positive</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">2</td><td style="text-align: center;">0</td><td style="text-align: center;">Negative</td></tr> </tbody> </table>		X1	X2	X3	Class	-1	1	1	Negative	5	1	0	Positive	0	2	1	Negative	-4	-1	0	Negative	0	0	1	Positive	9	2	1	Positive	2	2	0	Negative
X1	X2	X3	Class																														
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5	1	0	Positive																														
0	2	1	Negative																														
-4	-1	0	Negative																														
0	0	1	Positive																														
9	2	1	Positive																														
2	2	0	Negative																														
Using the K-nearest algorithm (kNN) algorithm with K=3, Classify the following points (i) (1,1,2) (ii) (2,1,1) (iii) (0,0,0)																																	
(c)	Consider a multilayer feed-forward neural network given below. Let the learning rate be 0.5. Assume initial values of weights and biases as given in the table below. Train the network for the training tuple (1, 1, 0) where last number is target output.																																

Show weight and bias updates by using back-propagation algorithm. Assume that sigmoid activation function is used in the network.



Q3 (20 marks)

- (a) Explain any one Ensemble method (Bagging, Boosting) with its implementation steps.
- (b) Use the k-means algorithm and Euclidean distance to cluster the following example into 2 clusters:

Height	Weight
185	72
170	56
168	60
179	68
182	72
188	77
180	71
180	70
183	84
180	88
180	67
177	76

- (c) Based on the table below, Calculate Classification Accuracy, Precision, Recall, F1-score, and Specificity .

n = 100	Actual: No	Actual: Yes	
Predicted: No	TN: 65	FP: 3	68
Predicted: Yes	FN: 8	TP: 24	32
	73	27	

Q4 (20 marks) CO3, CO4

- (a) Explain web mining with example. What are the main types of web mining?
- (b) What is association rule mining and for what purposes it is being used? Explain with example.

(c)	Consider the given transactional database. Using the threshold values for support S=22% and Confidence C= 70% Find frequent itemsets.																				
	<table border="1"> <thead> <tr> <th>TID</th><th>items</th></tr> </thead> <tbody> <tr> <td>T1</td><td>11, 12 , 15</td></tr> <tr> <td>T2</td><td>12,14</td></tr> <tr> <td>T3</td><td>12,13</td></tr> <tr> <td>T4</td><td>11,12,14</td></tr> <tr> <td>T5</td><td>11,13</td></tr> <tr> <td>T6</td><td>12,13</td></tr> <tr> <td>T7</td><td>11,13</td></tr> <tr> <td>T8</td><td>11,12,13,15</td></tr> <tr> <td>T9</td><td>11,12,13</td></tr> </tbody> </table>	TID	items	T1	11, 12 , 15	T2	12,14	T3	12,13	T4	11,12,14	T5	11,13	T6	12,13	T7	11,13	T8	11,12,13,15	T9	11,12,13
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T8	11,12,13,15																				
T9	11,12,13																				
Q5	(20 marks)																				
(a)	What Is a Neural Network ? How Does a Neural Network Work also discuss the types of Neural Networks.																				
(b)	Explain deep learning and in which applications can we use deep learning to solve the problem? Discuss the differences between deep learning and machine learning.																				
(c)	Write short note on (i) K-Fold Cross Validation (ii) Long Short-Term Memory																				

CO5,
CO6



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Roll No.

EVEN END SEMESTER EXAMINATION – 2024

Name of the Course: B.Tech.

Semester: VI

Name of the Paper: Cloud Computing Technologies

Paper Code: TCS 622

Time: 3 Hours

Maximum Marks: 100

Note:

- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a,b,& c in each main question.
- (iii) Total marks in each main question are Twenty.
- (iv) Each question carries 10 marks.

Q1	(20 marks)	CO 1
(a)	HappyFox, based in Irvine, California, is a cloud-powered customer relationship management software provider that offers help desk and support ticketing solutions to businesses across the globe. Evaluate Cluster Computing from the perspective of above mentioned organization.	
(b)	Thomson Reuters (TSX/NYSE: TRI) (“TR”) informs the way forward by bringing together the trusted content and technology that people and organizations need to make the right decisions. The company serves professionals across legal, tax, accounting, compliance, government, and media. Its products combine highly specialized software and insights to empower professionals with the data, intelligence, and solutions needed to make informed decisions, and to help institutions in their pursuit of justice, truth, and transparency. Discuss the importance of the Virtualization with suitable example.	
(c)	Commercial vehicle manufacturer MAN Truck & Bus used features of Amazon EC2 to build a payment processing system that speeds up transactions in and around vehicles and helps optimize fleet management. Evaluate Grid Computing with suitable example.	
Q2	(20 marks)	CO 2
(a)	Veriff is the preferred identity verification partner for the world’s biggest and best digital companies, including pioneers in fintech, gaming and the mobility sectors. It provides advanced technology, deep insights, and expertise from its foundation in digital-first Estonia. Evaluate IAAS from the perspective of above mentioned organization.	
(b)	Flywire is a global payments enablement and software company that combines its proprietary global payments network, next-gen payments platform, and vertical-specific software to deliver the most important and complex payments to global clients. Discuss PAAS from the perspective of above mentioned organization.	
(c)	Biotech software company Seqera was formed in 2018 by the Nextflow open-source project team. The company, an AWS Partner, provides data orchestration solutions that accelerate scientific research to customers in 47 countries. Analyze SAAS from the perspective of above mentioned organization.	
Q3	(20 marks)	CO 3
(a)	Japan-based multinational Toyota Motor Corporation (Toyota) produces around 10 million vehicles a year, making it the world’s largest automobile manufacturer. Its Toyota Connected data services division, established in	

	2016, leads the development of the Toyota Mobility Services Platform to advance data-driven mobility for drivers. Evaluate Taxonomy of Virtualization Techniques from the perspective of above mentioned organization.	CO 4
(b)	Gilead Sciences Inc. (Gilead) modernized its data infrastructure and improved its operational performance through a data mesh framework built on AWS, reducing data search times by over 50 percent. Identify VMware: Full Virtualization from the perspective of above mentioned organization.	
(c)	Navan is a travel and expense software company that simplifies booking, viewing, and managing business travel and expenses for thousands of companies around the world. Discuss Process-level Virtualization from the perspective of above mentioned organization.	
Q4	(20 marks)	
(a)	A division of News Corp., Dow Jones is a global provider of news and business information, delivering content to consumers and organizations around the world across multiple formats, including print, digital, mobile, and live events. Differentiate Parallel vs. Distributed Computing from the perspective of above mentioned organization.	CO 5 CO 6 &
(b)	Stability AI, a leading open-source generative artificial intelligence (AI) company, provides a definitive path for cutting-edge research in imaging, language, code, audio, video, 3D content, design, biotech, and other scientific studies. Analyze Remote Procedure Call from the perspective of above mentioned organization.	
(c)	Mircom, a global designer, manufacturer, and distributor of intelligent building solutions, wanted to modernize its Open Graphic Navigator (OpenGN)—a single-site digital twin and on-premises Internet of Things (IoT) software platform. Identify the Hardware Architectures for Parallel Processing from the perspective of above mentioned organization.	
Q5	(20 marks)	
(a)	Founded in 2008, Nearmap is a location-intelligence company that uses aerial camera technology to help organizations in Australia, New Zealand, the United States, and Canada track changes in their environments. Evaluate Cloud privacy from the perspective of above mentioned organization.	
(b)	Automotive technology company Cox Automotive used data from the AWS Well-Architected Tool to secure executive sponsorship to invest in increased security across its workloads and to reduce risk. Identify cloud security challenges from the perspective of above mentioned organization.	
(c)	Perplexity is building a functional and conversational answer engine optimized to help users find knowledge rather than boost ads and keywords. Analyze VMM hyper jacking from the perspective of above mentioned organization.	

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EVEN END SEMESTER EXAMINATION- 2024

Name of the course: B. Tech CSE and SPL

Semester: VI

Name of the paper: Network and System Security

Paper code: TCS619

Time: Three Hours

MM: 100

Note:

- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a, b & c in each main question.
- (iii) Total marks in each main question are twenty.
- (iv) Each question carries 10 marks.

Q1	(20 Marks)	CO1,2
(a)	Explain the following general security requirements. Integrity, access control, and availability.	
(b)	Describe the following cyber security terminologies. Vulnerability, threat, threat agent, and attack.	
(c)	Demonstrate that the double DES algorithm is vulnerable to the meet-in-the-middle attack.	
Q2	(20 Marks)	CO3
(a)	Demonstrate how a secure communication system can be designed through the guidelines of the model for network security.	
(b)	Write down the summary of the following network security appliances. Unified threat management (UTM), web application firewall, and Intrusion detection system.	
(c)	Investigate the signature generation and verification procedures of the RSA digital signature algorithm.	
Q3	(20 Marks)	CO4
(a)	Investigate scenarios where the following security mechanisms can be utilized to provide security to the ongoing communication. Notarization, data integrity, and encipherment.	

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(b)	Why do we need kerberos? Examine the authentication procedure of kerberos. Use a figure in your answer.	
(c)	The simple secret key distribution protocol, which was proposed by Merkle, was vulnerable to the man-in-the-middle (MITM) attack. Justify this statement.	
Q4	(20 Marks)	CO5
(a)	Demonstrate the working procedure of the "public-key authority method" available under the distribution of public keys. Use a figure in your answer. What will the impact be on the security of the system if the designated authority is somehow compromised?	
(b)	Explain the structure of the X.509 certificate format using a figure. Why do we need a certificate revocation procedure?	
(c)	Write down the summary of the following. Federated identity management (FIM) and public key infrastructure.	
Q5	(20 Marks)	CO6
(a)	Investigate the scenarios where the following firewalls can be deployed. Packet filtering firewall, proxy firewall, and next-generation firewall.	
(b)	Demonstrate the working procedures of the following security mechanisms available under the pretty good privacy (PGP). "PGP confidentiality only" and "PGP confidentiality with authentication."	
(c)	Describe the following functionalities of the Secure/Multipurpose Internet Mail Extensions (S/MIME). "Enveloped data," "signed data," and "signed and enveloped data."	

End of Question Paper

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End Semester Examination, 2024

Name of the Course: Bachelor of Technology (B.Tech.)

Code: TCS671

Name of the Paper: Bigdata Storage and Processing

Semester: VI

Time: 3 Hours

Maximum Marks: 100

Note:

- (i) All questions are compulsory.
- (ii) Answer any **two sub questions** among a, b & c in each main question
- (iii) Total marks in each main question are **twenty**.
- (iv) Each question carries **10 marks**.

Q1		(20 marks)
(a)	What are the primary characteristics of big data, and how do they differentiate it from traditional data processing methods?	CO1
(b)	Explain the steps involved in capturing and organizing big data. How does the volume, velocity, and variety of data pose challenges in this process?	CO2
(c)	Compare and contrast different techniques for analyzing big data, such as machine learning algorithms, data mining, and predictive analytics. How do these methods contribute to extracting valuable insights from large datasets, and what are their respective strengths and limitations?	CO3
Q2		(20 marks)
(a)	Can you describe the core components of Hadoop Distributed File System (HDFS) and their respective roles, including the DataNode, NameNode, and Secondary NameNode? How does the architecture of HDFS contribute to its scalability and fault tolerance?	CO2
(b)	Using the command-line interface (CLI) of HDFS, outline the steps involved in uploading a file from a local file system onto the Hadoop Distributed File System. How does HDFS handle data replication across multiple DataNodes, and why is this feature crucial for ensuring data reliability and availability?	CO3
(c)	Evaluate the limitations of Hadoop Distributed File System (HDFS) in managing large-scale data storage and processing tasks. How do factors such as single point of failure in the NameNode, overhead in small file storage, and lack of support for real-time data access impact the efficiency and performance of HDFS-based applications?	CO3
Q3		(20 marks)
(a)	Describe the key features of Hadoop I/O, including data integrity, compression, and serialization. How do these features contribute to improving the efficiency and reliability of data storage and processing in Hadoop ecosystems?	CO2
(b)	Using examples, explain the concept of MapReduce and its different types and formats. How does MapReduce facilitate parallel processing of large datasets across distributed computing clusters? Provide scenarios where each type of MapReduce job (e.g., batch processing, real-time processing) is most suitable.	CO5
(c)	Investigate the working principles of MapReduce, focusing on the shuffle and sort phase, task execution, and the roles of JobTracker and TaskTracker. How does the shuffle and sort phase	CO3

	optimize data transfer and distribution between map and reduce tasks? Discuss the fault tolerance mechanisms implemented by JobTracker and TaskTracker to ensure the successful completion of MapReduce jobs in the presence of node failures.	
Q4		(20 marks)
(a)	Explain the basic system requirements for setting up a Hadoop cluster, including hardware specifications and software dependencies. What are the key considerations for choosing appropriate hardware components such as CPU, RAM, storage, and network bandwidth to ensure optimal performance and scalability of the Hadoop cluster?	CO2
(b)	Compare and contrast the installation process and cluster formation for the different modes of Hadoop deployment: standalone, pseudo-distributed, and distributed. Provide step-by-step instructions for setting up each mode, highlighting the configuration changes required for transitioning from one mode to another. How does each mode serve different purposes in terms of development, testing, and production environments?	CO3
(c)	Assess the advantages and limitations of each mode of Hadoop installation in relation to specific use cases and applications. How does the standalone mode simplify the setup process for developers but lack scalability for production workloads? In what scenarios would a pseudo-distributed mode be preferred over a fully distributed mode, and vice versa?	CO4
Q5		(20 marks)
(a)	Compare and contrast Relational Database Management Systems (RDBMS) with NoSQL databases, highlighting their key differences in terms of data model, scalability, and schema flexibility. How do NoSQL databases address the limitations of RDBMS in handling unstructured, semi-structured, and rapidly changing data, especially in web-scale applications and Big Data environments?	CO2
(b)	Describe the different types of NoSQL databases, including document-oriented, key-value stores, column-family stores, and graph databases. Provide examples of popular NoSQL databases for each type and explain their use cases and strengths. How does the choice of NoSQL database type depend on factors such as data structure, query patterns, and scalability requirements in various application scenarios?	CO5
(c)	Analyze the architecture of NoSQL databases, focusing on the principles of horizontal scalability, eventual consistency, and distributed data storage. Discuss how NoSQL databases adhere to the principles of the CAP theorem, balancing consistency, availability, and partition tolerance. Provide examples of NoSQL databases that prioritize different aspects of the CAP theorem and explain the implications for data consistency and system reliability.	CO6

END SEMESTER EXAMINATION 2024

Name of the Course: B.Tech

Semester: VI

Name of Paper: Software
Engineering

Paper Code: TCS-611

Time: 3 Hours

Maximum Marks: 100

Note:-

- (i) All questions are compulsory.
- (ii) Answer any two sub questions among a, b & c in each main question
- (iii) Total marks in each main question are twenty.
- (iv) Each question carries 10 marks

Q1	(20 marks)	CO1/CO2
(a)	Elaborate software development process. Why it is difficult to improve?	
(b)	How does the Prototype Model contribute to software development, and what are its key phases and principles? Discuss its advantages and challenges for different types of projects.	
(c)	What is the Scrum framework, and how does it enable iterative and incremental product development through its roles, events, and artifacts?	
Q2	(20 marks)	CO3/CO5
(a)	Describe the differences between functional and non-functional requirements, and discuss strategies for effectively eliciting and managing each type.	
(b)	Imagine you are tasked with creating an SRS document for a project management software. Outline the key sections that should be included in the SRS and describe the information that should be documented in each section.	
(c)	Consider a scenario where a software development team is building a learning management system for a university that involves course registration, content delivery, assignment submission, grading, and student communication. For this create a hierarchical DFD that represents different levels of system functionality.	
Q3	(20 marks)	CO3/CO6
(a)	Discuss the relationship between cohesion and coupling in software design and how they influence each other. Describe different types of coupling and cohesion.	
(b)	Describe the layered architecture pattern. Using a case study scenario of an Library automation system, illustrate how the layered architecture pattern can be applied.	
(c)	Analyze Travel Booking System where a user wants to book a flight for a business trip. and design the following models- <ul style="list-style-type: none"> (i) Use case model to represent user's involvement. (ii) Sequence model to represent the ticket booking process. 	
Q4	(20 marks)	CO3/CO4
(a)	<pre>{ int i, j, k; for (i=0 ; i<=N ; i++) p[i] = 1; for (i=2 ; i<=N ; i++) { k = p[i]; j=1; while (a[p[j-1]] > a[k] { p[j] = p[j-1]; j--; } p[j]=k; }</pre> <p>Calculate the McCabe's cyclomatic complexity for the above code.</p>	

(b)	Differentiate between: i. Unit and integration testing ii. Alpha and beta testing	
(c)	Discuss equivalence partitioning and boundary value analysis as test case design techniques. Provide examples to illustrate their application.	
Q5	(20 marks)	
(a)	Write short notes on the following: i) SEI capability maturity model ii) Software configuration management	CO2/CO5
(b)	Consider a software project using semi-detached mode with 900 KLOC. Estimate the effort required, development time, and number of persons required for the project. Use the standard constant values for estimation.	
(c)	Illustrate the key steps involved in the risk management process and explain how they are applied in software development projects.	