

CS113503**B.Tech. (Fifth Semester) Examination,****Apr-May 2023**

[CSE, CSE (DS), CSE (IOT),
CSE (BDA), CSE (AI), CSE (AIML), CSE (GT) Branch]

INTRODUCTION TO DATA SCIENCE*Time Allowed: 3 hours**Maximum Marks: 100**Minimum Marks: 35*

Note: All five units are compulsory. Part (a) is compulsory carry 4 marks. Attempts any two parts from (b),(c) & (d) carry 8 marks each.

CO1:- Basic Concepts of Data Science

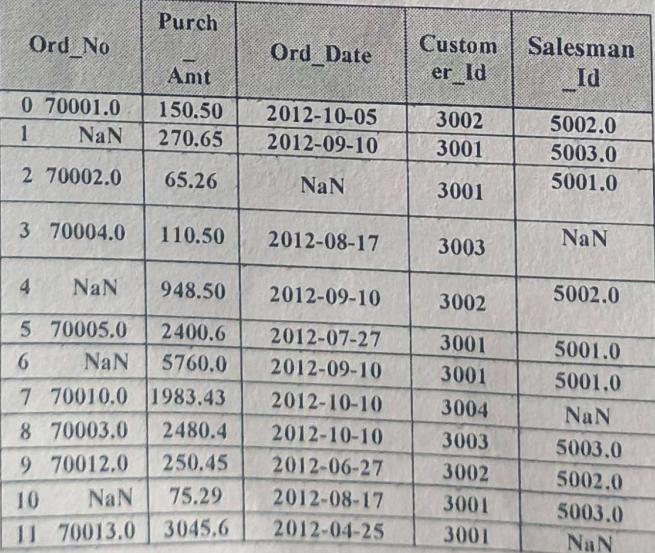
CO2:- Understanding of reading data and manipulation

CO3:- Understand data cleaning, dimensionality reduction

CO4:- Understand and analyze data

CO5:- Use visualization of data to capture data insight and build model.

Q. No	Questions		Marks	CO	BL	PI
Q.1	a)	Differentiate structures and unstructured Data.	4	CO1	L1	1.4.1
	b)	Explain various stages in data science process briefly.	8	CO1	L2	1.4.1
	c)	What is API? Explain with example.	8	CO1	L2	1.4.1
	d)	Write short notes on: i) Web Scraping ii) Relational Database iii) Qualitative data iv) Quantitative data	8	CO1	L1	1.4.1
Q.2	a)	What is JSON format? Explain with example.	4	CO2	L2	1.4.1

	b)	Write the difference between: tuple ,list, set and dictionary. With example.	8	CO2	L1	1.4.1
	c)	Write a NumPy Program to split a 2-D array into three 2-D array.	8	CO2	L1	1.4.1
	d)	Write a python program to demonstrate the following operations. Assume data for each. i) Inserting a new element in list ii) Deleting an element from the dictionary iii) Accessing 3 rd to 5 th element from the list iv) Displaying last four char from string "shankaracharya"	8	CO2	L2	1.4.1
Q.3	a)	Write a Pandas program to identify the column(s) of a given DataFrame which have at least one missing value and to count the number of missing values in each column of a given Data Frame. Test Data: 	4	CO3	L1	1.4.1

	b)	Explain all Data Transformation Technique.	8	CO3	L2	1.4.1
	c)	Normalize the following sample data using Z-score normalization technique. [2,40,500,1,3,900]	8	CO3	L1	1.4.1
	d)	What is data Discretization? Explain with examples.	8	CO3	L2	1.4.1
Q.4	a)	Explain different steps for data Preprocessing.	4	CO4	L1	1.4.1
	b)	The values for the data tuples are(in increasing order): [13,15,16,19,20,20,21,22,22,25,25,25,25,30,33, 33,35,35,35,35,36, 40,45,46,52,70] i) What is the mean of the data ii) What is the mode of the data iii) Find Q1,Q2,Q3 iv) Find variance and standard deviation	8	CO4	L2	1.4.1
	c)	Explain different types of probability with example.	8	CO4	L2	1.4.1
	d)	Write short notes on: i) Covariance ii) Skewness and kurtosis iii) Correlation iv) Coefficient of correlation	8	CO4	L2	1.4.1
Q.5	a)	Differentiate between Linear Regression and Logistic Regression?	4	CO5	L1	1.4.1
	b)	Write programs to understand the use of Matplotlib for Working with Multiple Figures and Axes, Adding Text, Adding a Grid, Adding a Legend, Saving the Charts?	8	CO5	L2	1.4.1

	c)	Differentiate between Supervised, Unsupervised and Reinforced Learning?	8	CO5	L2	1.4.1
	d)	WAP to create a pie chart with a title of the popularity of programming Languages .Make multiple wedges and multiple color of the pie(Java, Python, PHP, JavaScript, C#, C++)(Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7)	8	CO5	L2	1.4.1

CO- Course Outcomes, BL- Bloom's Taxonomy Levels, PI- Performance Indicator

CS113503**BTech (Fifth Semester) Examination****April-May 2024****[CSE , AI, AIML, IOT, DS, BDA, GT]****Introduction to Data Science***Time Allowed: 3 Hours**Maximum Marks: 100**Minimum Marks: 35*

Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

Q. No	Questions	Marks	CO	BL	PI
Q.1	a Explain evolution of Data science.	4	CO1	L2	1.3.1
	b With the help of neat block diagram explain data science process.	8	CO1	L2	1.3.1
	c What are various facets of data? Explain each with example.	8	CO1	L5	1.3.2
	d Explain followings. i. Web API ii. Relational Database iii. Structured Data & Unstructured Data Open Data sources	8	CO1	L5	1.3.2
Q.2	a Explain and WAP to all data type in python. List, Tuple, Set and Dictionary	4	CO2	L2	2.1.2
	b Explain Data Science Toolkits using Python: NumPy, Pandas, Matplotlib, Scikit-learn, NLTK	8	CO2 CO3	L4	2.1.2

	c	What are the various features of NumPy? Explain any five methods with suitable syntax.	8	CO2 CO3	L4	2.1.2
	d	What are some of the essential features provided by Pandas? Explain any five methods with suitable syntax.	8	CO2	L4	2.1.2
Q.3	a	Explain web Scrapping Tools?	4	CO3	L2	2.2.2
	b	Explain different type of dimensionality Reduction technique?	8	CO3	L2	2.2.3
	c	Difference between data generalization and data Aggregation?	8	CO3	L5	2.2.3
	d	Explain different data Smoothning Technique?	8	CO3	L5	2.2.3
Q.4	a	Explain different types of Probability?	4	CO3	L5	1.4.1
	b	Partition the given data into 4 bins using Equal-depth binning method and perform smoothing according to the following methods a) Smoothing by bin mean b) Smoothing by bin median c) Smoothing by bin boundaries Data:11,13,13,15,15,16,19,20,20,20,21,21,22,23,24,30,40,45,45,45,71,72,73,75	8	CO3	L2	1.4.1
	c	Calculate following in Dataset 19,24,17,25,32,25,7,12,29,4,10,15,18,29. (Please draw chart as requirement) a) Range and coefficient of range b) Interquartile range c) Quartile deviation d)Coefficient of quartile deviation	8	CO4	L4	1.4.1
	d	In a class of 50, 10 students were selected at random and their total marks in the final assessments are recorded, which are: 812, 836, 982, 769, 884, 924, 798, 823, 914,	8	CO5	L4	1.4.1

	790. Find the following in Date of their marks • a) Mean deviation b) Coefficient of mean deviation c) Standard deviation d) Coefficient of variation			
Q.5	a Explain different types of data visualization tools?	4	CO4	L4
	b Write a program to draw a Scatter, Line & Bar using matplotlib library with adding axis-label, text, grid and legend.	8	CO4	L5
	c WAP to draw a multiple figure with help of Histogram and Pie chart using matplotlib library includes axis-label, text, grid and legend.	8	CO5	L2
	d Wap to draw a Box and Whiskers plot with help of data Days. (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15)Temp. (36.6, 37, 37.7, 39, 40.1, 43, 43.4, 45, 45.6, 40.1, 44, 45, 46.8, 47, 47.8) using Seaborn library.	8	CO5	L4

CO- Course Outcomes, BL-Bloom Taxonomy, PI- Performance Indicator

CS102502

B.Tech. (Fifth Semester) Examination,**Apr-May 2023**

[CSE, CSE (DS), CSE (IOT),
CSE (BDA), CSE (IOTCS), CSE (AI), CSE (AIML), CSE (GT)
Branch]

COMPUTER NETWORK*Time Allowed: 3 hours**Maximum Marks: 100**Minimum Marks: 35*

Note: All five units are compulsory. Part (a) is compulsory carry 4 marks. Attempts any two parts from (b),(c) & (d) carry 8 marks each.

CO1: Describe the basis and structure of an abstract layered Network protocol model.

CO2: Understand the working of network protocols.

CO3: Students will have deep understanding of various protocols used at Data Link Layer and will be able to analyze the advantages and disadvantages of various available protocols for flow and error control.

CO4: Students will be able to analyze various Ethernet standards and will be able to choose an appropriate standard according to requirement of LAN.

CO5: Students will be able to use various network based application.

Q. No	Questions		Marks	CO	BL	PI
Q.1	a)	What do you mean by topology? Explain various network topologies used.	4	CO1	L1	1.7.1
	b)	Design ISO/OSI reference model. Explain briefly its layer.	8	CO1	L2	1.2.1
	c)	What is ISDN? Explain broadband ISDN with block diagram?	8	CO1	L2	2.5.2
	d)	Compare LAN, MAN and WAN.	8	CO1	L2	1.2.1

Q.2	a)	What do you mean by IEEE802.X standard?	4	CO2	L2	1.2.1
	b)	Explain HDLC with its frame format.	8	CO2	L5	1.2.1
	c)	Differentiate Pure Aloha and Slotted Aloha with its efficiency calculation.	8	CO2	L1	2.8.2
	d)	Write short notes on any two: (i) CSMA CA/CD (ii) ATM reference model (iii) Sliding Window Protocol	8	CO2	L1	1.3.1
Q.3	a)	What do you mean by classful	4	CO3	L3	5.4.1
	b)	Compare IPv4 and IPv6 addressing scheme.	8	CO3	L1	1.3.1
	c)	Write short notes on (any 2): (i) OSPF (ii) RIP (iii) IPsec	8	CO3	L4	1.2.2
	d)	Explain the significance of ICMP with its header format.	8	CO3	L2	1.3.1
Q.4	a)	Why TCP is called end to end protocol?	4	CO4	L4	1.2.1
	b)	Discuss TCP connection management phases in details.	8	CO4	L2	1.2.1
	c)	Explain TCP segment structure.	8	CO4	L1	1.2.1
	d)	Discuss TCP congestion policies	8	CO4	L1	1.2.1

		OR SSL security at transport layer.				
Q.5	a)	What is cryptography?	4	CO5	L5	I.I.I
	b)	Define Firewall with its types and advantages.	8	CO5	L1	I.3.1
	c)	What is the significance of MIME? Briefly describe its header format.	8	CO5	L1	I.3.1
	d)	Write short notes on any two: (i) FTP (ii) HTTP (iii) Telnet	8	CO5	L5	3.1.6

CO- Course Outcomes, BL- Bloom's Taxonomy Levels, PI- Performance Indicator

CS102502**BTech (Fifth Semester) Examination****Nov-Dec 2023****[CSE, DS, IOTCS, AI, AIML, IOT, BDA, GT]****Computer Network***Time Allowed: 3 Hours**Maximum Marks: 100**Minimum Marks: 35*

Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

Q. No	Questions	Marks	CO	BL	PI
Q.1	a Classify transmission media.	4	CO1	L2	1.3.1
	b Explain Novell's IPX/SPX protocol stack.	8	CO2	L2	1.3.1
	c Design full ISO-OSI reference model. Explain the function of each layer	8	CO1	L5	1.3.2
	d What is ISDN? Explain broadband ISDN with the help of block diagram.	8	CO2	L5	1.3.2
Q.2	a What is a frame?	4	CO2	L2	2.1.2
	b What is HDLC? Explain it with its frame format.	8	CO1 CO3	L4	2.1.2
	c What is DHCP? Explain in detail.	8	CO2 CO3	L4	2.1.2
	d Explain IEEE LAN technology in detail.	8	CO2	L4	2.1.2
Q.3	a What is a router?	4	CO3	L2	2.2.2
	b Compare IPv4 and IPv6 addressing.	8	CO3	L2	2.2.3
	c Explain multi-protocol label switching (MPLS) routing mechanism.	8	CO3	L5	2.2.3
	d Write short notes on- 1. RIP 2. OSPF 3. BGP	8	CO3	L5	2.2.3

Q.4	a	Why TCP is called end to end protocol?	4	CO3	L5 1.4.1
	b	What is congestion? Explain congestion control algorithm.	8	CO3	L2 1.4.1
	c	Differentiate between TCP and UDP.	8	CO4	L4 1.4.1
	d	Explain Quality of Service architecture model with IntServ and DiffServ.	8	CO5	L4 1.4.1
Q.5	a	Explain attacks and counterattacks in network.	4	CO4	L4 2.2.3
	b	Define firewall and different types of firewall.	8	CO4	L5 2.2.3
	c	What do you mean by MIME? Specify the details of different MIME header along with their details.	8	CO5	L2 2.2.3
	d	Write short notes on- 1. SMTP 2. FTP 3. DNS 4. IRC	8	CO5	L4 2.2.3

CO- Course Outcomes, BI- Bloom Taxonomy, PI→ Performance Indicator

CS102502**BTech (Fifth Semester) Examination****April-May 2024****[CSE, DS, AI, AIML, BDA, IOT, GT, IOTCSBCT]****COMPUTER NETWORK****Time Allowed: 3 Hours****Maximum Marks: 100****Minimum Marks: 35**

Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

CO1:- Describe the basis and structure of an abstract layered Network protocol model.

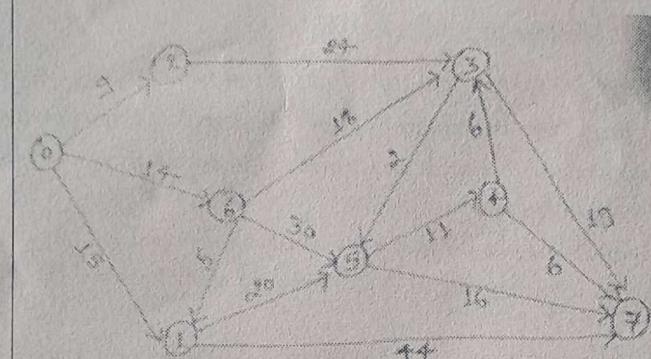
CO2:- Understand the working of network protocols.

CO3:- Students will have deep understanding of various protocols used at Data Link Layer and will be able to analyze the advantages and disadvantages of various available protocols for flow and error control.

CO4:- Students will be able to analyze various Ethernet standards and will be able to choose an appropriate standard according to requirement of LAN.

CO5:- Students will be able to use various network based applications.

Q. No	Questions	Marks	CO	BL	PI
Q.1	a What is XNS? Define IPX/SPX.	2	CO1	1	1.3.1
	b What is topology? Explain network topology and their types with diagram.	8	CO1	2	2.1.2
	c Write a detailed note on the TCP/IP reference model.	8	CO1	2	2.1.2
	d Write short notes (any two): a) Narrow band ISDN b) Broad band ISDN c) ATM	8	CO1	2	2.1.2
Q.2	a What do you mean by ARP? Define DHCP.	2	CO2	1	1.3.1
	b A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is X^3+1 . a) What is the actual bit string transmitted? b) Suppose the third bit from the left is	8	CO2	2	2.1.2

		inverted during transmission. How will receiver detect this error?			
	c	Explain stop & wait and Sliding window protocol with suitable example.	8	CO2	2 2.1.2
	d	What is ALOHA? Explain difference between pure ALOHA and Slotted ALOHA.	8	CO2	2 2.1.2
	a	What are the network address, broadcast address, and subnet mask in dotted notation for the IP Address 198.22.45.173/26?	2	CO3	1 1.3.1
Q.3	b	Given Weighted digraph G, source vertex 0.			
			8	CO3	2 2.1.2
Q.4		a.) Find the shortest directed path from 0 to 7 using Dijkstra's Algorithm. b.) Find the shortest path from 0 to every other vertex.			
	c	Write short notes (any two): a) RIP b) MPLS c) ICMP	8	CO3	2 2.1.2
	d	Write any four differences between IPv4 & IPv6 address scheme. Explain Link state routing protocol.	8	CO3	3 3.1.6
	a	What do you mean by QoS?	2	CO4	1 1.3.1
Q.4	b	Explain transport layer congestion control policy and it's categories.	8	CO4	2 2.1.2
	c	Explain congestion free data transfer with Go-Back N and selective repeat protocol.	8	CO4	2 2.1.2

	d	Explain the working of SSL and TLS in brief.	8	CO4	2
Q.5	a	What are the various types of keys used in cryptography?	2	CO5	1
	b	Explain congestion free data transfer with Go-Back N and selective repeat protocol.	8	CO5	2
	c	Explain about firewall, it's needs and advantages.	8	CO5	2
	d	Write short notes on: a) DNS b) MIME c) SMTP d) IRC	8	CO5	2

CO- Course Outcomes, BL- Bloom Taxonomy, PI→ Performance Indicator

CS112601
BTech (Sixth Semester) Examination
April-May 2024
[CSBS]

COMPUTER NETWORKS

Time Allowed: 3 Hours

Maximum Marks: 80

Minimum Marks: 28

Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

Q. No	Questions	Marks	CO	BL	PI
Q.1	a Explain about ALOHA and CDMA?	2	CO1	L2	1.3.1
	b Write short notes on the following i) Multi Media ii) SNMP iii) DNS iv) SNMP	7	CO2	L2	1.3.1
	c Write about electronic mail in detail? How DNS service map domain names to IP addresses?	7	CO1	L5	1.3.2
	d Explain the OSI reference model with a neat diagram?	7	CO2	L5	1.3.2
Q.2	a Explain various categories of networks?	2	CO2	L2	2.1.2
	b Explain the significance of Switching? What are different switching techniques used in computer networks? Discuss.	7	CO1 CO3	L4	2.1.2
	c With an example explain the Flooding, Hierarchical routing algorithms used in computer networks?	7	CO2 CO3	L4	2.1.2
	d Explain the Broadcast routing algorithm with an example? Differentiate the open loop congestion control and closed loop congestion control?	7	CO2	L4	2.1.2
Q.3	a What is an error? Explain the types of errors?	2	CO3	L2	2.2.2

	b	Explain Twisted pair cables and connectors of twisted pair cables with a neat graph. Also, explain the performance of Twisted pair cables?	7	CO3	L2	2.2.3
	c	How a Connection is established in a Transport Protocol. Explain three protocol scenarios for establishing a connection?	7	CO3	L5	2.2.3
	d	What is the significance of ISDN? Explain the basic concept of ISDN. Give the protocol architecture of ISDN?	7	CO3	L5	2.2.3
Q.4	a	Explain the types of transmission modes?	2	CO3	L5	1.4.1
	b	Explain the TCP/IP reference model?	7	CO3	L2	1.4.1
	c	What are the reasons for congestion? What are the problems with congestion?	7	CO4	L4	1.4.1
	d	With an example explain the shortest path routing algorithms used in computer networks?	7	CO5	L4	1.4.1
Q.5	a	Explain how Network Security can be achieved?	2	CO4	L4	2.2.3
	b	With an example explain the Dynamic routing algorithms used in computer networks?	7	CO4	L5	2.2.3
	c	Explain various classes of IEEE 802.X Standard Ethernet?	7	CO5	L2	2.2.3
	d	Explain the Manchester encoding and Differential Manchester encoding techniques with the help of bit sequence 1101 to be transmitted?	7	CO5	L4	2.2.3

CO- Course Outcomes, BL- Bloom Taxonomy, PI- Performance Indicator

CS102501

B.Tech.(Fifth Semester) Examination,

Apr-May 2023

[CSE, CSE (DS), CSE (IOT),
 CSE (BDA), CSE (IOTCS), CSE (AI), CSE (AIML), CSE (GT) Branch]

THEORY OF COMPUTATION

Time Allowed: 3 hours

Maximum Marks: 100

Minimum Marks: 35

Note: All five units are compulsory. Part (a) is compulsory carry 4 marks. Attempts any two parts from (b),(c) & (d) carry 8 marks each.

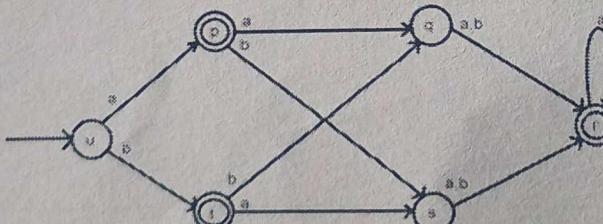
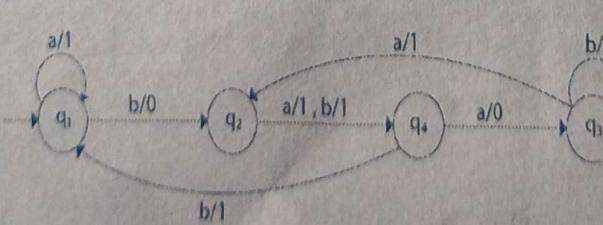
CO1:-Design finite automata to accept a set of strings of a language.

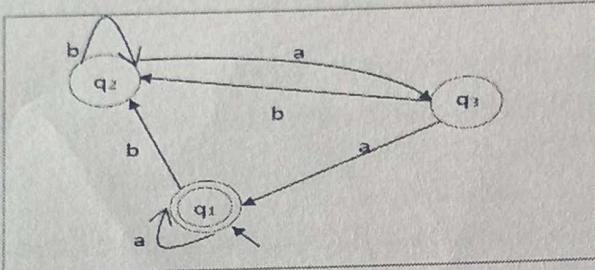
CO2:-Determine whether the given language is regular or not.

CO3:-Design context free grammars to generate strings of context free language.

CO4:-Design push down automata and the equivalent context free grammars and Design Turing machine.

CO5:-Distinguish between computability and no computability, Decidability and un-decidability

Q. No	Questions	Marks	CO	BL	PI
Q.1 a)	What is automata?	4	CO1	L2	1.3.1
	b) Write difference between DFA and NFA.	8	CO1	L2	1.3.1
	c) Minimize given DFA using Myhill Nerode theorem 	8	CO1	L5	1.3.2
	d) Convert the following Mealy machine into equivalent Moore machine. 	8	CO1	L5	1.3.2

Q.2	a)	Explain alphabet, string and language.	4	CO2	L2	2.1.2
	b)	Construct a regular expression corresponding to the automata given below using Arden's Theorem. 	8	CO2	L4	2.1.2
	c)	Design a FA from given regular expression $10 + (0 + 11)0^* 1$.	8	CO2	L4	2.1.2
	d)	Write all closure properties of regular sets.	8	CO2	L4	2.1.2
Q.3	a)	Define grammar and its type.	4	CO3	L2	2.2.2
	b)	What is pumping lemma? Explain with suitable example.	8	CO3	L2	2.2.3
	c)	Write decision algorithm for context free language.	8	CO3	L5	2.2.3
	d)	Simplify the given grammar $S \rightarrow aA/aBB$ $A \rightarrow aAA/\epsilon$ $B \rightarrow bB/bbC$ $C \rightarrow B$	8	CO3	L5	2.2.3
Q.4	a)	Define Pushdown automata.	4	CO4	L2	1.4.1
	b)	Design PDA which accept the string $L = \{a^n b^{3n} \mid n \geq 1\}$	8	CO4	L2	1.4.1
	c)	Explain Turing machine with example.	8	CO4	L4	1.4.1
	d)	Describe Halting problem of Turing machine.	8	CO4	L4	1.4.1
Q.5	a)	What is partial recursive function?	4	CO5	L4	2.2.3

	b)	Explain Decidable and Undecidable problem.	8	CO5	L5	2.2.3
	c)	Ackerman's function is defined as $A(0,y)=y+1$ $A(x+1,0)=A(x,1)$ $A(x+1,y+1)=A(x,A(x+1,y))$ <u>Compute $A(1,1), A(2,1), A(1,2), A(2,2)$</u>	8	CO5	L2	2.2.3
	d)	Explain post correspondence problem with example.	8	CO5	L3	2.2.3

CO- Course Outcomes, BL- Bloom's Taxonomy Levels, PI- Performance Indicator

CS102501**BTech (Fifth Semester) Examination****April-May 2024****[CSE, DS, AI, AIML, BDA, IOT, GT, IOTCSBCT]****THEORY OF COMPUTATION****Time Allowed: 3 Hours****Maximum Marks: 100****Minimum Marks: 35**

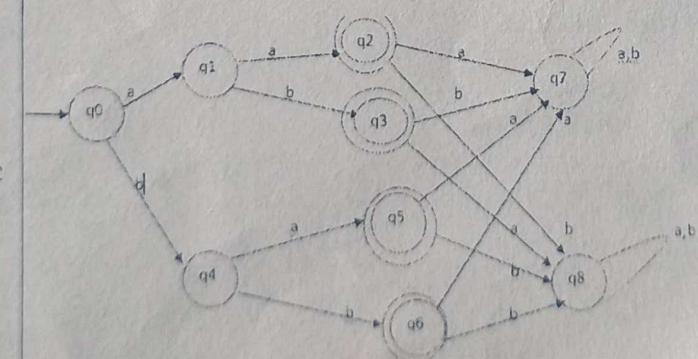
Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

CO1 Able to construct Turing machines and Post machines.

CO2 To prove the equivalence of languages described by pushdown automata and context free grammars.

CO3 To construct pushdown automata and the equivalent context free grammars.

CO4 To construct finite state machines and the equivalent regular expressions.

Q. No		Questions	Marks	CO	BL	PI
Q.1	a	Write the basic building block of TOC.	2	CO1	1	1.3.1
	b	i) Design a DFA which accept substring "USE" over $\Sigma = \text{HOUSE}$. ii) Design DFA m/c from a's & b's length is divisible by 5 .	8	CO1	2	2.1.2
	c	Minimize given DFA . 	8	CO1	2	2.1.2
	d	Write short notes on following : i) Two way finite automata.	8	CO1	2	2.1.2

	ii) Mealy machines.				
Q.2	a Explain decision problem?	2	CO2	1	1.3.1
	b Prove that $L = w^* wR / w \in (0, 1)^+ x = 5$ is not Regular?	8	CO2	2	2.1.2
	c Convert the regular expression $1 + (0 + 11) 0^* 1$ into its equivalent NDFA	8	CO2	2	2.1.2
	d State and prove Arden's Theorem.	8	CO2	2	2.1.2
Q.3	a Define Context Free Grammars.	2	CO3	1	1.3.1
	b Consider the grammar $S = S + S / S^* s / id$ Construct leftmost derivation, rightmost derivation and derivation tree for the string $W = id + id^* id$	8	CO3	2	2.1.2
	c Explain Chomsky classification of grammar.	8	CO3	2	2.1.2
	d Reduce the following grammar into CNF: $S \rightarrow ASA / bA$ $A \rightarrow B / S$ $B \rightarrow C$	8	CO3	3	3.1.6
Q.4	a What do you mean by universal Turing machine?	2	CO4	1	1.3.1
	b Design Turing machine M that recognize the language : $\{1^n 2^n 3^n \mid n \geq 1\}$	8	CO4	2	2.1.2
	c Explain Post Correspondence Problem.	8	CO4	2	2.1.2
	d Design a PDA which accept $L = \{ an b2n \mid n \geq 1\}$	8	CO4	2	2.1.2
Q.5	a Define Partial and Total Functions.	2	CO5	1	1.3.1
	b What is computation? Explain Turing model for computation	8	CO5	2	2.2.3
	c Show that the function : $f(x, y) = X + Y$ is primitive recursive	8	CO5	2	2.1.2
	d Write short notes on : (i) NP-completeness (ii) Space & Time complexity	8	CO5	2	2.1.2

CS112301
BTech (Third Semester) Examination
Nov-Dec 2023
[CSBS]

**FORMAL LANGUAGE & AUTOMATA
THEORY**

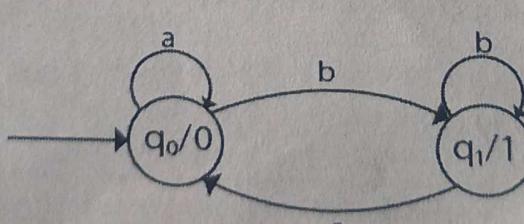
• Time Allowed: 3 Hours

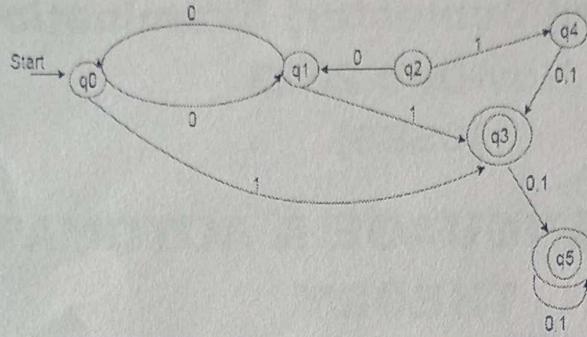
Maximum Marks: 80

Minimum Marks: 28

Note: Attempt all questions. Part (a) from each question is compulsory and carries 2 marks, attempt any two parts from part (b), (c) and (d) carrying 7 marks each.

- CO1. Design finite automata to accept a set of strings of a language.
- CO2. Determine whether the given language is regular or not.
- CO3. Design context free grammars to generate strings of context free language.
- CO4. Design push down automata and the equivalent context free grammars and design Turing machine.
- CO5. Distinguish between computability and non-computability, decidability and undecidability.

Q. No	Questions		Marks	CO	BL	PI
	a	Difference between NDFA and DFA.	2	CO1	1	1.3.1
Q.1	b	Convert the given Moore machine into its equivalent Mealy machine: 	7	CO1	2	2.1.2

Q.2	c	Construct the minimize DFA-				
	d		7	CO1	2	2.1.2
	a	What do you mean by Regular Expression?	2	CO2	1	1.3.1
	b	Design a FA from given regular expression $10 + (0 + 11)0^*$.	7	CO2	2	2.1.2
Q.3	c	Write short notes on:- I. Arden's theorem, II. Closure properties of regular sets.	7	CO2	2	2.1.2
	d	Write application of pumping lemma and show that the language $L = \{a^p \mid p \text{ is prime}\}$ is not regular.	7	CO2	2	2.1.2
	a	Define grammar, language and derivation.	2	CO3	1	1.3.1
	b	Reduce the following grammar into CNF: $S \rightarrow a \mid aA \mid B$ $A \rightarrow aBB \mid \epsilon$ $B \rightarrow Aa \mid b$.	7	CO3	2	2.1.2
Q.3	c	Explain Chomsky classification of grammar.	7	CO3	2	2.1.2
	d	Write short notes on :- I. Ambiguity in grammar	7	CO3	3	3.1.6

		II. Derivation Tree III. Context free grammar With proper example.				
Q.4	a	What do you mean by universal Turing machine?	2	CO4	1	1.3.1
	b	Design Turing machine M that recognize the language L : $\{0^n 1^n \mid n \geq 1\}$	7	CO4	2	2.1.2
	c	Design a PDA which accept $L = \{a^n b^{2n} \mid n \geq 1\}$.	7	CO4	2	2.1.2
	d	Write short notes on any two : I. Church's hypothesis II. Post correspondence problem III. Halting problem of Turing machine	7	CO4	2	2.1.2
Q.5	a	Define Partial and Total Functions.	2	CO5	1	1.3.1
	b	Write short notes on : (i) NP-completeness (ii) Space & Time complexity.	7	CO5	2	2.2.3
	c	Explain Recursive and Recursively Enumerable Sets.	7	CO5	2	2.1.2
	d	Calculate A(1,1), A(1,2), A(2,1), and A(2,2) using Ackermann Function.	7	CO5	2	2.1.2

CO- Course Outcomes, BL- Bloom Taxonomy, PI→ Performance Indicator

CS115504

B.Tech. (Fifth Semester) Examination,
Apr-May 2023
[CSE, CSE (DS), CSE (IOTCS) Branch]

INTERNET of THINGS**Time Allowed: 3 hours****Maximum Marks: 100****Minimum Marks: 35**

Note: All five units are compulsory. Part (a) is compulsory carry 4 marks. Attempts any two parts from (b),(c) & (d) carry 8 marks each.

CO1:-Students will familiar with the concepts of Internet of Things.

CO2:-Students will familiar with IoT Architecture

CO3:-Students will ready to Analyze basic protocols in wireless sensor network

CO4:-Students will be capable to design IoT applications in different domain and be able to analyze their performance

CO5:-Capable to implement basic IoT applications on embedded platform.

Q. No	Questions	Marks	CO	BL	PI
Q.1 a)	Define the term "Things" with respect to IoT.	4	CO1	L1	1.3.1
b)	Discuss the 4V's of Big Data.	8	CO1	L2	2.1.2
c)	Describe the levels of IoT with an example of each.	8	CO1	L2	2.1.2
d)	Write short notes on: (i) MANET (ii) IOV.	8	CO1	L2	2.1.2
Q.2 a)	Write down definition of gateway & Bluetooth.	4	CO2	L1	1.3.1
b)	Write difference between IPv4 & IPv6.	8	CO2	L2	2.1.2

	c)	Write short notes on following: (i) Zigbee (ii) NFC.	8	CO2	L2	2.1.2
	d)	Explain XMPP in detail.	8	CO2	L2	2.1.2
Q.3	a)	What are the various components of IoT system.	4	CO3	L1	1.3.1
	b)	Write short notes on working of servo motor.	8	CO3	L2	2.1.2
	c)	Write short notes on : (i) Image sensor (ii) Proximity sensors.	8	CO3	L2	2.1.2
	d)	Write down properties of sensors.	8	CO3	L3	3.1.6
Q.4	a)	Mention the versions of Linux OS supported by Raspberry Pi.	4	CO4	L1	1.3.1
	b)	Explain different operators used in Arduino.	8	CO4	L2	2.1.2
	c)	Explain features of ESP8266 with suitable pin diagram.	8	CO4	L2	2.1.2
	d)	Explain Raspberry Pi in detail.	8	CO4	L2	2.1.2
Q.5	a)	What do you mean by cloud computing.	4	CO5	L1	1.3.1
	b)	Explain the architecture of cloud computing with suitable diagram.	8	CO5	L2	2.2.3
	c)	Write short notes on: (i) Multi cloud (ii) Inter cloud.	8	CO5	L2	2.1.2
	d)	Explain Amazon Elastic Compute Cloud (EC2).	8	CO5	L2	1.4.1

CO= Course Outcomes, BL= Bloom's Taxonomy Levels, PI= Performance Indicator

CS115504
BTech (Fifth Semester) Examination
April-May 2024
[CSE , DS, IOTCBCT]

Internet of Things

Time Allowed: 3 Hours

Maximum Marks: 100

Minimum Marks: 35

Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

On successful completion of the course, the student will be able to:

CO1. Students will familiar with the concepts of internet of Things.

CO2. Students will familiar with IoT Architecture

CO3. Students will ready to Analyze basic protocols in wireless sensor network

CO4. Students will be capable to design IoT applications in different domain and be able to analyze their performance

CO5. Capable to implement basic IoT applications on embedded platform

Q. No	Questions	Marks	CO	BL	PI
Q.1	a What do you mean by internet of things?	4	CO1	L2	1.3.1
	b Explain architecture of IOT with suitable diagram.	8	CO1	L2	1.3.1
	c Write down difference between M2M & IOT.	8	CO1	L5	1.3.2
	d Write short notes on : (1) IOV (2) Big Data	8	CO1	L5	1.3.2
Q.2	a What do you mean by Gateways?	4	CO2	L2	2.1.2
	b Write a brief note on Data protocols used in IOT.	8	CO2 CO3	L4	2.1.2
	c Write down difference between Zigbee & Bluetooth.	8	CO2 CO3	L4	2.1.2
	d Write short notes on (1) ZWave (2) RFID	8	CO2	L4	2.1.2
Q.3	a What do you mean by sensors & sensing?	4	CO3	L2	2.2.2
	b Write a brief note on Accelerometers &		CO3	L2	2.2.3

	Temperature sensors.	8			
c	What do you mean by Actuation? Explain Pneumatic & SMP actuators.	8	CO3	L5	2.2.3
d	Write Short notes on (1) Solenoid (2) Stepper motor.	8	CO3	L5	2.2.3
Q.4	a What do you mean by Arduino?	4	CO3	L5	1.4.1
	b Explain various components of NodeMCU.	8	CO3	L2	1.4.1
	c Write a sketch to calculate distance using ultrasonic sensor.	8	CO4	L4	1.4.1
	d Explain Raspberry Pi in detail.	8	CO5	L4	1.4.1
Q.5	a Define cloud computing.	4	CO4	L4	2.2.3
	b Explain service models of cloud in detail.	8	CO4	L5	2.2.3
	c Write down difference between Multi cloud & Inter cloud.	8	CO5	L2	2.2.3
	d Write short notes on (1) Open Stack (2) Amazon EC2	8	CO5	L4	2.2.3

CO- Course Outcomes, BL-Bloom Taxonomy, PI- Performance Indicator

CS115523

B.Tech. (Fifth Semester) Examination,

Apr-May 2023

[Computer Science Engineering (IOT)]

IOT ARCHITECTURE AND SECURITY*Time Allowed: 3 hours**Maximum Marks: 100**Minimum Marks: 35*

Note: All five units are compulsory. Part (a) is compulsory carry 4 marks. Attempts any two parts from (b),(c) & (d) carry 8 marks each.

CO1:- Students will familiar with the concepts of Internet of Things.

CO2:- Students will familiar with IoT Architecture.

CO3:- Students will ready to Analyse basic protocols in wireless sensor network.

CO4:- Understand the IOT Applications for value creations.

CO5:- Capable to implement basic IoT applications on embedded platform.

Q. No	Questions	Marks	CO	BL	PI
Q.1 a)	Define the term "Things" with respect to IoT.	4	CO1	L2	1.3.1
b)	Describe the IoT enabling Technologies & M2M Communication with suitable explanations.	8	CO1	L2	1.3.1
c)	Describe the levels of IoT with an example of each.	8	CO1	L5	1.3.2
d)	Describe the simplified IoT Architecture outline .	8	CO1	L5	1.3.2
Q.2 a)	What are global value chains and why do they matter?	4	CO2	L2	2.1.2
b)	Explain Architecture Reference Model.	8	CO2	L4	2.1.2
c)	Write short notes on following:	8	CO2	L4	2.1.2

		(i) M2M Value Chains (ii) IoT Value Chains.				
	d)	Explain some the Emerging Trends in Industrial IoT.	8	CO2	L4	2.1.2
Q.3	a)	Difference between functional view and information view in IOT.	4	CO3	L2	2.2.2
	b)	Describe the ETSI M2M high-level architecture.	8	CO3	L2	2.2.3
	c)	Describe IOT Architectural view in detail.	8	CO3	L5	2.2.3
	d)	Explain IOT reference model.	8	CO3	L5	2.2.3
Q.4	a)	What is the difference between greenfield and brownfield IoT development?	4	CO4	L5	1.4.1
	b)	Explain the concept of Industry 4.0.	8	CO4	L2	1.4.1
	c)	Explain four aspects of the business to master IoT.	8	CO4	L4	1.4.1
	d)	What are the requirements that IoT application for industrial application should meet?	8	CO4	L4	1.4.1
Q.5	a)	Explain the smart home automation system in an IOT?	4	CO5	L4	2.2.3
	b)	Discuss the Infrastructures and Buildings development of an IOT?	8	CO5	L5	2.2.3
	c)	Describe the application of Securities and industrial automation in an IoT.	8	CO5	L2	2.2.3
	d)	Explain the types of home appliances and other IoT electronic equipment's.	8	CO5	L4	2.2.3

CO- Course Outcomes, BL- Bloom's Taxonomy Levels, PI- Performance Indicator

CS115523

BTech (Fifth Semester) Examination
April-May 2024
[CSE(IOT)]

IoT Architecture and Security

Time Allowed: 3 Hours

Maximum Marks: 100

Minimum Marks: 35

Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

On successful completion of the course, the student will be able to:

CO1. Students will familiar with the concepts of Internet of Things.

CO2. Students will familiar with IoT Architecture

CO3. Students will ready to Analyse basic protocols in wireless sensor network

CO4. Understand the IOT Applications for value creations.

CO5. Capable to implement basic IoT applications on embedded platform

Q. No	Questions	Marks	CO	BL	PI
Q.1	a Differentiate Privacy, Security and Trust on IOT?	4	CO1	L2	1.3.1
	b What is Future Internet Technologies? Explain with an example?	8	CO1	L2	1.3.1
	c Define IOT? Explain its Application with an example?	8	CO1	L5	1.3.2
	d Explain an IOT related Standardization?	8	CO1	L5	1.3.2
Q.2	a Define M2M value chain?	4	CO2	L2	2.1.2
	b Differentiate between M2M and IOT?	8	CO2 CO3	L4	2.1.2
	c Explain the Global Information Monopolies?	8	CO2 CO3	L4	2.1.2
	d How IOT emerging as an Industrial Structure?	8	CO2	L4	2.1.2
Q.3	a What is Information view?	4	CO3	L2	2.2.2

	b	Describe IOT Architecture with Diagram?	8	CO3	L2	2.2.3
	c	Describe IOT Reference Modal With diagram?	8	CO3	L5	2.2.3
	d	Explain Deployment and Operational view?	8	CO3	L5	2.2.3
Q.4	a	How IOT used as a Brownfield?	4	CO3	L5	1.4.1
	b	How IOT is used in Retaining Industry?	8	CO3	L2	1.4.1
	c	Explain IOT Applications for Industry along with Future Factory Concept?	8	CO4	L4	1.4.1
	d	How IOT is used in Home Management and E health also explain with example?	8	CO5	L4	1.4.1
Q.5	a	What are the First steps towards a secure platform?	4	CO4	L4	2.2.3
	b	Explain the contribution of an IOT from FP7 projects?	8	CO4	L5	2.2.3
	c	Explain Data Aggregation for the IOT in smart cities?	8	CO5	L2	2.2.3
	d	Explain the used of an IOT in Smart cities?	8	CO5	L4	2.2.3

CO- Course Outcomes, BL- Bloom Taxonomy, PI- Performance Indicator

CS115505

BTech (Fifth Semester) Examination
April-May 2024
[CSE (IoT)]

IoT Development Boards

Time Allowed: 3 Hours

Maximum Marks: 100

Minimum Marks: 35

Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

CO1:- The students should be able to understand basic Concepts of Arduino UNO.

CO2:- The students should be able to understand Arduino Uno connections with sensors .

CO3:- The students should be able to apply commonly used IOT protocols such as REST API, MQTT through IOT based demonstration.

CO4:- The students should be able to understand Raspberry PI along with critical protocols and its communication to cloud.

CO5:- The students should be able to solve analog sensor and digital sensor interfacing with IOT devices.

Q. No	Questions	Marks	CO	BL	PI
Q.1	a What is a Actuator? Classify various types of actuators used in IOT.	4	CO1	L2	1.3.1
	b What is a Sensor? Classify various types of sensors used in IOT based systems.	8	CO1	L2	1.3.1
	c What is Arduino UNO board? Explain overview of arduino UNO board.	8	CO1	L5	1.3.2
	d Discuss the basic buildings blocks of IoT.	8	CO1	L5	1.3.2
Q.2	a Explain various interrupt used in arduino.	4	CO2	L2	2.1.2
	b Describe Arduino programming control structures with an example	8	CO2 CO3	L4	2.1.2
	c Write a Arduino program blink and LED using the push button	8	CO2 CO3	L4	2.1.2

	d	Explain the functions of digital I/O and analog I/O in Arduino programming, with an example.	8	CO2	L4	2.1.2
Q.3	a	Write the basic features of Node MCU board.	4	CO3	L2	2.2.2
	b	Give the comparison of ESP 32 board with the ESP 8266 board.	8	CO3	L2	2.2.3
	c	Draw the pin diagram of Node MCU ESP 8266 board and explain its functionality.	8	CO3	L5	2.2.3
	d	Discuss the case study on Voice-based Home Automation for switching lights on/of using android.	8	CO3	L5	2.2.3
Q.4	a	What is a Raspberry Pi?	4	CO3	L5	1.4.1
	b	Give the comparison between the models of Rasberry Pi.	8	CO3	L2	1.4.1
	c	Write LED blink program in python for Raspberry Pi.	8	CO4	L4	1.4.1
	d	Briefly explain the IoT protocols at application layer with required architecture of the protocols	8	CO5	L4	1.4.1
Q.5	a	Explain the steps to install the library functions in python for sensors and actuators.	4	CO4	L4	2.2.3
	b	Explain how the Interfacing of DHT11 with Raspberry Pi 3 is done with diagram.	8	CO4	L5	2.2.3
	c	Explain the Raspberry Pi device and its role in IoT development.	8	CO5	L2	2.2.3
	d	What are the roles of cloud computing in IoT device development? Explain the need of data storage of IoT device at cloud.	8	CO5	L4	2.2.3

CO- Course Outcomes, BL-Bloom Taxonomy, PI- Performance Indicator

CS115603

BTech (Sixth Semester) Examination
April-May 2024
[AI, AIML, BDA, GT]

IoT Development Boards

Time Allowed: 3 Hours

Maximum Marks: 100

Minimum Marks: 35

Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

CO1: - Basic Concepts of Arduino UNO. •

CO2: - To understand Arduino Uno connections with sensors.

CO3: - To apply commonly used IOT protocols such as REST API, MQTT through IOT based demonstration.

CO4: - To understand Raspberry PI along with critical protocols and its communication to cloud.

CO5: - To solve analog sensor and digital sensor Interfacing with IOT devices.

Q. No	Questions		Marks	CO	BL	PI
Q.1	a	Explain the various functional blocks of IoT ecosystems.	4	CO1	L2	1.3.1
	b	Describe the IoT enabling Technologies & M2M Communication with suitable explanations.	8	CO1	L2	1.3.1
	c	Describe the simplified IoT Architecture.	8	CO1	L5	1.3.2
	d	Discuss about the following in detail a) Sensors and Actuators. b) Connecting Smart Objects.	8	CO1	L5	1.3.2
Q.2	a	Briefly discuss constrained nodes and Networks?	4	CO2	L2	2.1.2
	b	Describe Physical and MAC layers Topology and Security of IEEE 802.15.4	8	CO2 CO3	L4	2.1.2

	IEEE 802.15.4 & tabulate the protocol stacks utilizing IEEE 802.15.4.				
c	Analyze in detail Lora WAN technology, illustrating the layers, MAC format and Architecture.	8	CO2 CO3	L4	2.1.2
d	Discuss the following: a) IEEE 802.11ah b) IP versions	8	CO2	L4	2.1.2
Q.3	a Explain about embedded computing in IoT	4	CO3	L2	2.2.2
	b Demonstrate the key steps involved in IoT Design methodology in detail?	8	CO3	L2	2.2.3
	c (i) Analyze in detail an exemplary device: Raspberry Pi. (ii) Explain in detail the Raspberry Pi interfaces	8	CO3	L5	2.2.3
	d Illustrate the Arduino board details and explain the steps for installing the board. Also discuss in detail the building blocks of IoT and its functionalities with suitable illustration.	8	CO3	L5	2.2.3
Q.4	a Explain about Data Acquiring and Organizing in IoT/M2M?	4	CO3	L5	1.4.1
	b Explain in detail the need and types of Data Analytics for IoT and brief the challenges faced by IoT Data Analytics?	8	CO3	L2	1.4.1
	c What is the difference between data in motion and data in rest, mentioning examples to each one?	8	CO4	L4	1.4.1
	d Explain the following: (i) Cloud Platform for IoT/M2M Applications/ Services (ii) Cloud Service Models	8	CO5	L4	1.4.1

Q.5	a	Explain the concept of Industry 4.0?	4	CO4	L4	2.2.3
	b	Explain the types of home appliances and other IoT electronic equipment?	8	CO4	L5	2.2.3
	c	Discuss the Infrastructures and Buildings development of an IOT?	8	CO5	L2	2.2.3
	d	Describe the application of Securities and industrial automation in an IoT?	8	CO5	L4	2.2.3

CO- Course Outcomes, BL- Bloom Taxonomy, PI- Performance Indicator

CS113526

B.Tech.(Fifth Semester) Examination,
Apr-May 2023
[Computer Science Engineering (DS)]

STATISTICAL FOUNDATION FOR DATA SCIENCE*Time Allowed: 3 hours**Maximum Marks: 100**Minimum Marks: 35*

Note: All five units are compulsory. Part (a) is compulsory carry 4 marks. Attempts any two parts from (b), (c) & (d) carry 8 marks each.

CO1. Implement statistical analysis techniques for solving practical problems.

CO2. Apply statistical analysis on variety of data.

CO3. Perform multi-dimensional scaling.

CO4. Perform appropriate statistical tests using R.

CO5. Analyze data using python.

Q. No	Questions		Marks	CO	BL	PI												
Q.1	a)	Write short notes on Principles of Least Squares.	4	CO1	L1	1.1.1												
	b)	State and prove Bays theorem.	8	CO1	L3	1.1.1												
	c)	Fit a Second degree parabolato the following data:	8	CO1	L3	1.1.1												
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr> <td>y</td><td>1</td><td>5</td><td>10</td><td>22</td><td>38</td></tr> </table>	x	0	1	2	3	4	y	1	5	10	22	38				
x	0	1	2	3	4													
y	1	5	10	22	38													
	d)	Define moment generating function. Find the moment generating function of the exponential distribution $f(x) = 1/c e^{-\frac{x}{c}}, 0 \leq x \leq \infty, c > 0$ Hence find its mean and S.D.	8	CO1	L3	1.1.1												
Q.2	a)	What do you understand by estimator?	4	CO2	L1	1.1.1												

		Explain Sufficient and Efficient estimator.																																								
	b)	State and prove the Central Limit Theorem.	8	CO2	L3	1.1.1																																				
	c)	Show that in a random sampling from a normal population sample mean is a consistent estimator of population mean.	8	CO2	L3	1.1.1																																				
	d)	Write the properties of maximum likelihood estimation. If T is an unbiased estimator of θ , show that T^2 and \sqrt{T} are biased estimators of θ^2 and $\sqrt{\theta}$ respectively.	8	CO2	L6	1.1.1																																				
Q.3	a)	Define Analysis of Variance.	4	CO3	L1	1.1.1																																				
	b)	A medical Experiment was made to test the additional hours of sleep due to three drugs A, B, C tried on one patient each from four different age groups. Examine Whether age has not any significant effect on the gain in sleep. Further examine whether the three drugs are similar in their effects or not. It is given that at 5% level of significance $F_{2.6}=5.14$, $F_{3.6}=4.76$	8	CO3	L2	1.1.1																																				
	c)	<table border="1" data-bbox="396 1459 1031 1774"> <thead> <tr> <th>Age of group</th> <th>30-40</th> <th>40-50</th> <th>50-60</th> <th>60-70</th> <th>Row Total</th> </tr> <tr> <th>Drugs</th> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </thead> <tbody> <tr> <td>A</td> <td>2.0</td> <td>1.2</td> <td>1.0</td> <td>0.3</td> <td>4.5</td> </tr> <tr> <td>B</td> <td>1.1</td> <td>0.8</td> <td>0.0</td> <td>-0.1</td> <td>1.8</td> </tr> <tr> <td>C</td> <td>1.5</td> <td>1.3</td> <td>0.9</td> <td>0.1</td> <td>3.8</td> </tr> <tr> <td>Column Total</td> <td>4.6</td> <td>3.3</td> <td>1.9</td> <td>0.3</td> <td>10.1</td> </tr> </tbody> </table> Write short notes on Logistic regression with example.	Age of group	30-40	40-50	50-60	60-70	Row Total	Drugs						A	2.0	1.2	1.0	0.3	4.5	B	1.1	0.8	0.0	-0.1	1.8	C	1.5	1.3	0.9	0.1	3.8	Column Total	4.6	3.3	1.9	0.3	10.1	8	CO3	L2	1.1.1
Age of group	30-40	40-50	50-60	60-70	Row Total																																					
Drugs																																										
A	2.0	1.2	1.0	0.3	4.5																																					
B	1.1	0.8	0.0	-0.1	1.8																																					
C	1.5	1.3	0.9	0.1	3.8																																					
Column Total	4.6	3.3	1.9	0.3	10.1																																					

	d)	<p>The varieties A, B, C, D, E, F, G of wheat were sown in plots each and the following yields in quintals per acre were obtained.</p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th></tr> </thead> <tbody> <tr><td>13</td><td>15</td><td>14</td><td>14</td><td>17</td><td>15</td><td>16</td></tr> <tr><td>11</td><td>11</td><td>10</td><td>10</td><td>15</td><td>9</td><td>12</td></tr> <tr><td>10</td><td>13</td><td>12</td><td>15</td><td>14</td><td>13</td><td>13</td></tr> <tr><td>16</td><td>18</td><td>13</td><td>17</td><td>19</td><td>14</td><td>15</td></tr> <tr><td>12</td><td>12</td><td>11</td><td>10</td><td>12</td><td>10</td><td>11</td></tr> </tbody> </table> <p>Do the data indicate a significance difference in the yields of the varieties?</p>	A	B	C	D	E	F	G	13	15	14	14	17	15	16	11	11	10	10	15	9	12	10	13	12	15	14	13	13	16	18	13	17	19	14	15	12	12	11	10	12	10	11				
A	B	C	D	E	F	G																																										
13	15	14	14	17	15	16																																										
11	11	10	10	15	9	12																																										
10	13	12	15	14	13	13																																										
16	18	13	17	19	14	15																																										
12	12	11	10	12	10	11																																										
Q.4	a)	Write Difference between Generalized Linear Models and Generalized Additive Models.	4	CO4	L1	1.1.1																																										
	b)	Explain with example Generalized Additive Model.	8	CO4	L2	1.1.1																																										
	c)	What do you understand by Cluster analysis? Explain with Example Cluster Analysis.	8	CO4	L2	1.1.1																																										
	d)	Explain the following: (i) Survival Analysis (ii) Analyzing and (iii) Longitudinal Data.	8	CO4	L2	1.1.1																																										
Q.5	a)	What are the various data types in R programming?	4	CO5	L1	1.1.1																																										
	b)	Explain the following: (i) Control flow statement (ii) Break and next statement.	8	CO5	L2	1.1.1																																										

[4]

c)	What are matrices in Rprogramming? Give syntax and write a small program to access the elements of matrix.	8	CO5	L2	1.1.1
d)	Explain loops and write down types of loop in RProgramming.	8	CO5	L2	1.1.1

- Course Outcomes, BL- Bloom's Taxonomy Levels, PI- Performance Indicator

CS113526
BTech (Fifth Semester) Examination
April-May 2024
[CSE (DS)]

Statistical Foundation for data Science

Time Allowed: 3 Hours

Maximum Marks: 100

Minimum Marks: 35

Note: Attempt all questions. Part (a) from each question is compulsory and carries 4 marks, attempt any two parts from part (b), (c) and (d) carrying 8 marks each.

Q. No	Questions	Marks	CO	BL	PI																								
Q.1	a What is Poisson distribution? Obtain the mean and the variance of this distribution?	4	CO1	L2	1.3.1																								
	b A person runs the same race track for five consecutive days and is timed as follows: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Day</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr> <td>Time</td><td>15.3</td><td>15.1</td><td>15</td><td>14.5</td><td>14</td></tr> </table> make a least square fit to the above data using a function $a + \frac{b}{x} + \frac{c}{x^2}$	Day	1	2	3	4	5	Time	15.3	15.1	15	14.5	14	8	CO1	L2	1.3.1												
Day	1	2	3	4	5																								
Time	15.3	15.1	15	14.5	14																								
c Calculate the coefficient of correlation for the following data: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>y</td><td>0-4</td><td>4-8</td><td>8-12</td><td>12-16</td></tr> <tr> <td>x</td><td></td><td></td><td></td><td></td></tr> <tr> <td>0-5</td><td>1</td><td>-</td><td>-</td><td>-</td></tr> <tr> <td>5-10</td><td>2</td><td>4</td><td>1</td><td>2</td></tr> <tr> <td>10-15</td><td>-</td><td>5</td><td>3</td><td>-</td></tr> </table>	y	0-4	4-8	8-12	12-16	x					0-5	1	-	-	-	5-10	2	4	1	2	10-15	-	5	3	-	8	CO1	L5	1.3.2
y	0-4	4-8	8-12	12-16																									
x																													
0-5	1	-	-	-																									
5-10	2	4	1	2																									
10-15	-	5	3	-																									

[1]

		15-20	-	8	4	2																					
		20-25	2	-	-	1																					
	d	In a partially destroyed laboratory record of fan analysis of correlation data, the following result only are legible: Variance of $x = 9$ Regression equations $8x - 10y + 66 = 0$, $40x - 18y = 214$. What were (i) the mean values of x and y , (ii) the standard deviation of y , and (iii) the coefficient of correlation between x and y		8	CO1	L5	1.3.2																				
Q.2	a	Explain Power of a test.		4	CO2	L2	2.1.2																				
	b	State and Proof Central Limit Theorem.		8	CO2 CO3	L4	2.1.2																				
	c	Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results: <table border="1"><tr><td>A:</td><td>28</td><td>30</td><td>32</td><td>33</td><td>33</td><td>29</td><td>34</td></tr><tr><td>B:</td><td>29</td><td>30</td><td>30</td><td>24</td><td>27</td><td>29</td><td></td></tr></table> Test whether you can discriminate between two horses. You can use the fact that 5% value of t for 11 degree of freedom is 2.20	A:	28	30	32	33	33	29	34	B:	29	30	30	24	27	29			8	CO2 CO3	L4	2.1.2				
A:	28	30	32	33	33	29	34																				
B:	29	30	30	24	27	29																					
d	Two independent samples of 8 and 7 items respectively had the following values of the variable <table border="1"><tr><td>I</td><td>9</td><td>11</td><td>13</td><td>11</td><td>15</td><td>9</td><td>12</td><td>14</td></tr><tr><td>II</td><td>10</td><td>12</td><td>10</td><td>14</td><td>9</td><td>8</td><td>10</td><td></td></tr></table> Do the estimates of the population variance differ significantly? Given that for 7 and 6 degree of freedom the value of F at 5% level	I	9	11	13	11	15	9	12	14	II	10	12	10	14	9	8	10			8	CO2	L4	2.1.2			
I	9	11	13	11	15	9	12	14																			
II	10	12	10	14	9	8	10																				

	a Explain Application of Analysis of Variance.	4	CO3	L2
	The varieties A,B,C of wheat were sown in 4 plots each and the following yields in quintals per acer were obtained : A 8 4 6 7. B 7 5 5 3. C 2 5 4 4.			
Q.3	Test the significance of difference between the yield of the varieties. Given that 5 % tabulated value of F for 2 and 9 degrees of freedom is 4.26	8	CO3	L2
	c Explain Logistic regression with example.	8	CO3	L5
	d What Is Multiple Linear Regression (MLR) with example?	8	CO3	L5
	a Explain (a) Rank (b) vector space (c) linear independent (d) linear dependent	4	CO3	L5
Q.4	b Find singular value decomposition of a given matrix $\begin{bmatrix} -4 & -7 \\ 1 & 4 \end{bmatrix}$	8	CO3	L2
	c Test for consistency and solve : $x + 2y + 3z = 14,$ $3x + y + 2z = 11,$ $2x + 3y + z = 11$	8	CO4	L4
	d Solve the following system of equations by Gauss elimination method. $2x + 3y + 4z = 11$	8	CO5	L4

	x+5y+7z= 15 3x+11y + 13z=25				
	If $f(x) = x^2 \sin \frac{1}{x}$, $x \neq 0$ $= 0$, $x=0$				
a	(a) Differentiable (b) not differentiable (c) undefined (d) none of these	4	CO4	L4	2.2.3
b	Divide an iron rod of length 24 cm into three parts such that the continued product of the first, square of the second and the cube of the third may be maximum.	8	CO4	L5	2.2.3
c	Evaluate the following limits (i) $\lim_{x \rightarrow 0} \frac{\sin^2 x - x^2}{x^2 \sin^2 x}$ (ii) $\lim_{x \rightarrow 0} \frac{e^x \sin x - x - x^2}{x^2 + x \log(1-x)}$	8	CO5	L2	2.2.3
d	Find the Taylor's series expansion for $\log(\cos x)$ about the point $\pi/3$.	8	CO5	L4	2.2.3

Course Outcomes, BL-Bloom Taxonomy, PI-Performance Indicator