CBCS SCHEME

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22SCN/SAM/SCS/SDS/SAD11

First Semester M.Tech. Degree Examination, Jan./Feb. 2023
Mathematical Foundation of Computer Science

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define vector space and give an example.	10	L1	CO1
	b.	Prove that set of all polynomials is a vector space over F.	10	L2	CO1
		OR			
Q.2	a.	Show that the intersection of two subspace of a vector space V(F) is subspace of V(F).	10	L2	CO1
	b.	Define the Linear Transformation and find the dimension of the subspaces $H = \left\{ \begin{bmatrix} a-3b+6c \\ 5a+4d \\ b-2c-d \\ 5d \end{bmatrix} \right\}$ a, b, c, d EIR	10	L2	CO1
		Module – 2			
Q.3	a.	Define the following terms i) Inner product ii) Orthogonal sets iii) Orthogonal projections.	10	L1	CO2
	b.	Find the least – squares solution of AX = b for $A = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$, $b = \begin{pmatrix} -3 \\ -1 \\ 0 \\ 2 \\ 5 \\ 1 \end{pmatrix}$	10	L1	CO2
		OR			
Q.4	a.	Find the curve of best fit of the type $y = ae^{bx}$ to the following data by the method of least squares x: 1, 5, 7, 9, 12 y: 10, 15, 12, 15, 21	10	L2	CO2
	b.	Fit a second degree parabola a by the method of least squares. x: 1, 2, 3, 4, 5 y: 1090, 1220, 1390, 1625, 1915	10	L2	CO2

		Module – 3			
Q.5	**a.**	Find the eigen valves and eigen vectors of $A = \begin{bmatrix} 2 & -1 & 0 \\ 3 & -2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$	**10**	**L2**	**CO3**
	b.	Define orthogonal sets and show that $\{u_1, u_2, u_3\}$ is an orthogonal set, where $u_1 = \begin{pmatrix} 3 \\ 1 \\ 1 \end{pmatrix}$, $w_2 = \begin{pmatrix} -1 \\ 2 \\ 1 \end{pmatrix}$, $w_3 = \begin{pmatrix} -1/2 \\ -2 \\ 7/2 \end{pmatrix}$	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Find QR factorization of $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$	**10**	**L2**	**CO3**
	b.	Explain the principal component analysis.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the following : i) Level of significance ii) Testing of hypothesis iii) Alternative hypothesis	**10**	**L1**	**CO4**
	b.	Define the student's t-test and A machinist is making engine parts with axle diameter of 0.7 inch. A random sample of 10 parts shows that means diameter 0.742 inch with S.D of 0.04 inch. On the basis of this sample would you say that the work is inferior?	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	The following table gives the number of aircraft accidents that occurred during the various days of the week. Find whether the accidents are uniformly distributed over the week.	**10**	**L2**	**CO4**
	b.	Explain the one-way classification of ANOVA.	**10**	**L2**	**CO4**

Day	S	M	T	W	T	F	S	Total
No. of accidents	14	16	8	12	11	9	14	84

Module – 5					
Q.9	**a.**	Define the periodic function and obtain the Fourier series of $f(x) = x \sin x$ in $0 < x < 2\pi$.	**10**	**L2**	**CO5**
	b.	Define integral transform and find the Fourier transform $f(x) = \begin{cases} 1 & \lvert x \rvert < 1 \\ 0 & \lvert x \rvert > 1 \end{cases}$ and hence deduce that $\int_0^\infty \frac{\sin x}{x} dx$.	**10**	**L2**	**CO5**
OR					
Q.10	**a.**	State and prove convolution theorem.	**10**	**L2**	**CO5**
	b.	Derive the formula for Parseval's formula.	**10**	**L2**	**CO5**

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22SCN/SAM/SCS/SDS/SAD12

First Semester M.Tech. Degree Examination, Jan./Feb. 2023
Fundamentals of Data Sciences

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is data science? What are the differences between data science and big data?	10	L2	CO1
	b.	Explain Datafication and current landscape.	10	L2	CO1
		OR			
Q.2	a.	Explain drew Conway's Venn diagram of data science representation.	10	L2	CO1
	b.	What are statistical inference, populations and samples?	10	L3	CO1
		Module – 2			
Q.3	a.	What is exploratory data analysis in data science?	10	L2	CO2
	b.	Illustrate data science process with the help of neat diagram.	10	L2	CO2
		OR			
Q.4	a.	What are Machine learning algorithms in data science and explain three classes of algorithms.	10	L2	CO2
	b.	What is the significance of linear regression in data science and what are the assumptions?	10	L3	CO2
		Module – 3			
Q.5	a.	Why linear regression technique is not recommended for filtering spam?	10	L3	CO2
	b.	Explain Naïve Bayes algorithm appraising tree diagram to build intuition.	10	L2	CO2
		OR			
Q.6	a.	What are salient features of logistic regression in data science?	10	L2	CO2
	b.	Pronounce the underlying mathematics in M6D logistic regression and write down the differences between logit and inverse logit.	10	L3	CO2
		Module – 4			
Q.7	a.	What are feature generation, feature extraction and wrappers in data science?	10	L2	CO4
	b.	Explain selection criteria in feature extraction process.	10	L2	CO4

		OR			
Q.8	**a.**	Explain decision tree with an example.	**10**	**L2**	**CO4**
	b.	Explain Random Forest Algorithms in data science.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	What are various terminologies in social network?	**10**	**L2**	**CO4**
	b.	What is MapReduce in data science?	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	What are the basic principles of data visualization?	**10**	**L2**	**CO4**
	b.	Why does data scientist require clustering of data?	**10**	**L2**	**CO4**

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22SCN/SCS13

First Semester M.Tech. Degree Examination, Jan./Feb. 2023
Advances in Computer Networks

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain network architecture.	10	L2	CO1
	b.	Explain sliding window algorithm.	10	L2	CO1
		OR			
Q.2	a.	Explain : i) Scalable connectivity ii) Manageability	10	L2	CO1
	b.	Difference between i) Bandwidth and latency ii) Delay and Bandwidth product	10	L2	CO1
		Module – 2			
Q.3	a.	Explain Bridges and LAN switches.	10	L2	CO1
	b.	Explain IPV_4 packet header.	10	L2	CO1
		OR			
Q.4	a.	Explain Class A, Class B and Class C address.	10	L2	CO1
	b.	Explain subnetting and classless Address.	10	L2	CO1
		Module – 3			
Q.5	a.	Explain how network is represented as graph and elaborate on Distance Vector (RIP)	10	L2	CO2
	b.	Explain flooding of link state packets.	10	L2	CO2
		OR			
Q.6	a.	Explain Dijkstra's shortest path algorithm and mention steps involve in this algorithm.	10	L2	CO2
	b.	Explain : i) Address and Routing ii) Address space allocation iii) Address notation	10	L2	CO2

Module – 4					
Q.7	**a.**	Explain silly window syndrome and Nagle's algorithm.	**10**	**L2**	**CO2**
	b.	Explain FIFO and Fair Queuing.	**10**	**L2**	**CO2**
OR					
Q.8	**a.**	Explain Fast Retransmit and Fast Recovery.	**10**	**L2**	**CO2**
	b.	Explain slow start Wien packet diagram.	**10**	**L2**	**CO2**
Module – 5					
Q.9	**a.**	Explain Network Management (SNMP)	**10**	**L2**	**CO3**
	b.	Explain Domain Hierarchy with neat diagram.	**10**	**L2**	**CO3**
OR					
Q.10	**a.**	Explain electronic mail considering SMTP, POP, IMAP, and MIME.	**10**	**L2**	**CO3**
	b.	Explain Source based congestion Avoidance	**10**	**L2**	**CO3**

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22SCS/SCN14

First Semester M.Tech. Degree Examination, Jan./Feb. 2023
Internet of Things & Applications

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain with appropriate figures H_2H, H_2M and M_2M environment.	10	L2	CO1
	b.	Explain with block diagram communication supported in $MIPV_6$ through HA.	10	L2	CO1
		OR			
Q.2	a.	Explain with block diagram direction of standardization according to IOT definition.	10	L2	CO1
	b.	Explain with block diagram advanced metering infrastructure.	10	L2	CO2
		Module – 2			
Q.3	a.	Explain in detail properties and requirements of M_2M applications.	7	L2	CO2
	b.	Explain in detail with respect to IOT applications : (i) Device intelligence. (ii) Communication capabilities (iii) Mobility support (iv) Device power.	8	L2	CO2
	c.	Explain with block diagram RFID reader operation.	5	L2	CO2
		OR			
Q.4	a.	Explain in detail : (i) Abstract layering of COAP. (ii) Overall protocol stack in COAP's environment.	10	L2	CO2
	b.	Explain with block diagram : (i) M_2M in 3GPP – Service model (ii) M_2M in 3GPP – Architecture.	10	L2	CO2
		Module – 3			
Q.5	a.	Compare WBAN, WSN and Cellular wireless networks.	6	L3	CO2
	b.	Explain with block diagram, Zigbee protocol stack (details).	7	L2	CO2
	c.	Explain with block diagrams different frame formats used in IEEE 802.15.4.	7	L2	CO2
		OR			

Q.6	a.	Explain with appropriate figures IPV6 tunneling : unidirectional ; bidirectional.	10	L2	CO2
	b.	Explain with block diagram IpSec Network environment.	10	L2	CO2
Module – 4					
Q.7	a.	Explain in detail Home automation IOT system.	10	L2	CO3
	b.	Explain with block diagrams Home intrusion detection IOT system.	10	L2	CO3
OR					
Q.8	a.	Explain with block diagram Smart Parking IOT system.	10	L2	CO3
	b.	Explain with block diagrams weather monitoring IOT system.	10	L2	CO3
Module – 5					
Q.9	a.	Explain with block diagram, components of a Hadoop cluster and Hadoop Map Reduce job execution.	10	L2	CO4
	b.	Explain with block diagram Hadoop Map Reduce Next Generation (YARN) job execution.	10	L2	CO4
OR					
Q.10	a.	Explain in detail Oozie workflow for IOT data analysis.	10	L2	CO4
	b.	Explain with block diagram components of a storm cluster and also explain example of a storm topology.	10	L2	CO4

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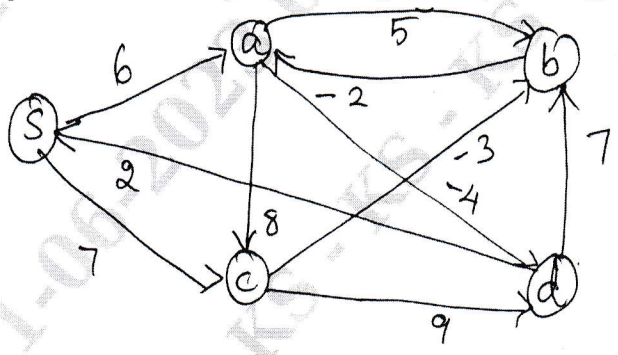
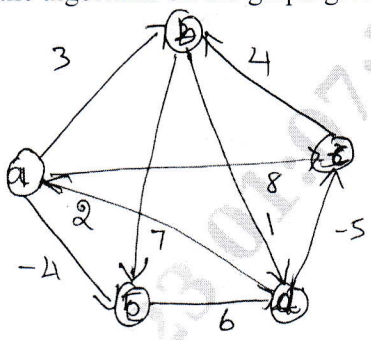
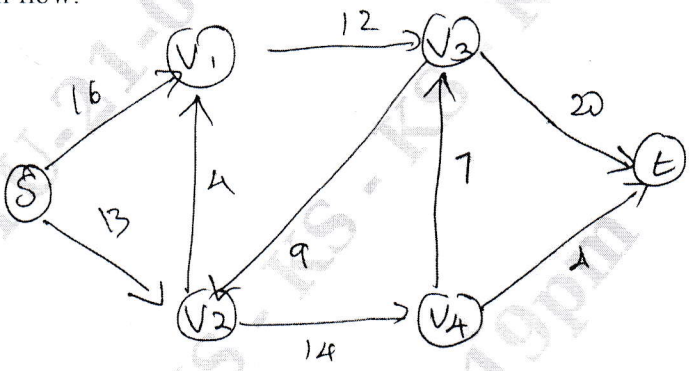
22SCS15

First Semester M.Tech. Degree Examination, Jan./Feb. 2023
Advanced Algorithms

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Describe the asymptotic notations used for running time of an algorithm with examples.	10	L2	CO1
	b.	Using substitution method, solve the following recurrence relation to give an upper and lower bound: $T(n) = 2T(n / 2) + n$.	5	L3	CO1
	c.	Construct a recursion tree for the recurrence, $T(n) = 3T(n/4) + cn^2$ and indicate the running time.	5	L2	CO1
		OR			
Q.2	a.	Using master method, solve the following recurrences: i) $T(n) = 3T(n/4) + n \log(n)$ ii) $T(n) = 4T(n/2) + n$ iii) $T(n) = 9T(n/3) + n$ iv) $T(n) = 8T(n/2) + n^2$ v) $T(n) = T(2n/3) + 1$.	10	L3	CO1
	b.	Define amortized analysis. Explain accounting method with an example.	10	L2	CO1
		Module – 2			
Q.3	a.	Find the single source 'S' shortest path using Bellman-Ford algorithm for the given graph. Write the analysis of the algorithm (Refer Fig.Q.3(a)).  Fig.Q.3(a)	10	L2	CO2
	b.	Briefly explain the following: i) Flow N/Ws ii) Residual networks iii) Cuts iv) Augmenting paths.	10	L2	CO2

		OR			
Q.4	**a.**	Write the Johnson algorithm to solve all pairs shortest path problem for sparse graphs and run the algorithm on the graph given in the Fig.Q.4(a).  Fig.Q.4(a)	**10**	**L3**	**CO2**
	b.	Write the basic Ford-Fulkerson algorithm for maximum flow problem and apply the algorithm on the graph shown in Fig.Q.4(b) and Find the maximum flow.  Fig.Q.4(b)	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Write the extended Euclid's algorithm and also find a GCD (99, 78) using the same.	**10**	**L2**	**CO2**
	b.	Define Group. When it is called abelian group? Give a table for group operation multiplication modulo 15 and show that it is an abelien group.	**10**	**L2**	**CO2**
		OR			
Q.6	**a.**	Apply the Chinese remainder theorem to the following equations: $a \equiv 2 \pmod 5$ $a \equiv 3 \pmod{13}$ Generate all the solutions in the form of a table.	**10**	**L3**	**CO2**
	b.	Write the procedure for RSA public-key crypto system. Apply it for the following input p = 3 and q = 11, e = 7 compute d and encrypt M = 2.	**10**	**L3**	**CO2**
		Module – 4			
Q.7	**a.**	Write a Rabin-Karp string matching algorithm. Search for a pattern 26 in the text string 3141592653589793 with 9 = 1.	**10**	**L2**	**CO3**
	b.	Discuss KMP matcher algorithm with steps. Find pattern 001002 in text 001001002000100201.	**10**	**L2**	**CO3**

		OR			
Q.8	**a.**	Explain finite – automation algorithm and construct the string matching automatic for pattern P = ababaca and illustrate its operation on the text string T = abababacaba.	**10**	**L2**	**CO3**
	b.	Write Boyer-Moore algorithm for string matching problem. Illustrate it on the following input: Text : BESS_KNEW_ABOUT_BAOBAB Pattern : BAOBAB.	**10**	**L2**	**CO3**
		Module – 5			
Q.9		Write a note on probabilistic algorithms and randomizing deterministic algorithm.	**20**	**L2**	**CO3**
		OR			
Q.10		Explain Monte Carlo and Las Vegas algorithms with example.	**20**	**L2**	**CO3**

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22RMI16

First Semester M.Tech. Degree Examination, Jan./Feb. 2023
Research Methodology and IPR

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What do you mean by research? Explain its significance in modern times and also list the objectives of research.	10	L2	CO1
	b.	Briefly describe the different steps involved in a research process.	10	L2	CO1
		OR			
Q.2	a.	List and explain the Qualities of a good research.	10	L2	CO1
	b.	List all the criterias satisfied by the scientific research.	10	L2	CO1
		Module – 2			
Q.3	a.	What is the importance of literature review in research.	10	L2	CO2
	b.	Explain how to review the literature (steps) and searching for the existing literature.	10	L2	CO2
		OR			
Q.4	a.	Explain meaning of Research Design and Features of a good design.	10	L2	CO2
	b.	Describe important concepts relating to a Research design.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the main steps in sampling design.	10	L2	CO2
	b.	List and explain types of sampling design.	10	L2	CO2
		OR			
Q.6	a.	Explain the classification of measurement scales.	10	L2	CO2
	b.	What is the Goodness of measurement scales? Explain.	10	L2	CO2
		Module – 4			
Q.7	a.	What is a hypothesis? List the characteristics of hypothesis.	10	L2	CO2
	b.	The procedure of testing hypothesis requires a researcher to adopt several steps. Describe in brief all such steps.	10	L3	CO3
		OR			
Q.8	a.	Find the value of χ^2 for the following information: Class: A B C D E Observed frequency: 8 29 44 15 4 Theoretical frequency: 7 24 38 24 7	10	L3	CO3
	b.	A die is turn on 132 times with following results: Number turned up: 1 2 3 4 5 6 Frequency: 16 20 25 14 29 28 Is the die unbiased?	10	L3	CO3
		Module – 5			
Q.9	a.	Explain the significance of a research report and narrate the various steps involved in writing such a report.	10	L3	CO3
	b.	Mention the different types of report, particularly pointing out the difference between a technical report and a popular report.	10	L3	CO3
		OR			
Q.10	a.	What is TRIPS? Explain in brief?	10	L2	CO2
	b.	What is Patent Cooperation Treaty (PCT)? Write its advantages and basic principles.	10	L2	CO2