4E1301

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4E1301

B. Tech. IV - Sem. (Main / Back) Exam., - 2025
Computer Sc. & Engineering (Cyber Security)
4CCS2-01 Discrete Mathematics Structure
CS, IT, AID, CAI, CCS, CDS, CIT

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 If A = {1, 2, 3} and B = {a, b, c}, how many total possible relations can be formed from A to B?

Q.2 If f, g : $\mathbb{R} \rightarrow \mathbb{R}$ are defined as $f(x) = x^2$ and $g(x)$ $5x + 1$. Find the composition $(f \circ g)(x)$ at $x = 2$.

Q.3 When are two finite state automata said to be equivalent?

Q.4 Define universal and existential quantifiers.

Q.5 What is a complemented lattice?

Q.6 Find the middle term in the expansion of $(x^2 + 2/x^4)^{14}$.

Q.7 What is an Abelian Group? Give an example of an infinite Abelian group.

Q.8 Define the cyclic group.

Q.9 What do you mean by a regular graph?

Q.10 Draw graph which is -

(a) Eulerian but not Hamiltonian.

(b) Hamiltonian but not Eulerian.

[5×4=20]

PART – B

(Analytical/ Problem solving questions)

Attempt any five questions

Q.1 Among 50 students in a class, 26 got an A in the first examination and 21 got an A in the second examination. If 17 students did not get an A in either examination, how many students got A in both the examinations?

Q.2 Use mathematical induction to prove that for all $n \geq 1$, $10^n - 1$ is divisible by 9.

Q.3 Prove by constructing truth table

$$P \rightarrow (Q \vee R) \cong (P \rightarrow Q) \vee (P \rightarrow R).$$

Q.4 Let B be the power set of $S = \{1, 2, 3\}$ and $(B, \leq)$ be a poset defined by $X \leq Y$ if $X \subseteq Y$ for $X, Y \in B$. Draw the Hasse diagram of the poset $(B, \leq)$.

Q.5 How many words can be formed from the letter of the word "DAUGHTER" if the vowels always coming together?

Q.6 Prove that the intersection of any two normal subgroups of a group G is normal subgroup of G.

Q.7 Determine whether the graph given below by its adjacency matrix is connected or not.

$$\begin{pmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{pmatrix}$$

PART – C

[3×10=30]

(Descriptive/ Analytical/ Problem Solving/ Design Questions)

Attempt any three questions

Q.1 Let R be a relation defined on the set $\mathbb{N} = \{1, 2, 3 \ldots\ldots\}$ such that a, b $\in \mathbb{N}$, aRb if and only if $a = b^k$, $k \in (0, 1, 2, 3, \ldots\ldots)$. Then show that R is a partial ordering relation on $\mathbb{N}$.

Q.2 (a) Find the disjunctive normal form of

$$P \rightarrow ((P \rightarrow Q) \wedge \sim (\sim P \vee \sim P)).$$

(b) Show that the following proposition is tautology:

$$(P \rightarrow Q) \leftrightarrow (\sim P \vee Q)).$$

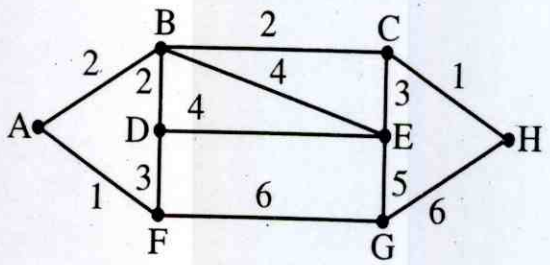
Q.3 Find an explicit formula for the following linear homogeneous recurrence relation :

$$a_n = -4a_{n-1} - 3a_{n-2}, \text{ if } n \geq 2,$$

with the initial conditions $a_0 = 4$ and $a_1 = 8$.

Q.4 Show that the set of all square matrix of order (m × m) under the binary operations addition and multiplication is a non-commutative ring.

Q.5 Using Dijkstra's algorithm, find the shortest path between the vertices A and H in the weighted graph shown in figure.



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4E1302

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4E1302

B. Tech. IV - Sem. (Main / Back) Exam., - 2025

Aeronautical Engineering

4AN1-03 Managerial Economics & Financial Accounting

All Branches

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Define Managerial Economics. [2]

Q.2 What do you mean by Opportunity Cost? [2]

Q.3 Distinguish between demand curve and demand schedule. [2]

Q.4 What are Giffen goods? [2]

Q.5 What is GDP? [2]

Q.6 Define Monopoly. [2]

Q.7 What is ISOQUANTS? [2]

Q.8 Define Elasticity. [2]

Q.9 What is Pay-back Period? [2]

Q.10 What is Profitability Ratio? [2]

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain 'Law of Returns to Scale'. [4]

Q.2 What are the determinants of demand? [4]

Q.3 What is Oligopoly? What are its features? [4]

Q.4 Explain the degrees of Price Elasticity of Demand. [4]

Q.5 Write a short note on Cash Flow Analysis. [4]

Q.6 Distinguish between Explicit and Implicit costs? [4]

Q.7 Given TFC as Rs. 40, find values of TVC, AC, AFC, and MC based on the given table - [4]

Q	0	1	2	3	4	5	6	7
TC	40	52	59	64	70	78	89	103

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 What is Elasticity of Demand? And explain its types and measurement. [10]

Q.2 Explain the price output determination under Perfect competition. [10]

Q.3 Using suitable diagrams, explain the Law of Variable Proportions. [10]

Q.4 Write a short note on - [5×2=10]

(i) Marginal Cost

(ii) Net Present Value Method

(iii) Proprietary Ratio

(iv) Internal Rate of Return

(v) Working Capital

Q.5 The Balance Sheet of Punjab Auto Limited as on 31-12-2002 was as follows - [10]

Particular	Rs.	Particular	Rs.
Equity Share Capital	40,000	Plant & Machinery	24,000
Capital Reserve	8,000	Land & Building	40,000
8% Loan on Mortgage	32,000	Furniture & Fixtures	16,000
Creditors	16,000	Stock	12,000
Bank Overdraft	4,000	Debtors	12,000
Taxation :		Investments (short-term)	4,000
Current	4,000		
Future	4,000	Cash-in-hand	12,000
Profit & Loss A/c	12,000		
	1,20,000		1,20,000

From the above, compute (a) The Current Ratio, (b) Quick Ratio, (c) Debt-Equity Ratio, and (d) Proprietary Ratio.

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4E1304

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4E1304

B. Tech. IV - Sem. (Main / Back) Exam., - 2025

Artificial Intelligence and Data Science

4AID3-04 Microprocessor & Interfaces

CS, AID, CAI, CCS, CDS, CIT

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Discuss the concept of static RAM.

Q.2 Differentiate between microprocessor and microcontroller.

Q.3 What do you mean by stack pointer?

Q.4 Define instruction cycle.

Q.5 Explain the purpose of READY and HOLD pins of 8085 MP.

Q.6 Draw the flag register of 8085 and explain.

Q.7 What is WZ pair in 8085 microprocessor?

Q.8 Discuss XTHL instruction of 8085 microprocessor.

Q.9 What are the methods of passing parameters to subroutines?

Q.10 What is BSR command of 8255 PPI?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Discuss the concept of multiplexing and de-multiplexing of buses in 8085 MP.

Q.2 What are the different addressing modes in 8085 MP? Discuss each with suitable example.

Q.3 Calculate the total delay produced by using an 8-bit register.

Q.4 Discuss the concept of RS232C and RS422A.

Q.5 Discuss the control word register command for 8254 PIT.

Q.6 Discuss the different operating modes used in 8259 PIC.

Q.7 Write an assembly language program to add two 8-bit number.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Draw the architecture of 8085 microprocessor and discuss each part of it.

Q.2 What are the vectored interrupts? How the address of the interrupt service routine calculated in vectored interrupts? Explain with an example.

Q.3 Draw the timing diagram of memory read machine cycle.

Q.4 Write the technical note on following -

(i) IEEE 488 (ii) Liquid crystal display

Q.5 Write an assembly language program to find the square of a number.

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B. Tech. IV - Sem. (Main / Back) Exam., - 2025

Information Technology

4IT3-04 Principle of Communication

Time: 3 Hours

Maximum Marks: 70

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What is the main difference between DSBSC and SSB modulation?

Q.2 State the advantages of CDMA.

Q.3 What is the purpose of pre-emphasis and de-emphasis in FM systems?

Q.4 Define aliasing and how it can be prevented.

Q.5 What is the Nyquist criterion for distortion-free baseband transmission?

Q.6 What is the role of a matched filter in digital communication systems?

Q.7 Define processing gain in the context of spread spectrum modulation.

Q.8 What is the significance of Pseudo-Noise (PN) sequences in DSSS?

Q.9 State the key difference between PAM and PWM.

Q.10 Discuss the need for modulation.

[5×4=20]

PART – B

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain the generation and demodulation of a DSBSC signal.

Q.2 Describe the time and frequency domain representation of an FM signal.

Q.3 What is Frequency Division Multiplexing (FDM)? Explain its applications.

Q.4 Derive the sampling theorem and explain its importance in communication systems.

Q.5 Describe the working of a T1 carrier system.

Q.6 Explain the generation and detection of QPSK signals.

Q.7 Discuss the working of a Frequency-Hop Spread Spectrum (FHSS) system.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Explain the working of a Phase-Locked Loop (PLL) and its applications in FM demodulation.

Q.2 Explain the concept of Delta Modulation and Adaptive Delta Modulation (ADM). Compare their performance with PCM.

Q.3 Discuss the geometric interpretation of signals and orthogonalization in digital modulation. Explain the coherent detection of ASK, PSK and FSK signals.

Q.4 Describe the raised cosine spectrum and its role in achieving Nyquist's criterion for distortion-free transmission.

Q.5 Explain the working of Direct Sequence Spread Spectrum (DSSS) with coherent BPSK. Derive the expression for its probability of error.

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4E1305

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4E1305

B. Tech. IV - Sem. (Main / Back) Exam., - 2025

Artificial Intelligence and Data Science

4AID4-05 Database Management System

CS, IT, AID, CAI, CCS, CDS, CIT

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Why is a DBMS preferred over a traditional file system?

Q.2 What is the difference between a weak entity and a strong entity?

Q.3 Name any two operations of relational algebra with example.

Q.4 What is ODBC? How does it differ from JDBC?

Q.5 Explain the concepts of Primary Key.

Q.6 What is Concurrency?

Q.7 Draw a neat diagram of database system architecture.

Q.8 What is Entity? Explain with example.

Q.9 What is the need of Serializability in transaction processing?

Q.10 Explain role of Triggers in SQL programming.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain binary, ternary and weak entity relationship with examples.

Q.2 Define the following with example -

(a) Aggregation in E-R model

(b) Data Integrity

Q.3 What is Boyce-Codd Normal Forms & 3-NF in detail?

Q.4 Describe relationship algebra selection and projection with example.

Q.5 What is shadow paging? Explain in detail.

Q.6 What is transaction? Explain its ACID properties?

Q.7 Compare lock-based and timestamp-based concurrency control.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Explain Entity Relationship model. Draw E-R diagram for university management system with complete labelling.

Q.2 What are functional dependencies? Give a relation R (A, B, C, D) with dependencies {A→B, B→C, C→D}, decompose it into BCNF and explain the process.

Q.3 Explain different types of concurrency control technique. Compare their advantages and disadvantages.

Q.4 Create a table called Employee that contain attributes (EMPNO, ENAME, JOB, MGR, SAL) execute the following -

(1) Add a column commission with domain to the Employee table.

(2) Insert any five records into the table.

(3) Update the column details of job.

(4) Rename the column of Employee table using alter command.

(5) Delete the employee whose Empno. is 105.

Q.5 Explain the recovery schemes in database. Also explain deadlock handling.

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4E1306

Roll No. _____ Total No. of Pages: 4

4E1306

B. Tech. IV - Sem. (Main / Back) Exam., - 2025
Artificial Intelligence and Data Science
4AID4-06 Theory of Computation
CS, IT, AID, CAI, CCS, CDS, CIT

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What are acceptors and transducer in context of Turing machine?

Q.2 Define a Finite Automata.

Q.3 Write applications of Mealy and Moore machines.

Q.4 What are the computable functions?

Q.5 Define any one closure property of regular sets.

Q.6 Show that the grammar $S \rightarrow aB \mid ab$, $A \rightarrow aAB \mid a$, $B \rightarrow Abb \mid b$ is ambiguous.

Q.7 Describe the Context-sensitive grammar (CSG).

Q.8 What is NP complete and NP hard problem?

Q.9 What is the use of Null Production and Unit Production?

Q.10 What is recursively enumerable language?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Describe the terms tractable problem, intractable problem and undecidability problem in context of computation.

Q.2 Discuss Turing machine as language acceptors and transducers. Construct Turing machine for language $L = \{a^n b^n c^n \mid n >= 1\}$.

Q.3 What is the role of CFG for PDA? Construct the PDA for language $L = \{a^n b^{2n} \mid n >= 1\}$.

Q.4 Distinguish CNF and GNF with examples. Also explain problem related to them.

Q.5 Explain the Chomsky classification with the suitable example of each grammar.

Q.6 Discuss the equivalence of DFA and NDFA.

Q.7 Construct the CSG for the language $L = \{a^n b^n c^n \mid n >= 1\}$.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Elaborate pumping lemma for regular language. Show that the language $L = \{a^n b^n \mid n > 0\}$ is not regular by using pumping lemma.

Q.2 Deduce Myhill-Nerode theorem and prove that following language is regular: $L = \{w \in \{a, b\}^* \mid w$ having even number of a's$\}$.

Q.3 Explain conversion of Finite automata to regular expression and vice versa. Prove that the strings recognized by the following finite automata are: (a + a (b + aa) * b)*a (b + aa) * a). Where P is the initial state and R is the final state.

Current State	Current Input: a	Current Input: b
P	P, Q	
Q	R	P, Q
R	Q	

Q.4 Discuss the solution of travelling salesman problem with a real-world example.

Q.5 Explain the following terms with examples -

(1) Universal Turing Machine

(2) Multitrack Turing Machine

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4E1307

Roll No. _____ Total No. of Pages: 4

4E1307

B. Tech. IV - Sem. (Main / Back) Exam., - 2025

Artificial Intelligence and Data Science

4AID4-07 Data Communication and Computer Networks

CS, IT, AID, CAI, CCS, CDS, CIT

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Name any three common network topologies.

Q.2 What is the purpose of communication protocols in a computer network?

Q.3 Which layers of the OSI model are combined into a single layer in the TCP/IP model?

Q.4 What is **line coding**, and why is it important in digital communication?

Q.5 What are the three main factors that affect the **performance** of a communication system?

Q.6 Differentiate between **IPv4** and **IPv6** addressing. Mention one advantage of **IPv6**.

Q.7 What is Quality of Service (QoS)?

Q.8 What is Forward Error Correction (FEC), and how is it different from error detection methods?

Q.9 What is **congestion control**, and why is it important in the network layer?

Q.10 What is the **Stop-and-Wait ARQ** protocol?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain the concept of data rate limitations in signal transmission and one factor that influences it.

Q.2 Define modulation and mention one advantage of using digital modulation techniques.

Q.3 What are the two main types of errors in data transmission? Provide a brief explanation of each.

Q.4 What is the main difference between CSMA/CD and CSMA/CA in managing data collisions?

Q.5 Explain the difference between **unicast**, **multicast**, and **broadcast** communication.

Q.6 Briefly describe the **leaky bucket** and **token bucket** algorithms and their role in traffic management.

Q.7 List and briefly describe any two protocols used for **email transmission**.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Given the following IPv4 subnet mask (255.255.255.192):

(a) How many subnets and hosts per subnet can be created?

(b) Identify the network address and broadcast address for the IP 192.168.10.65/26.

Q.2 A network experiences packet loss due to congestion. Suggest and explain two congestion control techniques the network layer can implement to mitigate this issue.

Q.3 In a sliding window protocol with a window size of 4, if frames 0, 1, 2, and 3 are sent and frame 1 is lost:

(a) How does the Go-Back-N protocol handle the error?

(b) How does the Selective Repeat protocol handle the error?

Q.4 A user reports that they cannot reach a website using its domain name, but accessing it via its IP address work fine. Diagnose and explain the most likely cause of this issue and propose a troubleshooting method.

Q.5 A network using Slotted ALOHA has a frame generation rate of 200 frames/second. If the time slot duration is 5 ms, calculate probability of successful transmission using the formula:

$$P=G\times e^{-G}$$

Where G is the average number of frames generated per time slot?

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