4E1301

Roll No. : ....

4E1301

B.Tech. IV-Sem. (Main/Back) Exam, 2024

Artificial Intelligence & Data Science

4AID2-01 / 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 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)

PART-A	[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. Represent the symmetric difference of two sets by Venn diagram.

Q.2. Define the properties of Partial Order Relation.

Q.3. What is Pigeonhole Principle?

Q.4. Obtain the DNF of the proposition $(p \to q) \wedge (\sim p \wedge q)$.

Q.5. Explain Quantifiers. Also write properties of quantifiers.

Q.6. Find the least upper bound of $\{2, 9\}$ and greatest lower bound of $\{60, 72\}$, if it exists, of the poset $(\{2, 4, 6, 9, 12, 18, 27, 36, 48, 60, 72\}, /)$.

Q.7. What is a generating function? Give example.

Q.8. Show that the multiplicative group $G = \{1, -1, i, -i\}$ is cyclic. Find its generators.

Q.9. State the Kurtowski's theorem.

Q.10. What is the difference between path and circuit? Define Hamiltonian path and circuit.

PART-B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Participation in sports is compulsory in a college. In a class of 80 students, 60 play football, 40 play basketball. Find :

   (i) how many play both the games

   (ii) how many play football only

Q.2. Let $A = \{1, 2, 3, 4\}$ and consider the partition $P = \{\{1, 2, 3,\}, \{4\}\}$ of A. Obtain the equivalence relation R on A determined by P.

Q.3. State the converse, inverse and contrapositive of the statement "If today is Easter, then tomorrow is Monday". Also construct truth table.

Q.4. Solve the recurrence relation : $a_r = 2a_{r-1} - a_{r-2}, r \geq 2$, with $a_0 = 1, a_1 = 2$.

Q.5. Define the following :

   (i) Permutation groups

   (ii) Normal subgroup

(iii)   Homomorphism group

(iv)   Isomorphism group

Q.6.   Prove that $1^3 + 2^3 + ... + n^3 = \left[\dfrac{n(n+1)}{2}\right]^2$,$n \geq 1$ by mathematical induction.

Q.7.   Find the chromatic polynomial, chromatic number and number of ways of proper coloring with minimum colors of the given graph :
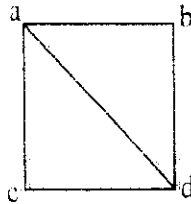
(Descriptive/Analytical/Problem-Solving/Design questions)

Attempt any three questions

Q.1.   Out of 250 failed students, 128 failed in Maths, 87 in Physics and 134 in aggregate, 31 failed in Maths and Physics, 54 failed in aggregate and in Maths, 30 failed in aggregate and in Physics. Find how many candidates failed :

(i)   In all three subjects

(ii)   In Maths not in Physics

(iii)   In aggregate but not in Maths

(iv)   In Physics but not in aggregate or Maths

(v)   In the aggregate or in Maths, but not in Physics

Q.2.   (a)   Define tautology and prove the following :   [3]

$(p \rightarrow q) \rightarrow (\sim q \rightarrow \sim p)$ is tautology.

(b)   Define fallacy and prove the following :   [3]

$(p \wedge q) \vee \sim (p \wedge q)$ is a fallacy.

(c)   Prove the following :   [4]

(i) $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \vee r)$

(ii) $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$

Q.3.   Use generating functions to solve the recurrence relation $a_r - 7a_{r-1} + 10a_{r-2} = 0$ for $r \geq 2$ where $a_0 = 10$ and $a_1 = 41$.

Q.4.   Consider an algebraic system $(G, *)$, where G is the set of all non-zero real numbers and * is a binary operation defined by $a * b = \dfrac{ab}{4}$, show that $(G, *)$ is an abelian group.

Q.5.   (a)   Find the shortest path and its length between the vertices a and h in the following weighted graph :   [6]
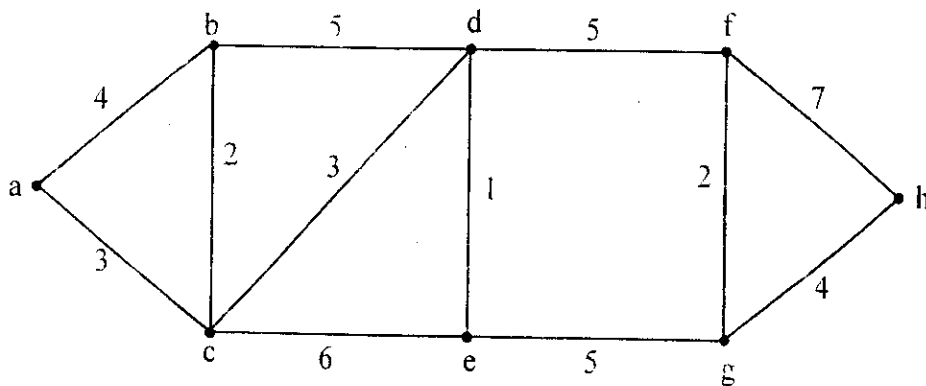
(b)   Define and explain the following by suitable example :   [4]
(i)   Isomorphism of graphs
(ii)   Planar graphs

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4E1303

4E1303

B.Tech. IV-Sem. (Main/Back) Exam. - 2024

COMPUTER SCIENCE & ENGINEERING (AI)

4CAI1-02 / Technical Communication

All Branches

Time : 3 Hours   Maximum Marks : 70

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 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. ....   2. ....

PART-A   **[10x2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1.   What is Technical Communication?

Q.2.   What is Linguistic Ability?

Q.3.   Name any two technical documents.

Q.4. What is Print Media?

Q.5. Why is technical communication important?

Q.6. What are 'Minutes of Meeting'?

Q.7. What is e-mail?

Q.8. Mention any two types of technical reports.

Q.9 What is Technical Proposal?

Q.10. What is Technical Report?

PART-B   [5x4=20]
(Analytical/Problem-solving questions)
Attempt any five questions

Q.1. Define Technical Communication. Why is it important?

Q.2. What are different aspects of technical communication?

Q.3. What are different kinds of technical documents?

Q.4. What is Information Collection?

Q.5. Discuss technical writing process.

Q.6. Discuss the characteristics of technical reports.

Q.7. What are Technical Articles? What are different types of technical articles?

PART-C   [3x10=30]
(Descriptive/Analytical/Problem-Solving/Design questions)
Attempt any three questions

Q.1. What are Technical Communication Skills? Discuss in detail.

Q.2. How to read and comprehend technical manuals?

Q.3. Write an application for job. Invent necessary detail. Attach your resume also.

Q.4. What is 'Technical Project Proposal'? Discuss in detail.

Q.5. What are characteristics of technical proposals?

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Total No. of Questions : 22   Total No. of Pages : 04

Roll No. : ....

4E1302

4E1302

B.Tech. IV-Sem (Main/Back) Exam, 2024

Artificial Intelligence and Data Science

4AID1-03 / Managerial Economics and Financial Accounting

All Branches

Time : 3 Hourse   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 from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing 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. ....   2. ....

<div align="center">

PART-A   [10×2=20]

Answer should be given up to 25 words only.

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Note : All questions are compulsory. Each question carries 02 marks.

Q.1. What do you mean by managerial economics?

Q.2. How is disposable income different from personal income?

Q.3. What are the determinants of Supply?

Q.4. What does the shape of an isoquant show?

Q.5. What does opportunity cost mean?

Q.6. Write down the steps of operating cycle.

Q.7. What do you mean by double entry accounting system?

Q.8. What does break-even point mean?

Q.9. Why is there problem of scarcity and choice in economics?

Q.10. What do you mean by income demand.

PART-B [5×4=20]

(Analytical / Problem-solving questions)

Note :Attempt any five questions. Each question carries 4 marks.

Q.1. Explain any one method of measuring National Income.

Q.2. Explain the concept of elasticity of demand.

Q.3. Write short note on least cost combination of inputs.

Q.4. Discuss the relations between Average Cost and Marginal Cost of a firm.

Q.5. Using suitable diagram, explain the kinked demand curve under Oligopoly.

Q.6. Discuss the various steps in accounting process.

Q.7. Explain the concept of ratio analysis.

PART-C
[3×10=30]

(Descriptive / Analytical / Problem solving / Design questions)

Note : Attempt any three questions. Each question carries 10 marks.

Q.1. What is demand forecasting? Discuss the qualitative and quantitative methods of demand forecasting.

Q.2. Explain the various types of cost with the help of suitable diagrams.

Q.3. Explain the price and output determination under monopoly.

Q.4. Discuss the main information given in balance sheet and profit and loss account.

Q.5. Critically examine the various methods of evaluation of capital budgeting proposals.

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4E1330

B.Tech. IV-Sem. (Main/Back) Exam. 2024

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 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. ....   2. ....

PART-A   [10x2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1.   Define frequency translation.

Q.2.   What is Amplitude Modulation (AM)?

Q.3.   Differentiate between DSBSC and SSB modulation.

Q.4. Explain the concept of Frequency Division Multiplexing (FDM).

Q.5. What is Phase Modulation (PM)?

Q.6. Describe the role of pre-emphasis and de-emphasis in FM.

Q.7. State the Sampling Theorem.

Q.8. What is aliasing in the context of sampling?

Q.9. Define Pulse Amplitude Modulation (PAM).

Q.10. Explain the difference between Uniform and Non-uniform quantization.

PART-B [5x4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Derive the mathematical expression for an AM signal and illustrate its spectrum.

Q.2. Explain the process of generating and demodulating a DSBSC signal.

Q.3. Describe the process of ideal sampling and its significance in Communication.

Q.4. Analyze the error probability in a PCM system and derive the expression for signal to quantization noise ratio.

Q.5. Illustrate the concept of intersymbol interference(ISI) and its impact on baseband transmission.

Q.6. Compare the performance of PSK and FSK modulation techniques in terms of bandwidth efficiency and error probability.

Q.7. Discuss the working of a Direct Sequence Spread Spectrum (DSSS) system with coherent BPSK.

PART-C   **[3x10=30]**

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any three questions

Q.1.   Explain the generation and demodulation of SSB signals and compare their bandwidth efficiency with DSBSC and full AM signals.

Q.2.   Describe the process of natural and flat top sampling and their reprsentation in the frequency domain.

Q.3.   What are the different methods of generating FM signals? Explain with suitable diagrams and equations.

Q.4.   Discuss the principles of Delta Modulation and Adaptive Delta Modulation (ADM). How does ADM improve over standard Delta Modulation?

Q.5.   Explain the Nyquist criterion for distortion-free baseband transmission. How does raised cosine filtering help in reducing ISI?

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Total No. of Questions : 22   Total No. of Pages : 04

Roll No. : ....

4E1304

4E1304

B.Tech. IV-Sem (Main/Back) Exam. 2024

COMPUTER SCIENCE & ENGINEERING (AI)

4CAI3-04, Microprocessor and Interfaces

CS, AID, CAI

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 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. ....   2. ....

PART-A   [10×2=20]

Answer should be given up to 25 words only

All questions are compulsory.

Each question carries 02 marks

Q.1. Specify the size of data, address, memory word and memory capacity of 8085 microprocessor.

Q.2. Draw the flag register configuration for 8085 microprocessor.

Q.3. State the difference between direct and indirect addressing.

Q.4. What is the use of tristate devices in bus oriented system?

Q.5. Describe the use of RIM and SIM instruction.

Q.6. Write a program to add 7 BH and 6 AH using ADI instruction.

Q7. What is the difference between delay and counter?

Q.8. State the difference between JUMP and CALL instruction.

Q.9. What are different modes of 8255 PPI?

Q.10. Mention the purpose of HOLD and READY pins of 8085 microprocessor.

PART - B   [5×4=20]

Analytical / Problem-solving questions. Attempt any 05 questions.
Each question carries 04 marks.

Q.1. Explain the internal architecture of 8085 microprocessor using neat diagram.

Q.2. What are external initiated operations in 8085 microprocessor? Explain briefly.

Q.3. Compare the function of following instruction pairs :

(i)   JMP & CALL

(ii)   STAX & LDAX

(iii)   LHLD & LXI

(iv)   ANA & ANI

Q.4. What is the use of stack? Explain the PUSH & POD operations using suitable example.

Q.5. Explain the control word of 8254 program. interval timer using suitable diagram.

Q.6. Write a program to do addition of two 8 bit numbers whose 16 bit result is stored at memory location 5080H.

Q.7. Compare RS232C and RS422A serial RS422A serial data standards.

PART - C [3×10=30]

Descriptive / Analytical / Problem-solving / Design questions.

Attempt any 03 questions. Each question carries 10 marks.

Q.1. Design 8085 based system with following specifications :

   (i) System frequency 3MH$_z$

   (ii) Interface 16 kb EPROM using 8kb chip

   (iii) Interface 32 kb RAM using 16 kb chip

Q.2. Draw the block diagram of 8259 programmable interrupt controllers and explain its operation.

Q.3. How Liquid crystal display is interfaced with 8085 microprocessor? Explain it using neat diagram.

Q.4. Draw the internal block diagram of 8251 USART and explain its initialization process.

Q.5. Write short notes on the following :

   (i) Memory interfacing

   (ii) IEEE 488

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4E1305

Roll No. : ....

4E1305

B.Tech. IV-Sem. (Main/Back) Exam. - 2024

COMPUTER SCIENCE AND ENGINEERING (AI)

4CAI4-05, Database Management System

CS, IT, AID, CAI

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 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. ....   2. ....

PART-A   [10×2=20]

Answer should be given up to 25 words only

All questions are compulsory.

Each question carries 02 marks

Q.1. How candidate key is different from super key?

Q.2. Differentiate between structured and unstructured data.

Q.3. What do you mean by Attributes?

Q.4. Explain the concepts of Primary Key.

Q.5. List out any three responsibilities of Database Administrator.

Q.6. What is Indexing?

Q.7. What is Weak Entity set and Strong Entity set?

Q.8. Define query language.

Q.9. Define instance and schema.

Q.10. Define null values.

PART-B   [5x4=20]

Analytical / Problem-solving questions. Attempt any 05 questions.
Each question carries 04 marks.

Q.1. Define transaction. Explain various states of transaction with suitable diagram.

Q.2. What is Data Model? Explain its types.

Q.3. What is DBMS? Write difference between File System and DBMS.

Q.4. Explain the Three-level Architecture of DBMS. Also mention its advantages.

Q.5. Discuss the clear difference between specialization and generalization with the help of an example. Is it prossible to represent their difference with the help of an E-R diagram? Explain.

Q.6. Discuss the different types of database failures that may occur in a database environment.

Q.7. Differentiate between immediate update and deferred update recovery techniques.

PART - C   [3×10=30]

Descriptive / Analytical / Problem-solving / Design questions.
Attempt any 03 questions. Each question carries 10 marks.

Q.1. (a)   Consider the following database tables and answer queries using SQL :

- Employee (emp_no, name, skill, pay_rate)

- Position (posting_no, skill)

- Duty-allocation (posting_no, emp_no, day, shift)

(i)   Get employee whose rate of pay is more than or equal to the rate of pay of employee "XYZ".

(ii)   Find the employee with the lowest pay rate.

(iii)   Get a count of different employee on each shift.

(b)   What are Recoverable Schedules, and Cascadeless Schedules? Explain with suitable example.

Q.2. (a)   What are relational set operators? Explain with example.

(b)   What are the challenges in the database design?

Q.3. (a)   What is log based recovery? Explain immediate database modification technique for database recovery.

(b)   Explain the following operations in relational algebra with suitable examples:

      (i)   Rename

      (ii)   Natural Join

      (iii)   Projection

      (iv)   Groupin

Q.4. (a)   Compute the Closure of the following set F of functional dependencies for relation schema :

$R = (A, B, C, D, E)$

$F = \{A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$

     (b)   Write short notes on the following :

        (i)   Multi-valued dependencies

        (ii)   3NF

Q.5. Write short notes on the following :

     (i)   Deadlock Handling

     (ii)   Database Recovery schemes

     (iii)   Triggers and Active Databases

     (iv)   Schema Refinement and Functional Dependencies

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4E1306

B.Tech. IV-Sem. (Main/Back) Exam. - 2024

COMPUTER SCIENCE AND ENGINEERING (AI)

4CA14-06 Theory of Computation

CS, IT, AID, CAI

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 suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(As mentioned in Form No. 205)

1. ....   2. ....

PART-A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1. Design a DFA which accepts strings with even number of 1's on S = {0, 1}.

Q.2. Write the regular set of following regular expression :

(a + b) * (aa + bb + ab + ba)*

Q.3. Is $L = \{a^{2n} / n \geq 1\}$ regular?

Q.4. Let $G = (V, \Sigma, R, S)$ be the context-free grammar, where $V = \{A, B, S\}$, $\Sigma = \{a, b\}$, S is the start variable, and R consists of the rules :

$$S \rightarrow aB|bA$$

$$A \rightarrow a|aS|BAA$$

$$B \rightarrow b|bS|ABB$$

Prove that $ababba \in L(G)$

Q.5. What is ambiguity? Explain with example.

Q.6. What is the difference between Finite Automata and Pushdown Automata?

Q.7. Define the recursive and recursively enumerable languages.

Q.8. Draw the diagram of Multiple Tracks Turning Machine.

Q.9. Write the generic Form of the production of Context sensitive grammars.

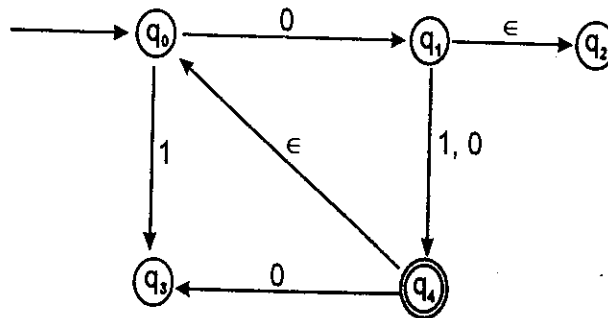**Q.10.** What are the Tractable and Untractable Problems?

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PART-B [5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

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Q.1. Convert the given NDFA to its equivalent DFA :

Q.2. Construct the finite automation equivalent to the regular expression $(0+1)*(00+11)$ $(0+1)*$.

Q.3. Explain the role of Finite Automata and Regular Expression in Compiler Design.

Q.4. Design the context free grammar for the languages $L = \{a^i b^j c^k \mid i = j + k\}$.

Q.5. Explain the working of Pushdown Automata with mathematical description.

Q.6. Explain the Chomsky Classification of Languages with the help of examples.

Q.7. What are the NP complete and NP hard problems? In which category Hamiltonian path problem and travelling salesman problem lies and why?
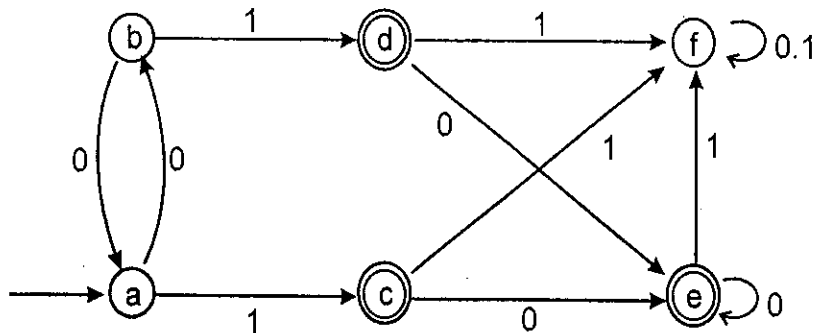
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PART-C   [3×10=30]

(Descriptive/Analytical/Problem solving/Design questions)

Attempt any three questions

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Q.1. Minimize the DFA as shown in below figure :

Q.2. Show that the language $L = \{a^n b^m : n \neq m\}$ is not regular.

Q.3. Explain the following :

    (a)   Leftmost derivation

    (b)   Rightmost derivation

    (c)   Sentential forms

    (d)   Null production

Q.4. Construct a PDA accepting the set of all strings over {a, b} with equal number of a's and b's.

Q.5. Design a Turning machine over {1, b} which can compute a concatenation function over $L = \{1\}$. If a pair of words (w_1, w_2) is the input and output has to be $w_1 w_2$.

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4E1307

B.Tech. IV-Sem. (Main/Back) Exam. - 2024

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

4AID4-07 Data Communication and Computer Networks

CS, IT, AID, CAI

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 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. ....   2. ....

PART-A   [10x2=20]

(Answer should be given up to 25 words only)
All questions are compulsory

Q.1.   What is the use of RJ-45 connector?

Q.2.   What are the differences between star and ring topology?

Q.3. Define the Data Rate.

Q.4. How we detect the error in packet at the transport layer?

Q.5. What is Piggy backing?

Q.6. List the four functions of the Network Layer.

Q.7. What do you mean by Quality of Services?

Q.8. Define the segmentation at the transport layer.

Q.9. What is port number?

Q.10. SMTP is a push protocol. Justify the statement.

<div align="center">

PART-B   [5x4=20]

(Analytical/Problem solving questions)

Attempt any five questions

(Word limit : 100 words)

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Q.1. What is the need of Line Encoding? Draw the wave diagrams of the binary sequence 01110110 for following Line Encoding :

    (a)   NRZ-L

    (b)   NRZ-I

    (c)   Polar RZ

    (d)   Manchester

    (e)   Differential Manchester

Q.2. Explain the Checksum. Suppose that a message 1001 1100 1010 0011 is transmitted using Internet Checksum (4-bit word). What is the value of the checksum?

Q.3. Consider the delay of pure ALOHA versus slotted ALOHA at low load. Which one is less? Exlain your answer.

Q.4. Explain the working of Routing Information Protocol (RIP). Why do you think RIP uses UDP instead of TCP?

Q.5. Why does the maximum packet lifetime, T, have to be large enough to ensure that not only the packet but also its acknowledgments have vanished?

Q.6. In a TCP connection, the initial sequence number at the client site is 2171. The client opens the connection sends three segments, the second of which carries 1000 bytes of data, and closes the connection. What is the value of the sequence number in each of the following segments sent by the client?

(a) The SYN segment

(b) The data segment

(c) The FIN segment

Q.7. FTP uses two separate well-known port numbers for control and data connection. Does this mean that two separate TCP connections are created for exchanging control information and data?

PART-C   [3x10=30]

(Descriptive/Analytical/Problem Solving/Design question)
Attempt any three questions

Q.1. Assume that an application-layer protocol is written to use the services of UDP. Can the application-layer protocol uses the services TCP without change?

Q.2. A 20 Kbps satellite link has a propagation delay of 400 msec, the transmitter employs the "Go back N" ARO"scheme with N set to 10. Assuming that each frame is 100 bytes long, what is the maximum data rate possible?

Q.3. Compare and contrast the IPv4 header with the IPv6 header. Create a table to compare each field.

Q.4. A computer on a 6-Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 1 Mbps. It is initially filled to capacity with 8 megabits. How long can the computer transmit at the full 6 Mbps?

Q.5. Explain the request and response message format of the HTTP protocol.

----- X -----