

4E1301

Roll No. \_\_\_\_\_

Total No. of Pages: 3

4E1301

B. Tech. IV - Sem. (Main) Exam., - 2022  
 Artificial Intelligence & Data Science  
 4AID2 – 01 Discrete Mathematics Structure  
 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 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. NIL2. NIL**PART – A****(Answer should be given up to 25 words only)****[10×2=20]****All questions are compulsory**

- Q.1 If  $A = \{4, 1, 8\}$ , then find the power set of A.
- Q.2 For a relation R on a set  $A = \{1, 2, 3, 4\}$  given by  $R = \{(1, 3), (1, 2), (2, 2), (3, 4)\}$ , then find reflexive and transitive closure of R on the given set.
- Q.3 What is the domain of the function  $f(x) = x/(x^2 + 3x + 2)$ ?
- Q.4 If  $f(x) = e^x$  and  $g(x) = x^3$ , then find the composition  $f \circ g$ .
- Q.5 Find the negation of the following statement –  
 “He is rich and unhappy.”

- 103
- Q.6 What is a finite state machine?
- Q.7 Define generating function.
- Q.8 Define homomorphism and isomorphism of groups.
- Q.9 What do you mean by a regular graph?
- Q.10 Define Hamiltonian graph with example.

### PART – B

(Analytical/Problem solving questions)

[5×4=20]

Attempt any five questions (Word limit 100)

- Q.1 If in a city 60% of the residents can speak German and 50% can speak French. What percentage of residents can speak both the language, If 20% residents cannot speak any of these two languages?
- Q.2 Let  $Q$  be the set of rational numbers. Show that the function  $f:Q \rightarrow Q$  defined by  $f(x)=2x+7$ ,  $x \in Q$  is a bijective function. Also find  $f^{-1}(0)$  and  $f^{-1}(2)$ .
- Q.3 Prove the following logical implication with constructing truth table –  
 $(\sim PVQ) \wedge (PVR) \wedge (\sim QVR) \Rightarrow R$
- Q.4 Design a deterministic FSA that accepts strings of 0s and 1s as input for which the number of 1s is divisible by 3.
- Q.5 How many words can be formed from the letter of the word “DAUGHTER” if the vowels always coming together?
- Q.6 Show that the set  $G = \{2^n \mid n \in \mathbb{Z}\}$  is a group for multiplication.
- Q.7 Determine whether the graph given below by its adjacency matrix is connected or not -

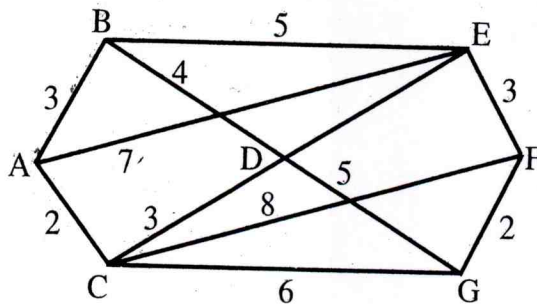
$$\begin{pmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{pmatrix}$$

### PART - C

(Descriptive/Analytical/Problem Solving/Design Questions) [3×10=30]

Attempt any three questions

- Q.1 Let  $U$  be the set of positive integer not exceeding 1000, that is  $|U|=1000$ . Then using the pigeonhole principle find  $|S|$ , where  $S$  is the set of such integer which is not divisible by 3, 5 or 7?
- Q.2 Find the disjunctive normal form of  $P \rightarrow ((P \rightarrow Q) \wedge \sim(\sim P \vee \sim P))$ .
- Q.3 Solve the recurrence relation  $s_n - 7s_{n-1} + 10s_{n-2} = 0$ ,  $s_0 = 0$  and  $s_1 = 3$  by using generating function where,  $n \geq 2$ .
- Q.4 Show that the set of all square matrix of order  $(m \times m)$  under the binary operations addition and multiplication is a non-commutative ring.
- Q.5 Using Dijkstra's algorithm, find the shortest distance of all vertices from the vertex A for the graph shown in figure -



105

4E1302

Roll No. \_\_\_\_\_

Total No. of Pages: 4

**4E1302**

**B. Tech. IV - Sem. (Main) Exam., - 2022**

**Computer Science & Engineering (AI)**

**4CAI1 – 03 Managerial Economics and 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 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**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 “Managerial economic supports manager to take decision for successful implementation of economic strategies.” Comment upon this statement.
- Q.2 Define GDP and NNP concepts of national income.
- Q.3 What is meant by price elasticity?
- Q.4 Elaborate the term circular flow of economy. Who are the main players involve in the circular flow of economy?

100

What are the basic elements of demand and supply?

Write the concept of opportunity cost with one example.

Define Kinked demand curve and write one reason of price rigidity.

Differentiate between deductive and inductive methods of economics.

Discuss any two significant uses of cash flow statement.

10 What is meant by debt, liabilities and current assets in accounting?

**PART – B**

**(Analytical/Problem solving questions)**

**[5×4=20]**

**Attempt any five questions (Word limit 100)**

1 Define the concept of managerial economics. What are the micro and macro scopes of economics? Explain all in brief.

2 What is Law of demand? Draw the suitable diagram of demand curve and write its determinants.

3 Elaborate the cost and output relations in short run and long run. What is the role of Marginal cost in decisions?

4 How demand forecasting is useful for future decision making? Explain any two methods of demand forecasting.

Q.5 Write the stages of production function. How manager can control the inputs in production?

Define your answer with suitable table of inputs and diagram.

Q.6 How price, output and profit can be determined in perfect competition? Draw suitable diagram.

Q.7 Sttelio Ltd. presents the following information and you are required to calculate funds from operations –

Profit and Loss Account

	₹		₹
To Operation Expenses	1,00,000	By Gross Profit	2,00,000
To Depreciation	40,000	By Gain on Sale of Plant	20,000
To Loss on sale of Building	10,000		
To Advertising Suspense Account	5,000		
To Discount Allowed	500		
To Discount on issue of Shares written off	500		
To Goodwill written off	12,000		
To Net Profit	52,000		
	<u>2,20,000</u>		<u>2,20,000</u>

108

**PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)** [3×10=30]

**Attempt any three questions**

- Q.1 Define circular flow of economy with suitable diagram. Which are the current economic problems are facing by nation after pandemic situation (Year 2020 - 2021)?
- Q.2 Define the term demand elasticity. What are the various degrees of elasticity? Define each with diagram and example.
- Q.3 What is meant by least cost combinations in production function? Elaborate the properties of least cost combinations.
- Q.4 Why price is rigid in market? Give reasons. Draw Kinked demand curve and how price and output can be determined under Kinked demand curve.
- Q.5 Differentiate between –
- (a) Demand curve and Supply curve
  - (b) Explicit cost and implicit cost
  - (c) Static economy and Dynamic economy
  - (d) Monopoly market and Monopolistic market
  - (e) Cash flow statement and Fund flow statement.
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189

4E1303

Roll No. \_\_\_\_\_

Total No. of Pages: 3

**4E1303**

**B. Tech. IV - Sem. (Main) Exam., - 2022**  
**Computer Science & Engineering (AI)**  
**4CAI1 – 02 Technical Communication**  
**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 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**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 What is technical communication?
- Q.2 Write the forms and aspects of 'Technical communication'?
- Q.3 What is the process of technical writing?
- Q.4 Define note-making.
- Q.5 What are the different discourse markers that can be used?
- Q.6 What are the different types of resumes?



110

7. Combine the following sentence using an appropriate form of the verb given in the brackets.
- (a) Man and woman.....complementary to each other. (is/are)
  - (b) The leader as well as his brothers.....to the same tribe. (belong/belongs)
8. Mention the characteristics of the Report.
9. Find the errors in the following –
- (a) She can to drive.
  - (b) The house isn't enough big
10. Write short on the following –
- (a) Conference paper
  - (b) Journal

## **PART – B**

**(Analytical/Problem solving questions)**

**[5×4=20]**

**Attempt any five questions (Word limit 100)**

- Q.1 “The more you read, the more you become efficient in speaking a language.” Throw light on the connection of reading and speaking and tell how you can develop effective speaking skills.
- Q.2 Write in detail about the aspects of technical communication and throw light on the 7C's of effective technical communication.
- Q.3 Write about the challenges in the process of technical communication in detail.
- Q.4 Elaborate editing strategies to achieve appropriate technical style.
- Q.5 Define technical communication and its importance in the life of an engineering professional.
- Q.6 Elucidate the structure and format of technical articles.
- Q.7 Write notes on the following –
- (a) Features of a report
  - (b) Sales Letter

## PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [3×10=30]

Attempt any three questions

- Q.1 Create an email informing a group of people in the workplace about a co-worker of theirs whose management position has been downgraded to a staff position. Be clear, direct and concise in your delivery of the information and your explanation for it. Take into account workplace morale and the ethics of this decision. Your email should be at least 150 words long.
- Q.2 Your workplace is deciding how to upgrade the desktop computer systems. Prepare a report comparing three types of brands. Identify what categories you would use to compare all three. Include what graphics might be necessary for this report. Include your final recommendation at the end of the analysis.
- Q.3 Write a job application in response to the advertisement for various faculty positions in June 2019 issue of the Hindustan Times to apply for the post of Assistant Professor in Computer Science. Write a detailed resume to be enclosed with it.
- Q.4 (a) Discuss the various elements of a formal report.  
(b) Write brief notes on the following –  
(i) Significance of reports.  
(ii) Formal and non-formal reports.
- Q.5 With the advancement of technology, technical communication has also evolved and many unethical practices have been adopted by the professionals with a huge loss of reputation and assets. Throw light on the role of ethics and moral values in generating, analyzing and communication of technical information.
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112

4E1330

Roll No. \_\_\_\_\_

Total No. of Pages: 2

**4E1330**  
**B. Tech. IV - Sem. (Main) Exam., - 2022**  
**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 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**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 Give any two advantages of FM and AM.
- Q.2 Discuss frequency division multiplexing (FDM).
- Q.3 State Shannon's theorem.
- Q.4 Draw the block diagram of communication system.
- Q.5 Draw the Phasor diagram of QPSK.
- Q.6 What is the need for modulation?
- Q.7 What is the need for pre emphasis and de-emphasis?
- Q.8 Explain T-1 carrier system.
- Q.9 What is sampling? State Nyquist Theorem?
- Q.10 What is the function of demodulator?

113

## **PART – B**

**(Analytical/Problem solving questions)**

**[5×4=20]**

**Attempt any five questions (Word limit 100)**

- Q.1 Compare FDMA, TDMA & CDMA.
- Q.2 What is the principle of BPSK modem? Draw the output wave forms for sending data 10101110 using BPSK module?
- Q.3 Derive the equations of AM & FM and also deduce the relation for carrier and sideband power.
- Q.4 Briefly explain TDM-PAM system.
- Q.5 Compare the Analog Communication Systems with Digital Communication Systems.
- Q.6 What is quantization? Derive an expression for signal to quantization noise ratio in PCM.
- Q.7 State and explain the types of spread spectrum techniques.

## **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[3×10=30]**

**Attempt any three questions**

- Q.1 Draw the block diagrams of DSSS and FHSS systems and explain the working. Calculate the signal-to-noise ratio for both systems.
- Q.2 Discuss the advantages and disadvantages of pulse modulation as compared to continuous wave modulation with neat sketches of waveforms discuss the generation and demodulation of PDM/PWN and PPM.
- Q.3 Draw the block diagram of ADM and explain its working and compare it with DM. explain the terms slope overload and granular noise in Delta modulation.
- Q.4 Explain with the help of block diagrams, the working of the QPSK transmitter and receiver.
- Q.5 Draw the block diagram of the Superhetrodyne receiver and explain the function of each block.
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4E1304

Roll No. \_\_\_\_\_

Total No. of Pages: **3**

**4E1304**

**B. Tech. IV - Sem. (Main) Exam., - 2022**  
**Artificial Intelligence & Data Science**  
**4AID3 – 04 Microprocessor & 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 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**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

Q.1 What is the function of ALE signal in 8085 up?

Q.2 Specify the size of data, address, memory word and memory capacity of 8085 up.

Q.3 State the function of following 8085 instructions –

- (i) JP
- (ii) JPE
- (iii) JPO
- (iv) JNZ

11 ←

Q.4 Write a program to add 7B H and 6A H using ADI instruction.

Q.5 Explain the PSW of 8085 up.

Q.6 Why data bus is bidirectional?

Q.7 Mention the purpose of SID and SOD lines.

Q.8 What are priority interrupts?

Q.9 List 16 bit registers of 8085 microprocessor.

Q.10 What is the purpose of Hold and Ready pins?

### **PART – B**

**(Analytical/Problem solving questions)**

**[5×4=20]**

**Attempt any five questions (Word limit 100)**

Q.1 What is the use of addressing modes? Explain different types of addressing modes with example.

Q.2 What are stack related operations? Compare call and push instruction.

Q.3 Explain DAA instruction with an example.

Q.4 Write a program to add the contents of memory locations of 2000 H and 2001 H and place the results in memory location 2002 H.

Q.5 Compare the function of following instruction pairs –

(i) JMP & CALL

(ii) STAX & LDAX

(iii) ANA & ANI

(iv) LHLD & LXI

118

Q.6 Show which interrupt will be masked if the following instructions are executed –

(i) MVI A, 10 H

(ii) SIM

Q.7 Write a 8085 program that enables RST 7.5 and RST 5.5 interrupts.

### **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)** [3×10=30]

**Attempt any three questions**

Q.1 Design 8085 up based system with following specifications –

(i) System frequency 3MHz

(ii) Interface 16 Kb EPROM using 8 Kb chip

(iii) Interface 32 Kb RAM using 16 Kb chip

Q.2 Draw the block diagram of 8279 Keyboard/display interface. Explain its operation also.

Q.3 Explain the evolution of microprocessor and list the sequence of events that occurs. When 8085 up reads data from memory.

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

Q.5 Compare RS – 422 A and RS – 423 A serial data standard.

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117

<b>4E1305</b>	Roll No. _____	Total No. of Pages: <span style="border: 1px solid black; padding: 2px;">4</span>
<p><b>4E1305</b></p> <p><b>B. Tech. IV - Sem. (Main) Exam., - 2022</b></p> <p><b>Computer Science &amp; Engineering</b></p> <p><b>4CS4 – 05 Database Management System</b></p> <p><b>CS, IT, AID, CAI</b></p>		

**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 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**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

Q.1 Which data independence is difficult to achieve and why?

- (a) Physical data independence
- (b) Logical data independence

Q.2 Consider the following schedule for three transactions T1, T2, T3, where R indicates a read of a Data item, W indicates a write of a data item and COM indicates a commit.

T1	R(A)						R(C)	W(B)	COM		
T2				R(A)	W(A)	COM					
T3		R(A)	R(C)							W(B)	COM

- (a) Draw the dependency graph for this schedule.
- (b) Whether the schedule is conflict serializable?



118

- Q.3 What is the difference between strict two phase locking and simple two phase locking protocols?
- Q.4 Which out of these are Data Manipulation Language (DML) commands and why?  
Create, Update, Alter, Delete, Drop, Insert .
- Q.5 What are the properties of a weak entity? How the primary key of weak entity is defined when it is converted to a relation in relational model?
- Q.6 What is the upper limit on number of primary keys and candidate keys for any relation in relational model?
- Q.7 How does aggregate operators of SQL treat NULL values? Explain with example.
- Q.8 Difference between Join and Cartesian product. Explain with an example.
- Q.9 Draw a neat diagram of database system architecture.
- Q.10 Draw a labeled transaction state diagram.

**PART – B**

**(Analytical/Problem solving questions)**

**[5×4=20]**

**Attempt any five questions (Word limit 100)**

- Q.1 Explain the role and importance of relational algebra. Also, explain six basic operators of relational algebra with example.
- Q.2 Consider a relation R (ABCDEF) where, A, B, C, D, E are the attributes of R. Consider functional dependency set  $F = \{A \rightarrow EC, C \rightarrow D, B \rightarrow F\}$ . Find out candidate key(s) and check the highest normal form.
- Q.3 Differentiate View and Conflict Serializability with an example.

1/19

Q.4 Consider two relation customers and orders with values as follows. What will be the result of natural join, left outer join, right outer join, and full outer join.

**Customers**

Customer Id	Name
1	Shreeram
2	Anubhuti
3	Jaya

**Orders**

Order Id	Customer Id
100	1
200	4
300	3

Q.5 Define briefly with example –

- (a) Data Integrity
- (b) Aggregation in E – R model
- (c) Tuple relational calculus
- (d) Cascadeless schedules

Q.6 Explain ternary relationship with example. Can we represent every ternary relationship with multiple binary relation?

Q.7 Differentiate Dynamic and Embedded SQL. Give example of Dynamic SQL.

**PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)** [3×10=30]

**Attempt any three questions**

Q.1 Write the algorithm for basic time stamp ordering protocol. For the below schedule S with transactions T1, T2, T3, whether the timestamp order T1, T2, T3 will successfully execute this schedule using basic time stamp protocol?

S: r1(A), r2(B), w1(C), r3(B), r3(C), w2(B), w3(A)

Here,  $r_i$  and  $w_i$  denote the read and write operations respectively by transaction  $T_i$ . A, B, C, are three data items.

120

- Q.2 Explain shadow paging recovery protocol along with its pros and cons. How does this differ from log based recovery scheme?
- Q.3 What is the role of normalization in database design? Explain first normal form, second normal form, third normal form and BCNF with example of each?
- Q.4 Draw the E-R diagram for University management system with complete labeling Convert the drawn E-R diagram into relational model. For each relation in relational model, clearly specify primary key and foreign keys.
- Q.5 Consider the following three relations with attributes shown in brackets for an organization.

employee (eno, ename, esalary, dcode),  
dept (dcode, dname)  
dependent (depndtname, eno, relation).

Here primary keys are underlined

Write SQL queries for the following –

- (a) Show the names of employees with at least one dependent.
- (b) List names of department(s) for which average salary for department is more than 10,000.
- (c) Find the number of employees in each department.
- (d) Find the name of department which have less than 10 employees.
- (e) List all employees whose name contain at least one 'a' and one 'h' at any position.
- (f) Find the total salary paid to employees of "accounts" department.
- (g) Print the total number of employees whose salary is more than 40,000.
- (h) Find the average salary of complete organization.
- (i) Update the dcode of employee having eno = 101 to dcode = 10.
- (j) Change the datatype of ename from char(20) to char(30).

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121

4E1306

Roll No. \_\_\_\_\_

Total No. of Pages: 3

**4E1306**

**B. Tech. IV - Sem. (Main) Exam., - 2022**  
**Computer Science & Engineering**  
**4CS4 – 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 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**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

Q.1 Define the Automata theory.

Q.2 Is the following set regular -

$$\{0^{2n} \mid n \geq 1\}$$

If yes, write down the corresponding regular expression. Else, prove that language is not regular.

Q.3 Is the set of odd – length strings over 0 regular, where the alphabet is  $\Sigma = 0$ ?

Q.4 Construct a Deterministic Finite Automata (DFA) that accepts the language over

$\Sigma = \{a, b\}$  in which length of string is divisible by three.

122

- Q.5 What is Pigeonhole Principle?
- Q.6 Define ambiguous grammar.
- Q.7 Consider the following grammar and draw the left most and right most tree. (S, A, B are non terminals and rest are terminals symbols)
- $S \rightarrow aScB \mid A \mid b$   
 $A \rightarrow cA \mid c$   
 $B \rightarrow d \mid A$
- Q.8 What is transition function? Write the transition function of Pushdown Automata.
- Q.9 Draw the diagram of Turing Machine.
- Q.10 What is NP – complete? Give one example.

### PART – B

(Analytical/Problem solving questions)

[5×4=20]

Attempt any five questions (Word limit 100)

- Q.1 Design a Mealy Machine that computes 2's complement of the given input binary number?
- Q.2 Write regular expression (R) for the following ( $\Sigma = a, b$ ) –
- (a) R that generate all string where length of string is at least 3
  - (b) R that generate all string where every 'a' must followed by 'b'
  - (c) R that generate all string contain second symbol from RHS is 'a'
  - (d) R that generate all string where each string contain atmost two b's
- Q.3 Convert the following Context Free Grammar (CFG) into an equivalent CFG in Chomsky Normal Form.
- $A \rightarrow BAB \mid B \mid \epsilon, B \rightarrow 00 \mid \epsilon$
- (Only A and B are non terminal and rest are terminal)
- Q.4 Design a Pushdown Automata (PDA) accepting  $\{a^n b^m c^n \mid m, n \geq 1\}$  by null store.
- Q.5 Give the 5 examples of languages that cannot be accepted by Finite Automata but can be accepted by Pushdown Automata. Contrast the reasons behind it.
- Q.6 What is the Chomsky Hierarchy of languages? Explain in detail.
- Q.7 What is Hamiltonian path problem? Explain with suitable example.

123

## PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [3×10=30]

Attempt any three questions

- 1 Design a DFA (Deterministic Finite Automation) to accept the language  $L = \{\alpha \in \{a, b, c\}^* \mid \alpha \text{ starts and ends with the same symbol}\}$ . Only draw the transition diagram, and clearly indicate the start state and final state (s).
  - 2 What is the regular languages? Explain any three applications of regular languages in software (Compiler or web) design.
  - 3 Explain the model of Pushdown Automate with the help of suitable diagram.
  - 4 Design a Turing Machine which recognizes the language,  $L = \{1^n 2^n 3^n, \text{ where } n > 0\}$ .
  - 5 Write an unrestricted grammar to accept the language,  $L = \{a^i b^j c^k d^l \mid i = k \text{ and } j = l\}$ .  
Mention the start symbol of your grammar. Use upper – case Roman letters for non-terminal symbols.
-

124

4E1307

Roll No. \_\_\_\_\_

Total No. of Pages: 2

**4E1307**

**B. Tech. IV - Sem. (Main) Exam., - 2022**

**Computer Science & Engineering**

**4CS4 – 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 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**

**(Answer should be given up to 25 words only)**

**[10×2=20]**

**All questions are compulsory**

- Q.1 What is Data Communication?
- Q.2 Differentiate Analog and Digital signals.
- Q.3 What is ALOHA?
- Q.4 Define Piggybacking.
- Q.5 What is Tunneling?
- Q.6 Write any two differences between classful and classless addressing.
- Q.7 Write features of UDP.
- Q.8 Write uses of Leaky Bucket Algorithm.
- Q.9 What is SMTP?
- Q.10 Draw Header format of HTTP reply message.

[4E1307]

Page 1 of 2

**[4360]**

125

## **PART – B**

**(Analytical/Problem solving questions)**

**[5×4=20]**

**Attempt any five questions (Word limit 100)**

- Q.1 Explain OSI reference model with neat diagram.
- Q.2 Describe Go Back N protocol.
- Q.3 Explain, how congestion is controlled at network layer?
- Q.4 Draw and explain TCP header format in detail.
- Q.5 Explain DNS and its working.
- Q.6 What is the purpose of Subnetting? Explain the use of masking in Subnetting.
- Q.7 Explain the various network topologies in detail.

## **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[3×10=30]**

**Attempt any three questions**

- Q.1 Explain the working of the following CSMA protocols in detail.
  - (a) Persistent
  - (b) Non – Persistent
  - (c) P – Persistent
- Q.2 Explain IPv4 Header format in detail. Compare it with IPv6.
- Q.3 Describe File Transfer Protocol (FTP) with suitable diagram. Explain SNMP.
- Q.4 Explain types of sliding window ARQ error control. How do they differ from each other?
- Q.5 What are three way handshaking protocol in TCP? Explain, why connection termination in TCP is symmetric, whereas connection establishment is not?

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126

4E4161

Roll No. \_\_\_\_\_

Total No. of Pages: 4

**4E4161**

**B. Tech. IV - Sem. (Back) Exam., - 2022**  
**Computer Science & Engineering**  
**4CS2A Discrete Mathematical Structure**

**Time: 3 Hours**

**Maximum Marks: 80**  
**Min. Passing Marks: 24**

*Instructions to Candidates:*

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. 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. NIL

2. NIL

### UNIT- I

Q.1 (a) Each student in Liberal Arts at some college has a mathematics requirement A and a science requirement B. A poll of 140 sophomore students shows that: 60 completed A, 45 completed B, 20 completed both A and B. Use a Venn diagram to find the number of students who have completed - [8]

- (a) At least one of A and B
- (b) Exactly one of A or B
- (c) Neither A nor B

(b) Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be a function defined as  $f(x) = 3x + 5$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$  be another function defined as  $g(x) = x + 4$ . Find  $(g \circ f)^{-1}$  and  $f^{-1} \circ g^{-1}$  and verify  $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$ . [8]

127

**OR**

- Q.1 (a) Let  $A = \{1, 1, 1, 2, 2, 3, 4, 4\}$  and  $B = \{1, 2, 4, 4, 5, 5, 5\}$ . Find  $A \cup B$ ,  $A \cap B$ ,  $A - B$  and  $A + B$ . [8]
- (b) Define the followings with example – [8]
- (i) Polynomial function
  - (ii) Floor function
  - (iii) Ceiling function
  - (iv) Remainder function

**UNIT- II**

- Q.2 (a) Define the following with example – [8]
- (i) Equivalence relation
  - (ii) Partial order relation
  - (iii) Total order relation
  - (iv) Cross partition of a set
- (b) Consider  $A = \{4, 6, 8, 10\}$  and  $R = \{(4, 4), (4, 10), (6, 6), (6, 8), (8, 10)\}$  is a relation on a set A. Determine the transitive closure of R using Warshall's Algorithm. [8]

**OR**

- Q.2 (a) Suppose that R and S are reflexive relations on a set A. Prove or disprove the following statements – [8]
- (i)  $R \cup S$  is reflexive
  - (ii)  $R \cap S$  is reflexive
  - (iii)  $R - S$  is irreflexive
  - (iv)  $SoR$  is reflexive
- (b) Let R be an equivalence relation on a set of positive integers defined by  $x R y$  if and only if  $x \equiv y \pmod{3}$ . Then, find the equivalence class of 2 and also find the partition generated by the equivalence relation. [8]

128

### UNIT- III

Q.3 (a) Prove that  $7^{2n} + 2^{3n-3} \cdot 3^{n-1}$  is divisible by 25 for all positive integers. [8]

(b) Compute the product AB by using Strassen's matrix multiplication algorithm, where - [8]

$$A = \begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 6 \\ 3 & 2 \end{bmatrix}$$

**OR**

Q.3 (a) Using the concept of mathematical induction, prove that - [8]

$$P(n) = 1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}, n \geq 1$$

(b) Explain any two of the followings - [8]

(i) Algorithm correctness

(ii) Searching algorithm

(iii) Sorting algorithm

### UNIT- IV

Q.4 Explain the following with example -

(a) Complete graph [4]

(b) Bipartite graph [4]

(c) Complete Bipartite graph [4]

(d) Weighted graph [4]

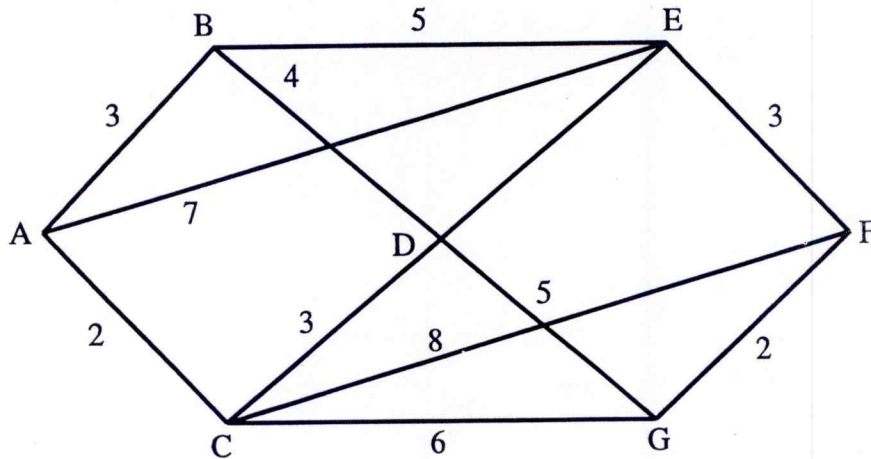
**OR**

Q.4 (a) Determine whether the graph given below by its adjacency matrix is connected or not. [8]

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

129

- (b) Using Dijkstra's algorithm, find the shortest distance of all vertices from the vertex A for the graph shown in figure. [8]



### UNIT- V

- Q.5 (a) Express  $P \leftrightarrow Q$  using  $\downarrow$  and  $\uparrow$  only. [8]  
(b) Prove the following logical implication with constructing truth table - [8]

$$(\sim P \vee Q) \wedge (P \vee R) \wedge (\sim Q \vee R) \Rightarrow R$$

OR

- Q.5 (a) Check the validity of the following argument - [6]

If I go to school, then I attend all classes. If I attend all classes, then I get A grade. I do not get grade A and I do not feel happy. Therefore, if I do not go to school then, I do not feel happy.

- (b) By constructing the truth table, show that  $(\sim P \wedge (P \vee Q)) \rightarrow Q$  is a tautology. [4]  
(c) Explain the following - [6]  
(i) Argument  
(ii) Predicates  
(iii) Quantifiers

130

4E4162

Roll No. \_\_\_\_\_

Total No. of Pages: 4

**4E4162**

**B. Tech. IV - Sem. (Back) Exam., - 2022**

**Information Technology**

**4IT3A Statistics & Probability Theory**

**Time: 3 Hours**

**Maximum Marks: 80**

**Min. Passing Marks: 24**

*Instructions to Candidates:*

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. 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. NIL

2. NIL

**UNIT- I**

Q.1 (a) If x is a continuous random variable with the following probability density function – [8]

$$f(x) = \begin{cases} \alpha (2x - x^2) & ; 0 < x < 2 \\ 0 & ; \text{elsewhere} \end{cases}$$

- (i) Find value of  $\alpha$
- (ii) Find  $P[x > 1]$

(b) A random variable x has the following probability distribution. [8]

x	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K <sup>2</sup>	2K <sup>2</sup>	7K <sup>2</sup> + K

131

**OR**

- Q.1 (a) Find the expected values of the sum of numbers of points on them, if two unbiased dice are thrown. [8]
- (b) Let a random variable  $X$  assume the value 'r' with probability mass function  $P(x = r) = q^{r-1} p$ ,  $r = 1, 2, 3 \dots$ . Find the m.g.f. and hence the mean and variance. [8]

**UNIT- II**

- Q.2 (a) A coin is tossed 12 times. Find the probability both exactly and by fitting normal distribution of getting – [8]
- (i) 4 heads
- (ii) At most 4 heads
- (b) Find the probability that at most 5 defective fuses will be found in a box of 200 fuses. If experience shows that 2 percent of such fuses are defective. [8]

**OR**

- Q.2 (a) In a certain examination 2000 students appeared. The average marks appeared. The average marks obtained were 50% and the s. d. was 5%. How many students do you expect to obtain more than 60 marks, supposing the marks to be distributed normally? (Area under the standard normal curve from  $x = 0$  to  $x = 2$  is 0.4772) [8]

- (b) The sales tax return of a salesman is exponentially distributed with the density

$$\text{function } f(x) \text{ given by } f(x) = \begin{cases} \frac{1}{4} e^{-1/4x} & ; x > 0 \\ 0 & ; x \leq 0 \end{cases}$$

What is the probability that his sale will exceed ₹ 100 assuming that the sales tax is levied at the rate 5% on the sales? [8]

132

### UNIT- III

- Q.3 (a) Calculate the coefficient of correlation between x and y using the following data. [8]

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

- (b) Two random variables have the least square regression lines with equations  $3x + 2y - 26 = 0$  and  $6x + y - 31 = 0$ . Find the mean values and the coefficient of correlation between x and y. [8]

**OR**

- Q.3 (a) Obtain the rank correlation coefficient for the following data – [8]

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	74

- (b) Fit a straight line to the following data treating y as the dependent variable. [8]

x	1	2	3	4	5
y	5	7	9	10	11

### UNIT- IV

- Q.4 A self-service store employs one cashier at its counter. 8 customer arrive on an average every 5 minutes while the cashier can serve 10 customer in the same time. Assuming Poisson distribution for arrival and exponential distribution for service rate, determine -

- (a) Average number of customer in the system. [4]  
(b) Average queue length. [4]  
(c) Average time a customer spends in the system. [4]  
(d) Average time a customer wait before being served. [4]

133

**OR**

Q.4 A one person in barber shop has 6 chairs to accommodate people waiting for haircut. Assume customers who arrive when all six chairs are full leave without entering the barber shop. Customer arrive at the average rate of 3 per hour and spend an average of 15 minutes in the barber shop, then find – [16]

- (a) The probability that there is no customer in the shop.
- (b) Average number of customers in the shop.
- (c) Average number of customers waiting for their haircut.

**UNIT- V**

Q.5 (a) Compute the probability distribution after – [8]

(i) One time step

(ii) After two time steps with  $p(o) = (0.4, 0.6)$  taking the t p m as  $P = \begin{bmatrix} 0.7 & 0.3 \\ 0.4 & 0.6 \end{bmatrix}$

(b) Write a short note on discrete parameter birth death process. [8]

**OR**

Q.5 Automata car wash facility operates with only one bay. Cars arrive according to Poisson distribution, with a mean of 4 cars per hour, and may wait in the facilities parking lot if the bay is busy. Find the time spent by a car in the system and in the waiting, if –

(a) The time for washing and cleaning a car is exponential with a mean of 10 minutes. [8]

(b) The time for washing and cleaning a car is constant and equal to 10 minutes which facility is better. [8]

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134

4E4164

Roll No. \_\_\_\_\_

Total No. of Pages: 2

**4E4164**

**B. Tech. IV - Sem. (Back) Exam., - 2022**

**Computer Science & Engineering**

**4CS5A Principle of Communication**

**Time: 3 Hours**

**Maximum Marks: 80**

**Min. Passing Marks: 24**

*Instructions to Candidates:*

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. 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. NIL \_\_\_\_\_

2. NIL \_\_\_\_\_

### UNIT- I

Q.1 (a) Define the standard form of amplitude modulation, derive its equation and explain each term. Derive the spectral equation of AM wave and hence draw the AM spectrum. [10]

(b) Explain the generation of DSBSC waves using a Ring Modulator. [6]

OR

Q.1 (a) Derive the expression for WBFM, showing that the spectrum of WBFM waves contains an infinite number of sidebands. Write the expression of theoretical bandwidth for WBFM? [10]

(b) With a neat block diagram explain the operation of a super-heterodyne receiver. [6]

125

## UNIT- II

- Q.2 (a) State the sampling theorem and explain the same with neat sketches and equations. [10]  
(b) With neat block diagrams explain the generation and detection of PPM waves. [6]

OR

- Q.2 (a) Explain the generation and recovery of PAM (Flat-top) signal with necessary equations and spectrum diagram. [10]  
(b) With a neat block diagram outline the concept of TDM. [6]

## UNIT- III

- Q.3 (a) Explain T-1 carrier system. [6]  
(b) Draw the block diagram of ADM and explain its working, and compare it with DM. [10]

OR

- Q.3 (a) Derive the expression for the output signal to noise ratio of a Quantization. [8]  
(b) With a neat diagram explain the basic elements of a PCM system. [8]

## UNIT- IV

- Q.4 (a) What is Keying? What are the principles of ASK & FSK? Draw the output waveforms for sending data 01110101 using ASK. [10]  
(b) Explain the working of QPSK modulator. [6]

OR

- Q.4 (a) What is the principle of the BPSK modem? Draw the output waveforms for sending data 10101110 using the BPSK modulator. [10]  
(b) Discuss the various line coding techniques with suitable examples. [6]

## UNIT- V

- Q.5 Draw the block diagrams of DSSS and FHSS systems and explain their working. Calculate the signal-to-noise ratio for both systems. [16]

OR

- Q.5 (a) Write the properties of the PN sequence. [6]  
(b) Discuss code division multiple access (CDMA). Write the applications of CDMA. [10]

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136

4E4165

Roll No. \_\_\_\_\_

Total No. of Pages: **3**

**4E4165**  
**B. Tech. IV - Sem. (Back) Exam., - 2022**  
**Computer Science & Engineering**  
**4CS6A Principles of Programming Languages**  
**CS, IT**

**Time: 3 Hours**

**Maximum Marks: 80**  
**Min. Passing Marks: 24**

*Instructions to Candidates:*

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. 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. NIL

2. NIL

**UNIT- I**

- Q.1 (a) Explain at least four language paradigms with example of each. [8]  
(b) Explain various basic syntactic elements of the language. [8]

**OR**

- Q.1 (a) Explain meaning of language standardization in detail. [8]  
(b) Explain the following with reference to formal translation model – [8]  
(i) BNF Grammars  
(ii) Syntax  
(iii) Parse tree  
(iv) Finite State Automata

137

## UNIT- II

- Q.2 (a) For an elementary data type in 'c' do the following – [8]  
(i) Describe the set of values that the data object of that type may contain.  
(ii) Define the syntactic representation used for constant of that type.
- (b) Write short notes on – [8]  
(i) Lists  
(ii) Sets

### OR

- Q.2 (a) Differentiate with help of example between an array & vector. Also explain multidimensional array. [5+3=8]  
(b) Give the accessing formula for computing the location of component A[I, J] of a matrix A declared as :- A : array [LB<sub>1</sub> ..... UB<sub>1</sub>, LB<sub>2</sub> ..... UB<sub>2</sub>] where A is stored in column – major order. [8]

## UNIT- III

- Q.3 (a) For structured sequence control explain implementation details of –  
(i) if statement [3]  
(ii) while statement [3]  
(iii) do – while [3]  
(b) Explain with example difference between simple and recursive subprogram. [7]

### OR

- Q.3 (a) Explain concept of static and dynamic scope with example. [8]  
(b) Explain problems and three suggested solutions in evaluation of three representation of expression. [8]

## UNIT- IV

- Q.4 (a) Explain the concept of association and referencing environment. [8]  
(b) Explain concept of block structure. Also explain local data and local referencing environments. [8]

138

**OR**

- Q.4 (a) Explain concept of explicit common environment in detail. [8]  
(b) Differentiate between deep access and shallow access. [8]

**UNIT- V**

- Q.5 (a) Name and explain elements which requires storage during program execution. [8]  
(b) Explain concept of fixed – size element with reference to storage. [8]

**OR**

- Q.5 Write short notes on (Any four) – [4×4=16]

- (a) Garbage collection  
(b) Type equivalence  
(c) Shared data  
(d) Methods for transmitting parameters  
(e) Exception handling
-

139

<b>3E1103</b>	Roll No. _____	Total No. of Pages: <span style="border: 1px solid black; padding: 2px;">2</span>
	<b>3E1103</b> <b>B. Tech. IV - Sem. (Back) Exam., - 2022</b> <b>HSMC Aeronautical Engineering</b> <b>4AN1-03/ Managerial Economics and Financial Accounting</b> <b>Common for all branches</b>	

Time: 2 Hours

Maximum Marks: 80  
Min. Passing Marks: 28

*Instructions to Candidates:*

*Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three 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**

**(Answer should be given up to 25 words only)**

**[5×2=10]**

**All questions are compulsory**

- Q.1 Circular flow of economic activity
- Q.2 Demand forecasting
- Q.3 Define marginal cost
- Q.4 Oligopoly marker
- Q.5 Capital budgeting

140

## **PART – B**

**(Analytical/Problem solving questions)**

**[4×10=40]**

**Attempt any four questions**

- Q.1 What is Managerial Economic? What are the principles of Managerial Economic?
- Q.2 What is National Income and methods of measuring National Income?
- Q.3 What is Price Elasticity? Explain types of Price Elasticity of Demand.
- Q.4 Discuss the different cost concepts relevant to managerial decision for Planning and Control.
- Q.5 Describe the characteristics of Pure/Perfect Competition and Pure Monopoly.
- Q.6 What are Financial Ratios? Explain two Financial Ratios in detail.

## **PART – C**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**[2×15=30]**

**Attempt any two questions**

- Q.1 What is Law Supply? What are the determinants of Supply? Explain four determinates in detail.
- Q.2 State and explain the law of variable proportions.
- Q.3 What is Financial Statement Analysis? What are the three basic tools for Financial Statement Analysis?