

Harcourt Butler Technical University, Kanpur
Mid Semester Exam 2021-22
COMPUTER NETWORKS (ECS-351)
Third Year CSE + IT

Time: 90 minutes

Max Marks [15]

- Q1. What is OSI Model? Explain the functions of each layer of OSI Model? [2.5]
- Q2. Define topology and explain the advantage and disadvantage of Bus, Star and Ring topology in detail. [2.5]
- Q3. Discuss the Go- Back N ARQ protocol in detail. Station A uses 32 bytes packet to transmit message to station B using sliding window protocol. The round trip delay between station A & B is 80 ms; and bottleneck bandwidth on the path between A and B is 128 kbps. Find the optimal window size. [2.5]
- Q4. Discuss all carrier sense protocols in details? [2.5]
- Q5. Compare and Contract twisted pair cable, co-axial cable and optical fiber cable. [2.5]
- Q6. An Aloha network user 19.2kbps channel for sending message packets of 100 bit long size. Calculate the maximum throughput for pure Aloha network. [2.5]

90 minutes

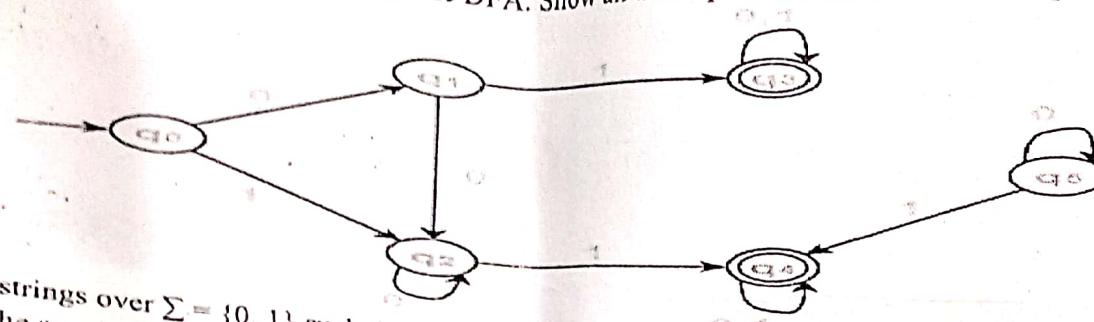
a: Attempt all questions.

Q1. Define the closure properties of the DFA.

[3]

Q2. Illustrate the steps of subset construction method to minimize DFA. Show all the steps to Minimize the below given DFA

[3]



Q3. Design a DFA for a set of strings over $\Sigma = \{0, 1\}$ such that the number of 0's is divisible by 5 and number of 1's divisible by 3.

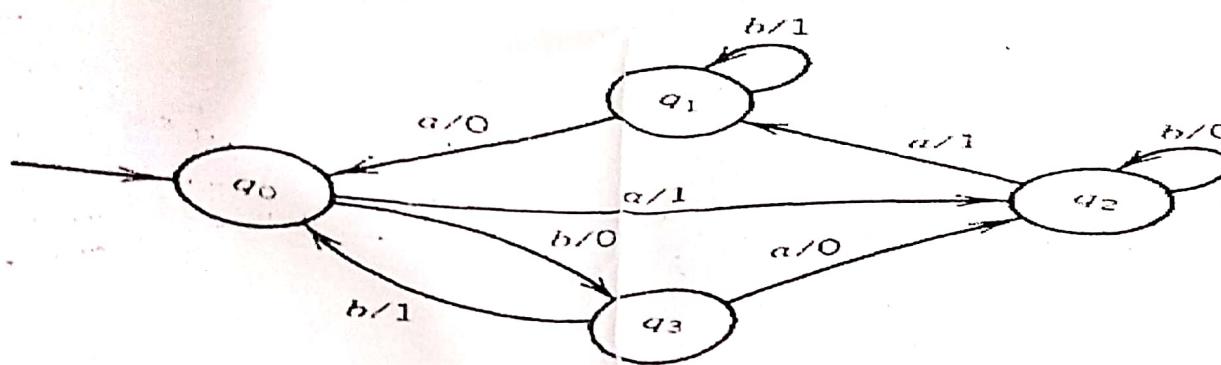
[3]

Q4. Construct NFA, DFA for the regular Expression $R = ab(a+b)^*abb$. Obtain minimized DFA

[3]

Q5. Illustrate the equivalences of Mealy machine and Moore machine. Convert the below given Mealy machine into Moore machine by showing all the steps

[3]



Harcourt Butler Technical University, Kanpur

B.Tech. CS/ IT (3rd year)
Mid Term Exam (Odd Semester), 2021-22
Data Science (ECS-359)

TIME: 1Hr 30 Min

MM: 30

NOTE: ATTEMPT ALL QUESTIONS.

- Q1. What is Data Science? Describe different types of data analytics. [5]
- Q2. Define Machine Learning and its types with their advantages and disadvantages. [5]
- Q3. What do you understand by Deep Learning? Explain with examples [5]
- Q4. Describe the application areas of Data Science and Machine learning. [5]
- Q5. Define Artificial Neural Network (ANN). How it is different from biological Neural Network? [5]
- Q6. Explain Chi-Square test and t-Test with example. [5]

Harcourt Butler Technical University, Kanpur

MID (Odd) SEMESTER EXAMINATION [MSE]/ CLASS TEST

3rd Year, 5th Semester B.Tech. CSE+IT

Subject: Database Management Systems (ECS-353)
Total Time: 1 hour 30 minutes

Max. Marks: 15

Q1.) A bank has many branches, and a large number of customers. A customer can open many different kinds of accounts with the bank. The bank keeps track of the customer with his SSN, name, address, and phone number. Age is a factor to check whether he is a major. There are different types of loans, each identified by a loan number. Customer can take out more than one type of loan, and all branches can give loans. Loans have a duration and interest rate. The account holder can enquire about the balance in his account. Draw an ER Diagram for the bank. Make suitable assumptions and show them with suitable cardinality ratios. [5 marks]

Q2.) Consider the following relation schema for a BANK database:-
BRANCH (BranchID, Bname, City, Phone)
ACCOUNT (AccountNo, Aname, Atype, BranchID, Balance)
TRANSACTION (TID, Tdate, Ttype, AccountNo, Amount)

On the basis of the relational schema, write the following queries in SQL.

- (1.) Retrieve the ID and names of all the branches located in "Seattle" City.
- (2.) Retrieve the ID, type and amount of all the transactions of withdrawal type. [2 marks]

Q3.) Define Database Management System? What are its advantages over a file system?

[3 marks]

Q4.) Define the attribute inheritance property with respect to specialization. Discuss in detail the various constraints that can be placed on specialization and generalization. [5 marks]

Mid -Semester (Odd Semester) Examination 2021-22
OPERATIONS RESEARCH (BMA- 341)
III B.Tech. (CS/IT/ET/ME/CE/EE)

Time: 1.5 hr.

MM: 30

Note: Attempt all the questions;

- Q.1** Explain all integer programming problem. Describe Gomory's constraint and explain its use in the solution of the problem. (5)
- Q.2** Determine the initial basic feasible solution to the following transportation problem by using Vogel's Approximation Method: (5)

| Origin | Destination | | | | Supply |
|----------------|----------------|----------------|----------------|----------------|--------|
| | D ₁ | D ₂ | D ₃ | D ₄ | |
| O ₁ | 6 | 1 | 9 | 3 | 70 |
| O ₂ | 11 | 5 | 2 | 8 | 55 |
| O ₃ | 10 | 12 | 4 | 7 | 70 |
| Demand | 85 | 35 | 50 | 45 | |

- Q.3** A captain of a cricket team has to allot five middle order batting positions to five batsmen. The average runs scored by each batsman at these positions are given in the table. (5)

Batting position →

| Batsman↓ | III | IV | V | VI | VII | |
|----------|-----|----|----|----|-----|----|
| | A | 40 | 40 | 35 | 25 | 50 |
| B | 42 | 30 | 16 | 25 | 27 | |
| C | 50 | 48 | 40 | 60 | 50 | |
| D | 20 | 19 | 20 | 18 | 25 | |
| E | 58 | 60 | 59 | 55 | 53 | |

Make the assignment so that the expected total average runs scored by these batsmen are maximum.

- Q.4** In a metal shop two articles A and B are produced. The article A takes 2 minutes to stamp, 3 minutes to form and 2 minutes to paint. The article B takes 4 minutes to stamp, 1 minute to form and 1.6 minutes to paint. The profit margins on products A and B are Rs. 6 and Rs. 9 respectively. The time available per week on each process is 50 hrs. (3000) minutes. How many products of type A and B should be produced so as to maximize profit? Find also the maximum profit by using graphical method. (5)

- Q.5** Use Big- M method to solve the following LPP:

$$\text{Minimize } Z = 12x_1 + 20x_2$$

$$\text{Subject to: } 6x_1 + 8x_2 \geq 100, \quad 7x_1 + 12x_2 \geq 120, \quad \text{and } x_1, x_2 \geq 0$$

(5)

- Q.6** What is degeneracy? Discuss a method to resolve degeneracy in LPP.

OR

Discuss the main characteristics of OR with suitable examples.

(5)

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

Mid-semester Examination, Session- 2021-22

3rd year, 5th semester B.Tech. (CSE & IT)

Subject Name: Design and analysis of algorithms

Subject code: ECS-355

Note: Maximum marks: 15. All questions are compulsory.

Duration: 1.5 Hrs

Q1. Briefly explain the divide and conquer analysis technique. [3]

Q2. Distinguish between Asymptotic notation and conditional asymptotic notation. [3]

Q3. Discuss the insert operation of Red-black tree using a suitable example. [3]

Q4. Explain the delete operation in Fibonacci heap using a suitable example. [3]

Q5. Arrange the following numbers in increasing order step-by-step using merge sort:
18, 29, 68, 32, 43, 37, 87, 24, 47, 50. [3]

HARCOURT BUTLER TECHNICAL UNIVERSITY

End-Semester Examination

Odd Semester (V/B. Tech.), 2021-22

(IT, CS, ME, EE, ET, CE)

BMA-341/351: Operations Research

Max. Marks: 50

Time: 2.30 Hrs.

INSTRUCTIONS:

- i) Answer all the questions. ii) All questions carry marks, as shown against them.
- iii) Mathematical symbols have their usual meanings.

Course outcomes (CO):

1. Understand and solve linear programming problems.
2. Formulate and solve Transportation models, Assignment models and integer linear programming problems.
3. Formulate and solve sequencing and scheduling models.
4. Formulate and solve Replacement and inventory models.
5. Learn and use Dynamic programming and Genetic Algorithms

-
1. (a) Two products P₁ and P₂ are to be manufactured by a firm. Profits on P₁ and P₂ are Rs.30 and 20 respectively. The products are to be processed on two machines, i.e., first on milling machine and other on surface grinder. The capacities and the time required to produce a unit are as follows:

CO1 5

| | P ₁ | P ₂ | capacity |
|-----------------|----------------|----------------|---------------------|
| | 3 hours | 1 hour | |
| Milling machine | 3 hours | 1 hour | 1500 man hrs./month |
| Surface grinder | 1 hour | 1 hour | 1000 man hrs./month |

Use simplex method to find the no. of products of type P₁ and P₂ to get maximum profit.

- (b) Solve the following Linear programming problem by graphical method:

2.5

$$\begin{aligned} \text{Min. } Z &= 3x_1 + 5x_2 \\ \text{subject to } & -3x_1 + 4x_2 \leq 12 \\ & 2x_1 - x_2 \geq -2 \\ & 2x_1 + 3x_2 \geq 12 \\ & x_1 \leq 4 \\ & x_2 \geq 2 \\ \text{and } & x_1, x_2 \geq 0 \end{aligned}$$

- (c) Explain the duality theory of the Linear Programming and find the dual of the following LPP:

2.5

$$\begin{aligned} \text{Min. } Z &= x_1 + x_2 + x_3 \\ \text{subject to } & x_1 - 3x_2 + 4x_3 = 5 \\ & x_1 - 2x_2 \leq 3 \\ & 2x_2 - x_3 \geq 4 \\ \text{and } & x_1, x_2 \geq 0 \text{ and } x_3 \text{ is unrestricted} \end{aligned}$$

1

OR

Describe the computational procedure of Two phase method.

2. (a) State the transportation problem in general terms and find the initial basic feasible CO₂ solution of the following T.P by using Lowest Cost Entry Method then check the optimality of the solution by MODI method.

Market

| Origins | M ₁ | M ₂ | M ₃ | M ₄ | Capacity |
|----------------|----------------|----------------|----------------|----------------|----------|
| | O ₁ | 8 | 10 | 7 | 6 |
| O ₂ | 12 | 9 | 4 | 7 | 50 |
| O ₃ | 9 | 11 | 10 | 8 | 40 |
| Requirement | 25 | 32 | 40 | 23 | 30 |

- (b) There are five machines and five operators. Assign one operator to one machine so that overall payment is minimum and find the total minimum cost.

| Jobs → Machines ↓ | J ₁ | J ₂ | J ₃ | J ₄ | J ₅ |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| M ₁ | 1 | 3 | 2 | 3 | 6 |
| M ₂ | 2 | 4 | 3 | 1 | 5 |
| M ₃ | 5 | 6 | 3 | 4 | 6 |
| M ₄ | 3 | 1 | 4 | 2 | 2 |
| M ₅ | 1 | 5 | 6 | 5 | 4 |

- (c) Explain all integer programming problem. Describe Gomory's Cutting Plane method to solve the IPP by a suitable example.

OR

Describe the Branch-and-Bound technique to solve the integer programming problem with suitable example.

2.5

2

What is CPM? What are the essential steps in CPM for project planning? A project CO3 consists of nine activities with the following relevant information:

5

| Activity | Estimated duration (days) | | |
|----------|---------------------------|-------------|-------------|
| | Optimistic | Most likely | Pessimistic |
| 1-2 | 2 | 5 | 14 |
| 1-6 | 2 | 5 | 8 |
| 2-3 | 5 | 11 | 29 |
| 2-4 | 1 | 4 | 7 |
| 3-5 | 5 | 11 | 17 |
| 4-5 | 2 | 5 | 14 |
| 6-7 | 3 | 9 | 27 |
| 5-8 | 2 | 2 | 8 |
| 7-8 | 7 | 13 | 31 |

- (i) Draw the PERT network and calculate the expected project completion time
- (ii) Find the expected time for each activity and critical path.
- (iii) Calculate EST, LST, EFT, LFT and floats.

(b) What is a sequencing problem? Describe the Johnson's algorithm to solve the problem of processing n jobs through two machines.
Determine the optimal sequence of jobs that minimizes the total elapsed time and the total elapsed time based on the following information:

5

| Job → Machines | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-------------------|---|---|---|----|---|---|----|
| M ₁ | 3 | 8 | 7 | 4 | 9 | 8 | 7 |
| M ₂ | 4 | 3 | 2 | 5 | 1 | 4 | 3 |
| M ₃ | 6 | 7 | 5 | 11 | 5 | 6 | 12 |

4. (a) Find the best replacement policy of a machine when its maintenance cost is given by CO4 a function increasing with time and money value is constant. The cost of a machine is Rs.6100, its scrap value is only Rs. 100. The maintenance cost is given as follows:

5

| Years | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------|-----|-----|-----|-----|-----|------|------|------|
| Maintenance cost | 100 | 250 | 400 | 600 | 900 | 1250 | 1600 | 2000 |

Determine the optimum period for replacement of the machine.

3

2.5

- (b) Derive the formula for economic order quantity when stock replenishment is not instantaneous (gradual replenishment or finite replenishment).
- (c) ABC manufacturing company needs ball bearings of worth Rs. 28,800 per year. The cost of placing an order is Rs. 48 and inventory carrying cost as a percentage of average inventory investment is 12%.
- (i) Determine the value of each assignment.
 - (ii) No. of orders per year.

OR

Derive the EOQ formula for the inventory model with infinite rate of replenishment and without shortage.

5. (a) Use the principle of optimality to find the maximum value of $Z = b_1 x_1 + b_2 x_2 + \dots + b_n x_n$ when $x_1 + x_2 + x_3 + \dots + x_n = C$ and $x_1, x_2, x_3, \dots, x_n \geq 0$

COS

5

- (b) Explain dynamic programming problem and describe the basic features and characteristics of dynamic programming problems.

4

III B. Tech. CSE/IT ODD SEMESTER/CARRYOVER EXAMINATION
DESIGN AND ANALYSIS OF ALGORITHMS

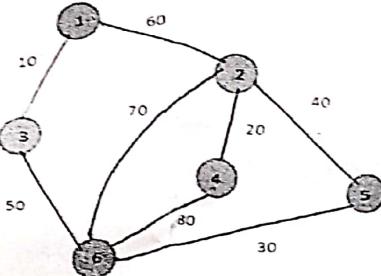
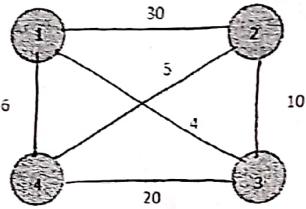
Course Outcomes

1. Understand and apply mathematical preliminaries to the analysis and design stages of different types of algorithms. (Understand, Apply)
2. Analyze worst-case time complexity of various algorithms using asymptotic methods. (Analyze)
3. Understand and apply the divide-and-conquer paradigm and synthesize divide-and-conquer algorithms on problems of Sorting, Searching, finding MST etc. (Understand, Apply)
4. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms. (Apply, Analyze)
5. Apply the dynamic-programming paradigm to model engineering problems using graph and write the corresponding algorithm to solve the problems. (Apply)
6. Explain the ways to analyze randomized and approximation algorithms (Apply, Analyze)

Time: 2:30 Hrs.**Max. Marks: 50**

Note: 1. Attempt all questions.
 2. All questions carry marks as shown against them.

| Q. No. | Questions | Marks | CO | BL |
|--------|--|----------|----|----|
| 1. | <p>Attempt any four subparts of this question.</p> <p>(a) Define Best case, Worst case and Average case time complexities alongwith the corresponding notations used to represent them.</p> | 08 03 | 1 | L1 |
| | (b) Write Divide and Conquer based Quick Sort algorithm and perform its time complexity analysis. | 03 | 1 | L3 |
| | (c) State the Master Theorem. What is the smallest value of n such that an algorithm having running time as $100n^2$ runs faster than an algorithm whose running time is 2^n on the same machine? | 02 | 1 | L2 |
| 2. | <p>Attempt ALL subparts of this question</p> <p>(a) Explain the advantages of using height Balanced Trees. Discuss the AVL Rotations used for height balancing. Find the minimum and maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0.</p> | 08 04 | 2 | L2 |
| | (b) A 2-3-4 tree is defined as a B-Tree with minimum degree t=2. Create a 2-3-4 tree by successively inserting the elements (in the given order) 42, 56, 24, 89, 1, 5, 87, 8, 61, 6, 78, 7, 12, 34. | 02 | 2 | L3 |
| | (c) Define Heaps in general and Fibonacci Heaps in particular. OR Discuss Amortized Analysis. | 02 | 2 | L1 |
| 3. | <p>Attempt ALL subparts of the following:</p> <p>(a) Formulate Fractional Knapsack Problem and write a Greedy Algorithm for solution to this problem. Find the optimal solution for the following fractional Knapsack problem. n=4, m = 60, W={40, 10, 20, 24} and P={280, 100, 120, 120}</p> | 08 04 | 2 | L3 |

| | | | | | |
|----|-----|--|----------|---|----|
| | (b) | Discuss the Dynamic Programming approach of designing an algorithm. Explain it by taking a suitable example. | 04 | | |
| | | OR | | | |
| | | Discuss the Graph Coloring Problem and its solution using Branch and Bound Technique. | | | |
| 4. | (a) | Attempt ALL subparts of this question. Explain Prim's algorithm for finding minimum spanning tree. Obtain a minimum cost spanning tree for the graph shown below. | 08 04 | 4 | L2 |
| | |  | | | |
| | (b) | Using Dynamic Programming solve Travelling Salesman Problem presented as a following graph. | 04 | 4 | L1 |
| | |  | | | |
| | | OR | | | |
| | | Apply backtracking to the problem of finding a Hamiltonian circuit in the above graph. Ignore the weight values of the links. | | | |
| 5. | | Define any FOUR subparts of the following | 08 | 5 | L1 |
| | | (i) Class P and Class NP (ii) NP-complete problem (iii) NP-hard problem (iv) Randomized Algorithms (v) Approximation Algorithms | | | |
| 6. | (a) | Attempt ALL subparts of this question Write a program in C/C++ to find K th smallest number from a given list of 'N' integer numbers. | 10 05 | 6 | L2 |
| | (b) | Discuss Binary Search Technique and write a program in C/C++ to search a given number 'K' in a given list of 'N' integer numbers. Assume that the given list is sorted in ascending order. | 05 | 6 | L2 |

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

3rd B.Tech (CSE/IT)

End Semester/Carry Over Examination

ODD SEMESTER (V), 2021-22

ECS 357/ECS 305: THEORY OF AUTOMATA & FORMAL LANGUAGES

Time: 2:30 Hours

Max. Marks: 50

Note: Attempt all questions. All questions carry marks, as shown against them.

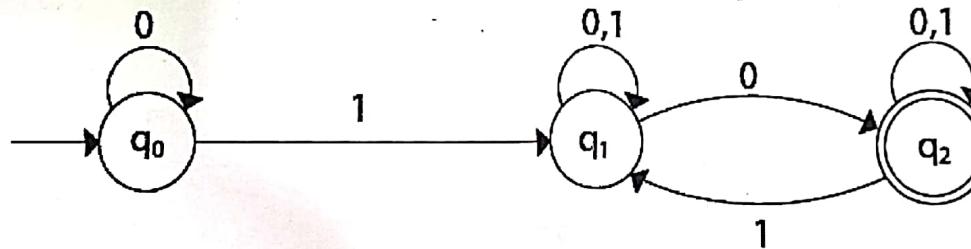
Please mention all the Course Outcomes (CO) in statement form

1. Describe the capabilities and limitations of the abstract machines including finite automata, pushdown automata, and Turing machines and their associated languages.
2. Construct finite automata, pushdown automata, Turing machines for the given grammar and vice-versa.
3. Show that a language is not regular / not context-free using pumping lemma.
4. Outline the characteristics of P, NP and NP Complete problems in the context of Turing machines.

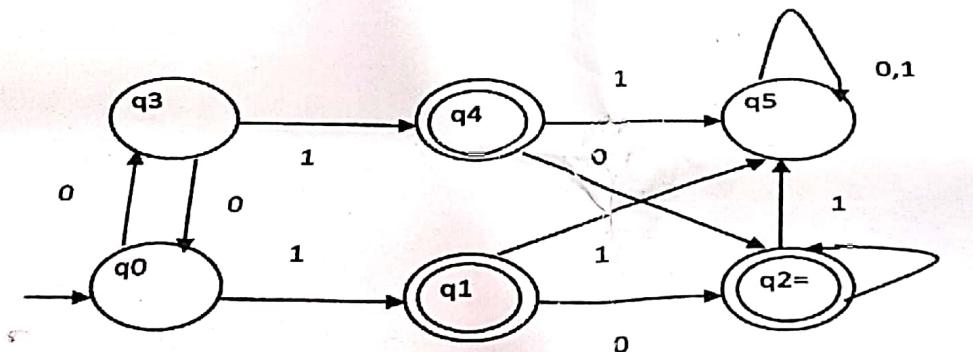
| Related Course Outcome (CO) | Marks |
|-----------------------------|-------|
|-----------------------------|-------|

Q No. 1: Attempt all the Questions.

- (a) Design a DFA that accepts the strings which contains the substring 0101 ($\Sigma = \{0,1\}$). 01 2.5
- (b) Convert the following given state diagram of NFA into an equivalent DFA. 02 2.5



- (c) Draw the minimum state FA for the following state diagram. 02 2.5



02 2.5

- (d) Prove that NDFA = DFA.

Q No. 2: Attempt all the Questions.

02 05

- (a) Design a Moore machine to find the complement of binary string.
OR

L_1 and L_2 are regular languages then prove that these languages are closed under union and concatenation.

03 05

- (b) State and proof pumping lemma for regular sets.

OR

Prove that language $L = \{a^p \mid p \text{ is prime}\}$ is not regular.

Q No. 3: Attempt all the Questions.

- (a) Construct a FA for regular expression $10 + (0+1)0^*1$.
03 2.5
(b) Describe the definition of PDA, how it is more powerful than DFA?
03 2.5
(c) Construct a PDA for the language
 $L = \{a^m b^n c^r d^m \mid m, n > 0\}$

OR

$$L = \{w c w^R \mid w \in \{0,1\}^*\}$$

- (d) Verify that the family of CFL is not closed under intersection.
02 2.5

Q No. 4: Attempt all the Questions.

01 2.5

- (a) Describe turing machine with suitable example.
02 2.5
(b) Design a turing machine for $L = \{a^n b^n c^n \mid n \geq 1\}$.
03 2.5
(c) Prove that complement of recursive language is recursive.

OR

The union of two recursive languages is recursive.

- (d) Define Post correspondence problem with example.
01 2.5

Q No. 5: Attempt all the Questions.

03 05

- (a) Consider the following grammar

$$L_1 = \{a^n b^{2n} c^m \mid n, m \geq 0\}$$

$$L_2 = \{a^n b^m c^{2m} \mid n, m \geq 0\}$$

(i) Show that L_1 and L_2 are CFL by generating CFG.

(ii) Is $L_1 \cap L_2$ a CFL

- (b) Convert the following grammar into Greibach normal form.

03 05

$$S \rightarrow AB \mid BC$$

$$A \rightarrow aB \mid bA \mid a$$

$$B \rightarrow bB \mid cC \mid b$$

$$C \rightarrow c$$

of Printed Pages: 01

Roll No.

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR
B-TECH

End Semester Examination
 Odd Semester (V Semester), 2021-22
ECS-359: Data Science

Max. Marks: 50**Time: 2:30 Hours****Note:** 1. Attempt all questions. All questions carry marks, as shown against them.**Course Outcomes (CO):**

1. This course creates relevant programming abilities in the student.
2. This course creates demonstrate proficiency with statistical analysis of data.
3. This course develops the ability to build and assess data-based models.
4. This course executes statistical analyses with professional statistical software.
5. This course demonstrates skill in data management.
6. Students will apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively.

| | Related Course Outcome (CO) | Marks |
|---|--------------------------------------|-------|
| Q. No. 1: Attempt both questions. | | |
| (a) What is data science? Discuss data analytics and its types. | CO1 | (05) |
| (b) Discuss Machine Learning and its types with their advantages & disadvantages. | CO1 | (05) |
| Q. No. 2: Attempt both questions. | | |
| (a) Explain Levels of measurement in data analysis and its types. | CO5 | (05) |
| (b) What is data categorization and indexing? | CO2 | (05) |
| OR | | |
| Explain Chi-Square test and t-test with an example. | | |
| Q. No. 3: Attempt both questions. | | |
| (a) Define data modelling. What are the uses of data modelling tools? | CO3 | (05) |
| OR | | |
| Explain different type of modelling techniques in data modelling. | | |
| (b) What is Support Vector Machine (SVM)? What do you understand by Kernels in SVM. | CO3 | (05) |
| Q. No. 4: Attempt both questions. | | |
| (a) What is data manipulation and visualization? | CO1 | (05) |
| (b) What are data frames and how can we use pandas in that, give suitable example. | CO1 | (05) |
| Q. No. 5: Attempt both questions. | | |
| (a) How analytics can predict bank loan default and fraudulent activity in Banking sector? | CO4 | (05) |
| (b) Explain the role of analytics in the telecommunications industry. How they can predict customer Churn- Network analysis and optimize fraud detection. | CO6 | (05) |



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HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR
MID SEMESTER EXAMINATION 2021-22
Entrepreneurship Development (HHS-352)
B.Tech 3rd year (ET/CE/EE/ME/CSE/IT)

TOTAL MARKS – 30

TIME: 1:30 hr.

1. How ideation is related to entrepreneurship? Enumerate different phases of entrepreneurial process. [7.5]
 2. Critically examine Schumpeter's thought in comparison to Drucker's with respect to entrepreneurship. [7.5]
 3. Define MSMEs? Briefly explain about the significance of MSME in India. [7.5]
 4. Evaluate Sole-Proprietorship as form of business ownership. [7.5]
-

Harcourt Butler Technical University, Kanpur
Mid Semester Exam 2021-22
Internet of Things (ECS-360)
Third Year CS +IT

Time: 90 minutes

Max Marks [30]

Q.1. Explain in detail the term Internet of Things. What are the main characteristics of the Internet of things also write the advantage and disadvantage.

[5]

[5]

Q2. What are the key features of M2M. Explain the architecture and component of M2M

[5]

Q3. Explain the following protocols for IOT – a) 802.3 b) 802.16 c) TCP d) CoAP e) Websocket

[5]

Q4. What do you mean by sensors ? What are the key specification of sensor ? Explain in brief four different type of sensor.

[5]

Q5. Explain the platform middleware for M2M in detail with suitable block diagram.

[5]

Q6. Write Notes on- a) Reset based communication API b) Web Socket based communication API.



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B.Tech CS/ IT (3rd year)
Mid Term Exam (Even Semester), 2021-22
Soft Computing (ECS-358)

TIME: 1Hr 30 Min

MM: 30

NOTE: ATTEMPT ALL QUESTIONS.

- Q1. What is soft computing? Differentiate between Hard & Soft computing. [5]**
- Q2. Define Knowledge based System. What are different types of knowledge? [5]**
- Q3. Define fuzzy, crisp and rough set with an example. [5]**
- Q4. Explain characteristic behaviour of intelligent systems. [5]**
- Q5. Explain different types of operations performed on fuzzy sets by taking an example of each. [5]**
- Q6. Define fuzzy interference systems. And explain if-then rule. [5]**

1st MID SEMESTER EXAMINATION 2021-22

III (CSE +IT)

Computer Graphics (ECS-356)

Time: 90 Min.

MM: 30

Note: Attempt All Questions.

Q.1: Derive midpoint ellipse algorithm. (10)

Q.2: What is polygon fill? Name the various fill algorithms. Explain scan-line polygon fill algorithm. (10)

Q.3: Find out final transformation matrix, when point P (x, y) is to be reflected about a line

$$y = mx + c \quad (10)$$

Harcourt Butler Technical University, Kanpur

B.Tech CSE (3rd Year)
Mid Term Exam (Even Semester), 2021-22
Object Oriented System (ECS- 354)

TIME: 1Hr 30 Min

MM: 15

NOTE: ATTEMPT ALL QUESTIONS.

Q1. What do you understand by Object Oriented Design. [3]

Q2. Differentiate between Designing and modelling. [3]

Q3. Write different principles of modelling. [3]

Q4. Explain the OOPS Concept. [3]

Q5. Define UML and explain the concept of things in UML building blocks. [3]

Date of showing evaluated answer books: 15 days after exam
No. of Printed Pages: 01

Roll No.

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

End Semester Examination

Even Semester (IIIrd B.Tech.), 2021-22

HHS 352: Entrepreneurship Development

Time: 2:30 Hours

Max. Marks: 50

Note: 1. Attempt all questions.

2. All questions carry marks, as shown against them.

Please mention all the Course Outcomes (CO) in statement form

1. Describe what it takes an Entrepreneur; describe multiple ways to become an entrepreneur; including, intrapreneur, and manager, woman entrepreneur rural & urban: highlights motives to become entrepreneur.
2. Apply the beginner concept, ownership and various forms with focus on small scale enterprises.
3. Identify opportunities using identification; project conceptualization, formulation & evaluation.
4. Identify potential contribution of human resources, marketing, financial and strategic management with fund, opportunities
5. Decipher the role of Institution support and policy framework of Government for enterprises in India.

| | Related CO | Marks |
|--|------------|--------|
| Q.No. 1: Attempt any two of the followings. (a) Who is an entrepreneur? Discuss the main characteristics of an entrepreneur. (b) Discuss rural entrepreneurship; suggest some schemes that support rural entrepreneurship. (c) Enumerate the different objectives of EDP in detail. | CO1 | 5*2=10 |
| Q.No. 2: Attempt any two of the followings. (a) Define MSMEs. Elucidate Role of Govt.in developing MSMEs. (b) Distinguish between long term & short term source of finance? (c) What is the process of company formation? Explain. | CO2 | 5*2=10 |
| Q.No. 3: Attempt any two of the followings. (a) What is project formulation? Explain its Significance in developing project. (b) Give a specimen of a project report for any industry. (c) What is a project? Explain various phases of project management. | CO3 | 5*2=10 |
| Q.No. 4: Attempt any two of the followings. (a) Explain marketing mix with suitable example. (b) Discuss the process of strategy formulation. Explain main strategies for business growth. (c) What is human resource management and explain its functions. | CO4 | 5*2=10 |
| Q.No. 5: Attempt any two of the followings. (a) Discuss the Institutional framework to promote small scale industry in India. (b) What are the different functions of a TCO? Explain in detail. (c) Who is a venture capitalist? What is the need of venture capital in startups? | CO5 | 5*2=10 |

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

B. Tech.

End Semester Examination

Even Semester (VI), 2021-22

ECS-362: NETWORK SECURITY

Time: 2.30 Hours

Max. Marks: 50

Note: 1. Attempt all questions. All questions carry marks, as shown against them.

Please mention all the Course Outcomes (CO) in statement form

1. Understand and deploy cryptographic techniques to secure data in networks. (Understand, Apply)
2. Analyze the vulnerabilities in any computing system and design a security solution. (Apply, Analyse)
3. Understand and use standard algorithms for confidentiality, integrity and authenticity. (Understand, Apply)
4. Apply various key distribution and management schemes in network system. (Apply)
5. Apply security protocols in various IT applications. (Apply)

| Related Course Outcome (CO) | Marks |
|-----------------------------|-------|
|-----------------------------|-------|

Q. No. 1: Attempt all parts of the following:

- (a) What services are being offered under network security? Differentiate the following pairs: 1 (05)
- (i) Brute Force Search and Cryptanalysis
 - (ii) Known plaintext attack and chosen plaintext attack
- (b) Write down the algorithm for S-DES encryption and decryption. Explain the role of S-Boxes in S-DES algorithm. 1 (05)

Q. No. 2: Attempt all parts of the following:

- (a) Perform encryption and decryption using RSA algorithm for the following: 2 (05)
 $p=17, q=7, e=5, n=119$, message $M=6$.
Here p, q, e and M have usual meanings. Show all the steps of calculations. Write down the steps involved in encryption and decryption in RSA algorithm.
- (b) Describe Fermat's and Euler's Theorems with their applications. 2 (2.5)
- (c) Explain distribution of public-key using public-key certificate scheme. 2 (2.5)

Or

In Diffie-Hellman key exchange algorithm, let prime numbers be 11 and 7. Let A and B select their secret keys $X_A = 3$ and $X_B = 6$ to exchange secret key between two communicating parties. Compute

- (i) Public keys of A and B
- (ii) Common secret key

Q. No. 3: Attempt all parts of the following:

3 (05)

- (a) Enlist security services provided by digital signature. Write the DSS (digital signature standard) scheme of digital signature generation and verification. Prove the correctness of the verifying process.

3 (05)

- (b) Describe secure hash algorithm (SHA) using suitable example. Differentiate MAC (Message Authentication Code) and secure hash algorithms (SHA).

Q. No. 4: Attempt all parts of the following:

4 (05)

- (a) What are major security aspects in the security of electronic mail system? Explain the working of PGP (Pretty Good Privacy).

4 (05)

- (b) What requirements are defined for Kerberos? Explain the duties of each server. Write the sequence of message exchanges that happens when a client attempts to obtain a service granting ticket in Kerberos 4.

Q. No. 5: Attempt all parts of the following:

5 (05)

- (a) Explain the requirements of Security Association (SA) in IP Sec. How Authentication Header (AH) is used in transport and tunnel modes in IP Sec protocol?

5 (2.5)

- (b) Enlist the various components of Web Security. What are the various services are being offered by secure socket layer (SSL)?

5 (2.5)

- (c) What do you mean by web security threats and its mitigation?

Or

Write down the role and working of Secure socket layer (SSL) in web security.

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR
EVEN SEM, I MID SEM EXAM, 2021-22
COMPILER DESIGN (ECS- 352)
CLASS – III CSE/IT (B.Tech)

TIME:1.5 hr

MAX MARKS:30

Note: Attempt all questions .

1. Explain all the phases of compiler in brief. [5]
2. Explain the Context-Free Grammar with example. Also state the difference between Left Most derivation and Right most derivation with proper grammar example. [5]
3. Write a Short note on LEX compiler and Bootstrap compiler. [5]
4. What do you understand by parsing? Name the types of parser. Also state the comparison between Top-Down parser and Bottom-Up parser. [3]
5. Perform the following operations as asked in the questions.
 - i) Find no of tokens in below program. [1]

```
#include<stdio.h>
main()
{
    int i;
    int *pi = &i; //parent pointer
    scanf("%d", pi);
    printf("%d\n", i+5);
}
```
 - ii) Consider the following grammar and eliminate left recursion. [2]
$$\begin{aligned} E &\rightarrow E + T / T \\ T &\rightarrow T \times F / F \\ F &\rightarrow id \end{aligned}$$
 - iii) Do left factoring in the following grammar. [2]
$$\begin{aligned} S &\rightarrow aAd / aB \\ A &\rightarrow a / ab \\ B &\rightarrow ccd / ddc \end{aligned}$$
 - iv) Calculate the first and follow functions for the given grammar. [2]
$$\begin{aligned} S &\rightarrow (L) / a \\ L &\rightarrow SL' \\ L' &\rightarrow ,SL' / \epsilon \end{aligned}$$
 - v) Convert the following ambiguous grammar into unambiguous grammar. [2]
$$R \rightarrow R + R / R . R / R^* / a / b$$

where * is kleen closure and . is concatenation.
6. Explain whether the given grammar is LL(1). [3]
$$\begin{aligned} S &\rightarrow A \mid a \\ A &\rightarrow a \end{aligned}$$

OR

Design a FA from given regular expression $10 + (0 + 11)0^* 1$.

**** All The Best****

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

B. Tech. (CSE / IT)

End Semester Examination

Even Semester (IV), 2021-22

ECS-354: Object Oriented Systems

Time: 2:30 Hours

Max. Marks: 50

- Note: 1. Attempt all questions. All questions carry marks, as shown against them.
2. Q.No.6 is from the lab component of the subject.

Course Outcomes (CO):

1. Analyse information systems in real-world settings and use an object-oriented method for analysis and design. (Analyse)
2. Understand features of object-oriented design such as encapsulation, polymorphism, inheritance, and UML. (Understand)
3. Understand and prepare different types of UML diagrams like use case diagrams, interaction diagrams, nested state diagrams, state chart diagrams, activity diagram etc. (Understand, Apply)
4. Understand and appreciate the use of Design Patterns in the Software Development. (Understand, Apply)
5. Understand the core and advance Java Programming features and apply them in complex problem solving. (Understand, Apply)

| | | Related CO | Marks |
|-----------------|---|------------|-------|
| Q. No. 1 | Attempt ALL subparts of this question. | | |
| (a) | What is Unified Process? How it came to its present form? Brief the notations and symbols used in UML diagrams. Give its comparative advantages and disadvantages. | CO1, CO2 | 4 |
| (b) | Compare and contrast the Object oriented approach with traditional approach of software development. Also, discuss the software engineering models suitable for these two approaches of software development. | CO1, CO2 | 4 |
| Q. No. 2 | Attempt ALL subparts of this question. | | |
| (a) | A Bank offers two kinds of accounts to its customers that they can make withdrawals from, deposit funds into and enquire as to the current balance. The first is an ordinary account and the second is a current account. Both have an account number and hold the current balance. However, Current Account has an overdraft limit that is normally agreed with Bank Manager when the Account is created. Withdrawals can be made up to the overdraft limit. There is no overdraft limit available for the ordinary accounts. Clearly, there is no limit on deposits that can be made in either case. Construct a Class diagram for the Bank Account. | CO1, CO3 | 4 |

| | | | |
|----------|--|----------|---|
| (b) | Differentiate between Aggregation and Generalization relationships in Classes and objects diagrams. Give an example where both relations coexist in a class diagram. | CO1, CO3 | |
| Q. No. 3 | Attempt ALL subparts of this question. | | |
| (a) | What are the advantages of nested states diagrams over flat states diagrams? Prepare States Diagram for functioning of Traffic Control System for a Crossroad in a Smart City. | CO2, CO3 | 4 |
| (b) | Explain the concepts of activity, action, guarded transition, automatic transition in States diagrams using suitable example(s). | CO2, CO3 | 4 |
| Q. No. 4 | Attempt ALL subparts of this question. | | |
| (a) | Discuss the importance of use case diagrams in Unified Process. Draw Use Case diagram for Library management System. | CO4 | 4 |
| (b) | What are the benefits of using Component Diagrams? How dependencies are shown in Component Diagrams? Discuss various types of dependencies in Component diagrams with the help of suitable examples. | CO3 | 4 |
| Q. No. 5 | Attempt ALL subparts of this question. | | |
| (a) | What are Design patterns in UML? How they are useful? Explain the Composite or Adapter design patterns with a suitable example. | CO5 | 4 |
| (b) | Discuss how Object Oriented technologies have been useful in web services? | CO5 | 4 |
| Q. No. 6 | (Laboratory Component): Attempt ALL subparts of this question | | |
| (a) | Describe the life cycle of an applet. Develop an applet that receives three numeric values from the user and displays the largest of the three on the screen. Write a HTML page that embeds this applet. | CO5 | 5 |
| (b) | What is a thread? How do threads behave in Java? Write a program in Java showing the action from three threads using a suitable example | CO5 | 5 |
| | <u>OR</u> | | |
| | What are the various approaches to connect Java programs to a database? Explain any one approach in details with the help of a suitable example. | | |

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

B. Tech (CSE / IT)
END SEMESTER EXAMINATION
EVEN SEMESTER (VI), 2021-22
ECS-360: INTERNET OF THINGS

Max. Marks: 50

Time: 2:30 Hours

Note: 1. Attempt all questions. All questions carry marks, as shown against them.

Please mention all the Course Outcomes (CO) in statement form

1. Understand framework and architecture of Internet of Things. (Understand)
2. Understand key technologies in Internet of Things. (Understand)
3. Explain wireless sensor network architecture and its framework along with WSN applications. (Understand)
4. Explain resource management in the Internet of Things. (Understand)
5. Understand Security measures and design applications based on Internet of Things. (Understand, Apply)

| Related Course Outcome me (CO) | Marks |
|---|--------|
| Q. No. 1: Attempts all parts of the following: | |
| (a) What are the major challenges for IOT system Designing? Explain components of IOT. | 01 05 |
| (b) What do you mean by IOT communication model? Explain the Publish-Subscribe model for IOT in detail. | 01 2.5 |
| (C) Write Notes on following protocols (i) 802.11 Wifi (ii) UDP (iii) CoAP | 01 2.5 |
| Q. No.2: Attempts all parts of the following: | |
| (a) What do you mean by smart objects? Explain different communication pattern used for smart objects. | 02 05 |
| (b) What are key criteria to choose a Sensor? Differentiate between active and passive sensors. | 02 05 |
| Q. No. 3: Attempts all parts of the following: | |
| (a) Explain the operational principal of Radio Frequency Identification Technology (RFID) with help of suitable block diagram. | 03 05 |
| (b) Elaborate the Layered Architecture of wireless sensor network with help of structure. | 03 2.5 |
| (c) Describe the four applications of wireless sensor networks in detail. (OR) Discuss the issues in designing of wireless sensor networks in detail. | 03 2.5 |

Q. No. 4: Attempts all parts of the following:

- (a) Explain the clustering principle of internet of things with the help of two layered IOT framework. 04 05
- (b) With the help of a diagram discuss the software agent for object representation. 04 05
What are the many types of software agents available?

Q. No. 5: Attempts all parts of the following:

- (a) What are the IOT security issues? Explain the security architecture for IOT with suitable diagram. 05 05

- (b) Discuss the security component in detail and what are the main goals of security?
(OR)
What do you mean by Business model for IOT? Discuss any business model for IOT in detail

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

B-TECH

End Semester Examination

Even Semester (VI), 2021-22

ECS-358: Soft Computing

Time: 2:30 Hours

Max. Marks: 50

Note: 1. Attempt all questions. All questions carry marks, as shown against them.

1. Understand differential behavior of Human and Intelligent Systems.
2. Understand and use supervised and un-supervised learning techniques in ANN.
3. Understand and apply different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Network and their combination.
4. Correlate human-like processing in problem solving with current technologies in various domains like Bio Informatics, Multimedia Systems, Big Data Analytics, etc.
5. Apply evolutionary computing techniques in real life problems.

| | | Course Outcome (CO) | Marks |
|------------------|---|---------------------|-------|
| Q. No. 1: | Attempt both questions. | | |
| (a) | What do you understand by intelligent systems? Explain its characteristic behavior. | CO1 | (05) |
| (b) | What do you understand by soft computing? Differentiate between Hard and Soft Computing. | CO1 | (05) |
| Q. No. 2: | Attempt both questions. | | |
| (a) | Differentiate between Single layer perceptron and multilayer perceptron method. | CO2 | (05) |
| (b) | Write the algorithm for back propagation training and explain about the updation of weights. | CO2 | (05) |
| Q. No. 3: | Attempt both questions. | | |
| (a) | Define Hebb's Learning rule for competitive Learning. What are its uses? OR Explain the concept of Kohonen's self-organizing map (SOM) with its applications. | CO3 | (05) |
| (b) | Explain the concept of Adaptive Resonance Theory. | CO3 | (05) |
| Q. No. 4: | Attempt both questions. | | |
| (a) | Explain the concept of fuzzy inference systems with example. | CO3 | (05) |
| (b) | Explain the different methods of Defuzzification. | CO3 | (05) |
| Q. No. 5: | Attempt both questions. | | |
| (a) | What is Genetic Algorithm? Draw its general flow diagrams of genetic Algorithms. | CO4 | (05) |

CO5 (05)

- (b) Write short notes on:
- i. Fitness Function
 - ii. Rank Selection

OR

Explain the use of evolutionary computing in image processing, information retrieval, computer vision and semantic web.