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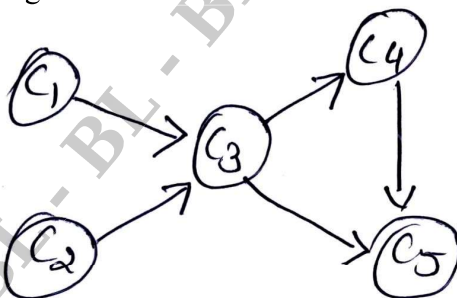
Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Analysis and Design of Algorithms

Time: 3 hrs.

Max. Marks: 100

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

Module – 1			M	L	C
Q.1	a.	Define algorithm with the help of flow chart, explain the various stages of algorithm's design and analysis process.	10	L2	CO1
	b.	Compare the order of $1/2 \cdot n(n-1)$ and n^2 .	4	L3	CO1
	c.	List and explain asymptotic notations used to compare the orders of growth of an algorithm, with an example each.	6	L3	CO1
OR					
Q.2	a.	Give the general plan for analyzing the time efficiency of recursive algorithm show that efficiency of tower of Hanoi is exponential.	10	L2	CO1
	b.	Prove that if $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$, then $t_1(n) + t_2(n) \in O\{\max g_1(n), g_2(n)\}$.	4	L3	CO1
	c.	Solve the following recurrence $x(n) = x(n - 1) + 5$ for $n > 1$, $x(1) = 0$	6	L3	CO1
Module – 2					
Q.3	a.	Define Divide and Conquer. Design an algorithm for merge sort and sort the list "EXAMPLE" in alphabetical order using merge sort.	10	L3	CO2
	b.	Design an algorithm for quick sort. Sort the list 65, 70, 75, 80, 85, 60, 55, 50, 45. Also derive the worst case complexity of quick sort.	10	L3	CO2
OR					
Q.4	a.	Define decrease and conquer technique. What are the three major variations of decrease and conquer technique? Obtain the topological ordering for the following graph. Using source removal method.	10	L3	CO2
		 Fig.Q.4(a)			
1 of 3					

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| | b. | Design an algorithm to sort N number of elements using insertion sort. Illustrate the tracing of insertion sort algorithm for the following set of numbers 25, 10, 72, 18, 40, 11, 64, 58, 32, 9. | 10 | L3 | CO2 |
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Module – 3

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| Q.5 | a. | What is heap? Design an algorithm to construct a heap for the elements of the given array by bottom up approach. Show heap construction of the given list 2, 9, 7, 6, 5, 8 by successive insertion using bottom up procedure. | 10 | L2 | CO3 |
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| | b. | What is AVL tree? Explain the four types of rotations used to construct the AVL tree. Construct AVL tree for the set 5, 6, 8, 3, 2, 4, 7 by successive insertion. | 10 | L3 | CO3 |
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OR

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| Q.6 | a. | Apply Horse Pool's algorithm to search for the pattern DEMOCRATIC from the text INDIA_IS_A_DEMOCRATIC_COUNTRY. Explain its working along with a neat shift table and algorithm to find the pattern string. | 10 | L3 | CO3 |
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| | b. | Design an algorithm for comparison counting sort. Apply the same to sort the list 62, 31, 84, 96, 19, 47. | 10 | L3 | CO3 |
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Module – 4

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| Q.7 | a. | Apply Kruskal's algorithm to find minimum cost spanning tree to the graph shown below source = a ; | 10 | L3 | CO4 |
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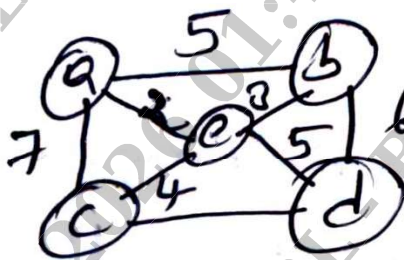


Fig.Q.7(a)

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| | b. | Explain the Warshall's algorithm to find the transitive closure of a directed graph. Apply it to the following graph. | 10 | L3 | CO4 |
|--|-----------|---|-----------|-----------|------------|

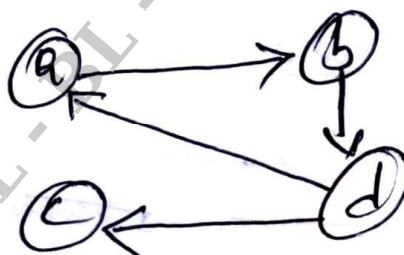


Fig.Q.7(b)

OR

- Q.8 a.** Construct a minimum cost spanning tree using prim's algorithm for the following graph source = 'a'. **10 L3 CO4**

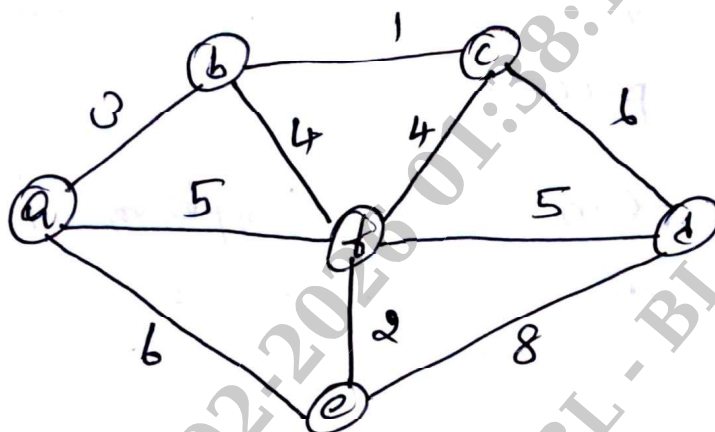


Fig.Q.8(a)

- b.** What is Huffman Tree? Explain the algorithm to construct the Huffman tree. Construct the Huffman tree for the following data: **10 L3 CO4**

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

Module – 5

- Q.9 a.** Using Branch and Bound technique solve the below instance of knapsack problem. **10 L3 CO6**

Item	Weight	Value
1	2	12
2	1	10
3	3	20
4	2	5

Capacity = 5

- b.** Define Backtracking. Apply backtracking to solve the instance of the sum of subset problem $s = \{3, 5, 6, 7\}$ and $d = 15$. **10 L3 CO6**

OR

- Q.10 a.** Explain the concept of P, NP, NP – complete and NP-Hard problem. **10 L2 CO5**

- b.** What are Decision Trees? Explain with example, how decision trees are used in sorting algorithms. **10 L2 CO6**

CBCS SCHEME

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Question Paper Version : A

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

UI / UX

Time: 1 hr.

Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. Usability is primarily concerned with,
a) Aesthetics
b) Functionality
c) Ease of use
d) Branding
 2. In usability testing, which group of people are primarily involved?
a) Developers
b) Stake holders
c) End users
d) Marketing team
 3. When a human user and a computer system in broad sense, get together to accomplish something. It is called as,
a) Software testing
b) HCI – Human Computer Interaction
c) Software development
d) Graphics Design
 4. The best user experience requires a balance of,
a) Functionality
b) Usability
c) Aesthetics
d) All of these
 5. _____ is referred as what user feels internally including the effects of usability, usefulness and emotional impact?
a) User experience
b) User interface
c) User design
d) User expertise
 6. What does UX stand for?
a) Universal experience
b) User experience
c) User expertise
d) Universal expertise
 7. What does UI stand for?
a) User interaction
b) User Interface
c) Universal interface
d) User impact

8. What does usability refer to in UX design?
 - a) The visual design of the product
 - b) The ease of use and effectiveness of the product
 - c) The use of animations and transitions
 - d) The color scheme used in the product
9. Which method for requirement extraction involves observing and interviewing users when they are in work?
 - a) Interviews
 - b) Surveys
 - c) Contextual inquiry
 - d) Card sorting
10. What is the purpose of formal requirement extraction in UI/UX design?
 - a) To eliminate user feedback
 - b) To document user needs and system functionalities
 - c) To prioritize aesthetics over functionality
 - d) To restrict the scope of the project
11. Emotional impact in user experience design refers to,
 - a) How user feels when they interact with a product or service
 - b) Gathering feedback
 - c) Creating empathy map
 - d) Conduct user research
12. User personas are created during which phase of design process,
 - a) Design stage
 - b) Discover stage
 - c) Development stage
 - d) None of these
13. What is Design Thinking?
 - a) It is approach to create an experience that includes emotional impact, aesthetis and social and value oriented interaction.
 - b) It is an approach to for collecting user requirements
 - c) Design of buttons and navigation bars
 - d) It is unnecessary in UI/UX design
14. What is the primary focus of interaction design requirement?
 - a) Enhancing visual appeal
 - b) Identifying user needs and goals
 - c) Maximizing technical complexity
 - d) Minimizing user engagement
15. Which of the following is NOT a common method for requirement extraction in UI/UX design?
 - a) Interviews
 - b) Brainstroming
 - c) Surveys
 - d) Guesswork
16. What is the purpose of creating personas as in requirement extraction?
 - a) to exclude user preferences
 - b) To represent different user groups and their characteristics
 - c) To prioritize aestyhetics over functionality
 - d) To minimize stakeholder involvement

17. Ideation means,
a) To rapidly change
b) It is a collaborative group process for forming ideas for design
c) Creating 3D model of design
d) Understanding culture of the organization
18. _____ is rapid creation of free-hand drawings expressing preliminary design ideas.
a) Imagination
b) Creativity
c) Sketching
d) Ideation
19. A _____ is a conversation between the sketcher or designer and the artifact.
a) Ideation
b) Design
c) UI tool
d) Sketch
20. _____ is about how the system or product works within its external environment.
a) Ecological design perspective
b) Interaction design perspective
c) Emotional design perspective
d) Iterative design perspective
21. What is a users mental model?
a) It is a description of how the system works, as held by the user
b) It is a description of how the system works, as held by the developer
c) It is a description of how the system works, as held by the tester
d) It is a description of how the system works, as held by the marketer
22. A _____ is a sequence of visual “frames” illustrating the interplay between a user and an envisioned system.
a) Brainstroming
b) Prototyping
c) Storyboard
d) Wireframing
23. What is the purpose of wireframing in UI/UX design?
a) To create a final polished design
b) To communicate layout and functionality
c) To select color schemes
d) To add animations
24. A _____ is a representative task in which user participants are observed for their performance and behavior and take qualitative and quantitative data.
a) Conceptual design
b) Horizontal task
c) Vertical task
d) Benchmark task
25. Design thinking typically helps in,
a) Innovation
b) Data analytics
c) Financial planning
d) Operational efficiency
26. Which tool used for wireframing?
a) Microsoft visio
b) Adobe InDesign
c) OmniGraffle
d) All of these
27. Lunacy, Framer, Penpot, Figma are the tools used by,
a) End users
b) UI designers
c) Developers
d) Testers

28. In UX measure, the _____ typically refers to performance during more constant user over a longer period of time.
- a) Initial performance
 - b) Long term performance
 - c) Refinability
 - d) Learnability
29. In UX measure, _____ means how well users will retain what they have learned over some period of time.
- a) Learnability
 - b) Retainability
 - c) Initial performance
 - d) Long term user satisfaction
30. Which of the following is an example of usability metric?
- a) Number of likes on social media post
 - b) Conversion rate of an e-commerce website
 - c) Number of colours used in the design
 - d) Length of the company slogan
31. _____ is an iterative and incremental method of managing development and design.
- a) Acyclic model
 - b) Agile methodology
 - c) Cyclic methodology
 - d) All of these
32. A _____ is used to evaluate design alternatives for particular isolated interaction details, such as behavior of an individual function or icon.
- a) Depth prototype
 - b) Breadth prototype
 - c) Local prototype
 - d) Common prototype
33. _____ are more detailed representation of design, including details of appearance and interaction behavior.
- a) High-fidelity prototype
 - b) Low-fidelity prototype
 - c) Medium-fidelity prototype
 - d) Local prototype
34. _____ is very broad in the features it incorporates, but offers less depth in its coverage of functionality?
- a) A horizontal prototype
 - b) A vertical prototype
 - c) A High prototype
 - d) A low prototype
35. Materials required for paper prototyping,
- a) Blank plastic material, pens
 - b) Marking pens, pencils, scissors
 - c) Plain copier-type paper, rulers
 - d) All of these
36. A successful project requires both SE and UX roles to communicate?
- a) Above statement is true
 - b) Above statement is false
 - c) Above statement is not related to user interface design
 - d) Project can be successful without communication
37. What does accessibility in UX design refer to?
- a) The ability to access the internet
 - b) The ease of accessing the product or service
 - c) Ensuring that the product is available in multiple languages
 - d) Making the product usable for all, including people with disabilities

38. Which of the following is golden rule for interface design?
a) Place the user in control b) Reduce the user's memory load
c) Make the interface consistent d) All of the mentioned
39. Which is correct sequence in SE lifecycle?
a) Analyze → Design → Implement → Test
b) Design → Analyze → Implement → Test
c) Implement → Test → Design → Analyze
d) Design → Test → Analyze → Design
40. Which is correct sequence in UX lifecycle?
a) Prototype → Analyze → Design → Evaluate prototype
b) Design → Prototype → Analyze → Evaluate prototype
c) Evaluate Prototype → Design → Analyze → Prototype
d) Analyze → Design → Prototype → Evaluate prototype
41. UX design guidelines focuses on,
a) How to create and employ windows b) How to create button, menus
c) how to create icons, radio buttons d) All of these are true
42. What is short term memory?
a) Concerned with in HCI and has duration of about 30 secs
b) Concerned with in HCI and has duration of about 30 mins
c) Concerned with in HCI and has duration of about 60 mins
d) Concerned with in HCI and has duration of about 120 mins
43. Information stored in short-term memory can be transferred to long term memory by,
a) Learning b) Visualizing
c) Communicating d) Listening
44. The ultimate goal of design thinking is to help you design better,
a) Services b) Products
c) Experiences d) All of these
45. Structure of interaction cycle in UX design involves,
a) Planning → Translation → Physical action → Outcome
b) Research → Analysis → Test → Design
c) Analysis → Test → Design
d) Physical action → Planning
46. Keep users aware of task progress or include progress indicators, what has been done and what is left to do?
a) It is a good design practice
b) It is a bad design practice
c) Progress indicator are not needed in UI
d) Progress indicators consumes lots of space in display screen
47. Collecting _____ is an important portion of testing a prototype in the test stage of design thinking.
a) Pictures b) Money c) Feedback d) Emails

48. Translation includes,
a) Existence b) Presentation c) Task structure d) All of these
49. Help users determine, what to do to get started?
a) It is a UX guideline b) It is not a UX guideline
c) It is a requirement of a designer d) None of these
50. Use of precise wording in labels, menu titles, menu choices, icons, data fields are necessary in UI/UX design.
a) Statement is true
b) Statement is false
c) Menu choices, icons are not related to UI
d) User can use any wording or language in UI design, complexity of wording is not a worry.

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