

Tribhuvan University
Institute of Science and Technology

2078



Bachelor Level / Second Year/ Forth Semester/ Science
Computer Science and Information Technology (CSC 257)
(Theory of Computation)
NEW COURSE

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

*Candidates are required to give their answers in their own words as far as practicable.
All figures in the margin indicate full marks.*

Long Answer Questions
Attempt any Two questions

Section A

(2x 10=20)

- ✓ 1. Give the formal definition of DFA and NFA. How NFA can be converted into equivalent DFA? Explain with suitable example. (4+6)

- ✓ 2. Find the minimum state DFA for the given DFA below

(10)

States	Inputs	
	0	1
→A	B	F
B	E	C
C	B	D
*D	E	F
E	B	C
F	B	A

- ✗ 3. Construct a Turing Machine that accepts the language of odd length strings over alphabet {a,b}. Give the complete encoding for this TM as well as its input string w=abb in binary alphabet that is recognized by Universal Turing Machine. (2+6+2)

Section B

Short Answer Questions
Attempt any Eight questions.

(8x5=40)

- ④ 4. Define the term alphabet, prefix and suffix of string, concatenation and Kleen closure with example. (5)
- ⑤ 5. Give the regular expressions for the following language over alphabet {a,b}. (2.5 + 2.5)
- a. Set of all strings with substring bab or abb
 - b. Set of all strings whose 3rd symbol is 'a' and 5th symbol is 'b'.

IOST,TU aAns- $(a+b)^*bab(a+b)^* + (a+b)^*abb(a+b)^*$
bAns- $(a+b)(a+b) \cdot a \cdot (a+b) \cdot b \cdot (a+b)^*$

6. Show that $L = \{ a^n \mid n \text{ is a prime number} \}$ is not a regular language. (5)
7. Explain about the Chomsky's Hierarchy about the language and grammars. (5)
8. Define a Push Down Automata. Construct a PDA that accept $L = \{ a^n b^n \mid n \geq 0 \}$. (1+4)
9. Convert the following grammar into Chomsky Normal Form. (5)
- $$\begin{aligned} S &\rightarrow abSb \mid a \mid aAb \\ A &\rightarrow bS \mid aAb \mid \epsilon \end{aligned}$$
- $\overset{SA \rightarrow bC}{\cancel{S \rightarrow}}$
10. Define Turing Machine and explain its different variations. (2+3)
11. What do you mean by computational Complexity? Explain about the time and space complexity of a Turing machine. (1+4)
12. Explain the term Intractability. Is SAT problem is intractable? Justify. (1+4)
- (1)

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Bachelor Level / Second Year/ Forth Semester/ Science
Computer Science and Information Technology (CSC 258)
(Computer Network)

Candidates are required to give their answers in their own words as far as practicable.
All figures in the margin indicate full marks.

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

Attempt all the questions.

Section A

Long Answer Questions
Attempt any Two questions

(2x 10=20)

1. What is transmission media? How do guided media differ from unguided media? Explain different types of guided media in detail. (6) (1+2+7=10)
2. What is flow control? Explain Stop-and-Wait ARQ with suitable example. How is it different from Go-Back-N ARQ? (6) (2+5+3=10)
3. Explain link state routing with example. (10)

Section B

Short Answer Questions
Attempt any Eight questions

(8x5=40)

4. Explain client/ server network. How is it different from peer to peer network? (3+2=5)
5. What is CSMA/CD? Why is there no need for CSMA/CD on a full-duplex Ethernet LAN? (2.5+2.5=5)
6. Write subnet ID and broadcast address of each subnet if you divide a class B network 150.10.0.0 - 150.10.255.255) in 4 different subnets. What is the new subnet mask? (4+1=5)
7. Explain the structure of IPv6 address. Compare IPv6 address with IPv4 address. (3+2=5)
8. What is virtual circuit network? Explain ATM as a virtual circuit wide area network (2+3=5)
9. What is routing table? Differentiate static routing table with dynamic routing table. (2+3=5)
10. What is open-loop congestion control? Compare it with closed-loop congestion control. (2+3=5)
11. What are the different approaches for multimedia streaming? Explain. (5)
12. Write short note on (any two): (2x2.5=5)
 - a. Backbone network
 - b. ISDN
 - c. ALOHA

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Bachelor Level / Second Year/ Forth Semester/ Science
Computer Science and Information Technology (CSC 259)
(Operating Systems)

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

*Candidates are required to give their answers in their own words as far as practicable.
All figures in the margin indicate full marks.*

Attempt all the questions.

Long Answer Questions
Attempt any Two questions

Section A

(2x 10=20)

- 1 What kind of problem arises with sleep and wakeup mechanism of achieving mutual exclusion? Explain with suitable code snippet.
- 2 Why OPR is best but not practically feasible page replacement algorithm? Calculate the number of page faults for OPR, LRU, and Clock page replacement algorithm for the reference string: 1, 3, 4, 2, 3, 5, 4, 3, 1, 2, 4, 6, 3, 2, 1, 4, 2. Assume that memory size is 3.
- 3 How unsafe state differs from deadlocked state? Consider following initial state and identify whether requested resource is granted or denies for the given cases.

Process Has Max

A	2	6
B	1	5
C	2	3
D	3	8

$$Free = 2$$

- What will happen if process D request 1 resource?
- What will happen if process A request 1 resource?

$$\begin{aligned} TAT &= CT - AT \\ WF &= STAT - BT \end{aligned}$$

$$CT - AT$$

$$C \quad A$$

Section B

Short Answer Questions
Attempt any Eight questions.

(8x5=40)

- ④ 4. What is system call? Discuss process of handling system calls briefly.
5. What is lock variable? Discuss its working and problems associated with it in detail.

6. Differentiate between internal and external fragmentation? Suppose that we have memory of 1000 KB with 5 partitions of size 150 KB, 200 KB, 250 KB, 100 KB, and 300 KB. Where the processes A and B of size 175 KB and 125 KB will be loaded, if we used Best-Fit, and Worst-Fit Strategy?

7. What is meant by file attributes? Discuss any one technique of implementing directories in detail.

8. Why the concept of disk interleaving is important? Explain with suitable example.

9. What is resource allocation graph? Explain the process of detecting deadlocks when there is single instance of each resource with suitable example?

10. Discuss the concept of SJF and SRTN scheduling algorithms with suitable example.

11. What approaches are used for managing free disk spaces? Explain linked list approach with example.

12. Write short notes on:

- IPC in Linux
- Disk access

DAG

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Bachelor Level / Second Year/ Forth Semester/ Science
Computer Science and Information Technology (CSC 260)
(Database Management System)

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

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Attempt all the questions.

Section A

Long Answer Questions

Attempt any Two questions

(2x 10=20)

1. What are different types of Database users and their roles? Explain the Data independence with example. (5+5)
2. What are the components of ER diagram? Explain the function of various symbols used in ER diagram. Construct an ER diagram to store data in a library of your college. (2+4+4)
3. Explain deadlock and starvation. Explain Time stamp based protocol for concurrency control? (5+5)

Section-B

Short Answer Questions

Attempt any Eight questions.

(8x5=40)

1. What is difference between logical data independence and physical data independence? (5)
2. Explain Relationship and Relationship sets with example. (5)
3. Retrieve the TName, SName, SPhone for "ABC" school using SQL from given relation as below. (5)
TEACHER (TID, TName, TAddress, TQualification)
SCHOOL (SID, SName, SAddress, SPhone)
SCHOOL_TEACHR (SID, TID, No_of_Period).
4. What is integrity? Explain different types of database integrity. (1+4)
5. Define Functional dependencies. Explain trivial and non trivial dependencies? (2+3)
6. Explain the difference between "Join" and "Natural Join" of algebraic operators with example. (5)
7. What is Checkpoints in database recovery? How does it help in database recovery? Explain. (2+3)
8. Define schedule and serializability. How can you test the serializability? (2+3)
9. Explain Boyce-Codd normal form with example. How it is different than 3rd Normal form. (3+2)

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Bachelor Level / Second Year/ Forth Semester/ Science
Computer Science and Information Technology (CSC 261)
(Artificial Intelligence)

Candidates are required to give their answers in their own words as far as practicable.
All figures in the margin indicate full marks.

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

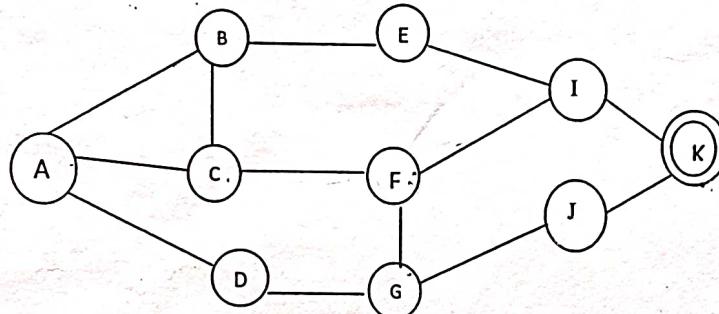
Section A

Long Answer Questions

Attempt any Two questions

(2x 10=20)

1. How informed search are different than uniformed? Given following state space, illustrate how depth limited search and iterative deepening search works? Use your own assumption for depth limit.



Hence, A is start and K is goal

(3+7)

2. Consider following facts

Every traffic chases some driver. Every driver who horns is smart. No traffic catches any smart driver. Any traffic who chases some driver but does not catch him is frustrated.

Now configure FoPL knowledge base for above statements. Use resolution algorithm to draw a conclusion that " If all drivers horn, then all traffics are frustrated." (10)

3. Describe mathematical model of neural network. What does it mean to train a neural network? Write algorithm for perceptron learning.

(3+2+5)

Section-B

Short Answer Questions

Attempt any Eight questions.

(8x5=40)

4. What is Turing Test? How it can be used to measure intelligence of machine?

(3+2)

5. How agent can be configured using PEAS framework? Illustrate with example

(5)

6. Construct semantic network for following facts

Ram is a person. Persons are humans. All humans have nose. Humans are instances of mammals. Ram has weight of 60 kg. Weight of Ram is less than weight of Sita. (5)

7. What is crossover operation in genetic algorithm? Given following chromosomes show the result of one-point and two point crossover.

$$C1 = 01100010$$

$$C2 = 10101100$$

Choose appropriate crossover points as per your own assumption. (2+3)

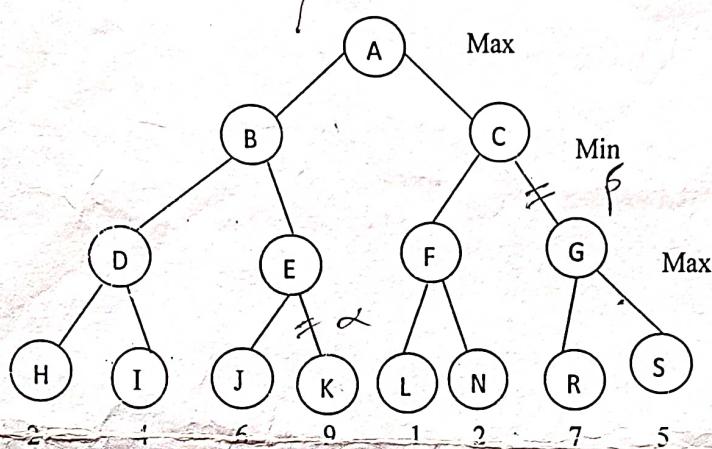
8. What is expert system? How it works? Mention role of inference engine in expert system.

(2+2+1)

9. How semantic and pragmatic analysis is done in natural language processing. (5)

10. How philosophy, sociology and economics influence the study of artificial intelligence? (5)

11. Given following search space, determine if there exists any alpha and beta cutoffs. (5)



12. What is posterior probability? Consider a scenario that a patient has liver disease is 15% probability. A test says that 5% of patients are alcoholic. Among those patients diagnosed with liver disease, 7% are alcoholic. Now compute the chances of having liver disease, if the patient is alcoholic. (1+4)

$$P(A|D)$$

$$0.21$$