(3 Hours) **[80 Marks]**

N.B. 1) Question No. 1 is compulsory.
2) Attempt any **three** questions out of remaining.
3) Assume suitable data wherever necessary and state them clearly.

Q.1 a) Give the advantages of memory segmentation of 8086 microprocessor. 05

b) Differentiate Procedure and macro with example. 05

c) Explain VM, RF, IOPL and NT flags of 80386 microprocessor. 05

d) Explain an instruction issue algorithm of Pentium processor. 05

Q. 2 a) Explain minimum mode configuration of 8086 microprocessor 10

b) Explain cache organization of Pentium processor. 10

Q. 3 a) i) Write a short note on mixed language programming. 05
ii) Write a program to find the largest number from an array. 05

b) Draw and explain the block diagram of 8255 Programmable Peripheral Interface (PPI) with control word formats. 10

Q.4 a) Differentiate Real Mode, Protected Mode and virtual 8086 mode of 80386 microprocessor. 10

b) Design 8086 based system for following specifications: 10
i) 8086 in minimum mode with clock frequency 5MHz.
ii) 128 KB EPROM using 32KB*8 chips
iii) 32 KB RAM using 16KB*8 chips

Q.5 a) Explain different addressing modes of 8086 microprocessor. 10

b) Explain the operation of three 8259 PIC in cascaded mode. 10

Q.6 a) Draw and explain memory read and memory write machine cycle timing diagrams in maximum mode of 8086. 10

b) Explain the following:
i) Types of interrupts 05
ii) Modes of 8253 Programmable Interval timer 05

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[Time: 3 Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Question No.1is **Compulsory.**

2. Attempt any 3 questions out of rest.

3. Make suitable assumptions if any.

4. All questions carry equal marks.

Q.1	a)	Differentiate between file system and database system with an example	**05**
	b)	Explain Referential Integrity with suitable example	**05**
	c)	List the steps required to map ER , EER model to relational model	**05**
	d)	Explain the ACID properties of transactions	**05**
Q.2	a)	Explain the following Relational Algebra operations with suitable example. a) Project b) Select c) Union d) Cartesian Product	**10**
	b)	Construct an EER diagram and convert into Relational Model for a library Management System. Specify 2 complex SQL queries on the above-one using Group by clause and the other using Join operation with an example	**10**
Q.3	a)	Explain the following terms with an example:- i) Natural join. ii)Set Intersection. iii)Weak Entity. iv) Foreign key	**10**
	b)	Explain the Overall Architecture of DBMS in detail. .	**10**
Q.4	a)	Define Deadlock. Explain how deadlock can be handled	**10**
	b)	Explain Specialization and Generalization with suitable example	**10**

Q.5 a) For the schema mentioned below **10**

Employee(eid, ename, address, city) Works(eid, cid, salary)

Company(cid, cname, city)

Create an ER diagram for the same and Specify the SQL queries for each of the statements given below

1) Modify database so that John now lives in Mumbai, assuming the database entry has John staying in Delhi.
2) Find Employees who live in same city as the company for which they work.
3) Give all employees of"AZ Corporation" whose salary has increased by15% in the year 2018-19.

b) Define the term Normalization as used in database design. Explain the various normal forms with an example **10**

Q.6 Write short notes on **any two** **20**

a) Log based recovery mechanism
b) Triggers and transaction control commands
c) Conflict and View Serializability
d) Data Independence

[Time: 3 hrs] **[Marks: 80]**

N.B: 1. Question No.1 is compulsory.
2. Assume suitable data if necessary.
3. Attempt any three questions from remaining questions.

Q.1	a)	Explain design issues of layers. Explain ISO OSI reference model with diagram.	**10**
	b)	Explain design issues of Data Link layer. Explain Sliding Window protocol Selective Repeat.	**10**
Q.2	a)	Explain with diagram the relationship between Protocol, Interface and Service.	**05**
	b)	Explain Repeater, Hub, Bridge, Switch Gateway.	**05**
	c)	Describe TCP header with diagram.	**10**
Q.3	a)	Explain different framing methods? What are the advantage of variable length frame over fixed layer frame.	**10**
	b)	Describe IPV4 header format with diagram.	**10**
Q.4	a)	Classify transmission media and compare them.	**10**
	b)	Explain Distance vector routing protocol. What is count to infinity problem How to overcome it?	**10**
Q.5	a)	Explain Channel allocation problem. Explain CSMA/CD protocol. A network with CSMA/CD has 10 Mbps bandwidth and 25.6 ms maximum propogation delay. What is the minimum frame size?	**10**
	b)	Explain Congestion control. Explain leaky bucket algorithm	**10**
Q.6		Short note on (**any 4**)	**20**

a) HDLC
b) Network Address Translation (NAT)
c) Berkeley Sockets
d) ARP
e) ICMP
f) DNS
g) SMTP

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Time: 3 Hours **Total Marks: 80**

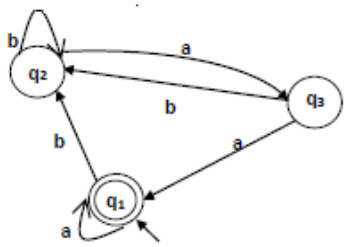
N.B.: (1) Question No.1 is compulsory.
(2) Attempt any three questions from the remaining five questions.
(3) Make suitable assumptions wherever necessary but justify your assumptions.

1. (a) Differentiate DFA and NFA. **05**
(b) Design a DFA to accept string of 0's and 1's ending with the string 100. **05**

(c) Explain the applications of Regular Expressions. **05**
(d) What are Recursive and Recursively Enumerable Languages? **05**

2. (a) Design NFA for recognizing the strings that end in "aa" over $\sum$ ={a,b} & convert above NFA to DFA. **10**
(b) Design moore m/c for following:- **10**
If input ends in '101' then output should be A, if input ends in '110' output should be B, otherwise output should be C and convert it into mealy m/c.

3. (a) Obtain a regular expression for the FA shown below**:** **10**



(b) Explain the types of Turing machine in detail. **10**

4. (a) Design a turing machine that computes a function f(m,n)=m+n i.e. addition of two integers. **10**
(b) State and explain pumping Lemma for Context Free Languages. Find out whether the language L= $\{x^n y^n z^n \mid n \geq 1\}$ is context free or not. **10**

5. (a) Design PDA for the following language: **10**

L(M) = $\{wcw^R \mid w \ \{a,b\}^*\}$ where w^R is reverse of w & c is a constant.
(b) Convert the following Grammars to the Chomsky normal form (CNF). **10**
S →0A0 | 1B1| BB
A →C
B →S | A
C →S | ε

6. Write detailed note on **(any two):-** **20**
(a) Post Correspondence Problem
(b) Halting Problem.
(c) Rice's Theorem.

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68476

[Time: 3 Hours] **[Total Marks: 80]**

Note: (1) Question 1 is compulsory
(2) Solve any three questions out of remaining
(3) Assume suitable data wherever necessary

Q.1. (a) Mention different types of Operating systems and list their salient features. (5M)
(b)With the help of examples explain Test and Set condition in Microprocessor systems. (5M)
(c) What is a superblock? Elaborate on its structure and role in Operating system. (5M)
(d) What are the characteristics of Real time Operating Systems? (5M)

Q.2. (a)With the help of a neat diagram discuss process states and state transitions with respect to Unix O.S. (10M)
(b) Bring out the design issues of Multiprocessor Operating systems. (10M)

Q.3. (a) Give the structure of a buffer header. Discuss any scenario that the kernel may follow to allocate a buffer for a disk block.. (10M)
(b) What is the relevance of an inode in Unix? What are direct and indirect blocks in an inode? (10M)

Q.4. (a) Explain in brief Gang based scheduling and affinity based scheduling algorithms for multiprocessor systems. (10M)
(b) Discuss in detail transparency issues of distributed operating systems. (10M)

Q.5. (a) Consider 3 periodic processes scheduled on a preemptive uniprocessor. The execution times and periods are as shown in the following table:

Process	Execution Time	Period
1	1	8
2	2	5
3	4	10

The units of time may be considered to be schedulable time slices. The deadlines are that each periodic process must complete within its period. Depict the scheduling of the processes with the help of a timing diagram. Calculate the Utilization and state whether the system is schedulable with EDF. (10M)

(b) Compare and contrast i) EDF and RMA scheduling ii) Test and Set and Compare-and-Swap instructions. (10M)

Q.6. Write short notes on: (any two) (20M)
i. Architecture of Unix OS
ii. Android OS
iii. Cloud OS.

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[Time: Three Hours] **[Total Marks:80]**

Please check whether you have got the right question paper.

NB: **1. Question No.1 is compulsory**
2. Attempt any 3 questions from the remaining 5 questions.
3. Draw neat diagrams wherever necessary.

Q 1		Differentiate	20
	a)	Juke box and DVD	
	b)	RTF and TIFF	
	c)	Gray and color image	
	d)	PCM and DPCM	
Q 2	a)	Why the communication service quality should be good for multimedia streaming? Explain the role of RTP, RTSP, RTCP and RSVP	10
	b)	For the phrase "Excellent Achievement" perform huffmann coding and generate the output. Apply decoding and convert it back to the text. Also find the redundancy in encoding.	10
Q 3	a)	What are the characteristics of sound waves? Illustrate the steps to digitize audio data.	10
	b)	What is the job of header in a file? Give the header details for BMP file format.	10
Q 4	a)	What is Steganography? Explain any one method with an example.	10
	b)	Discuss the different steps involved in MPEG compression technique. Also compare with H.261.	10
Q 5	a)	What parameters define the quality of an image? Discuss these parameters and their effect on the storage requirement.	10
	b)	What are the multimedia security requirements? Discuss.	10
Q 6		Write short note on(Any Two)	20
	a)	Digital Signature	
	b)	Authoring Systems	
	c)	JPEG compression technique	

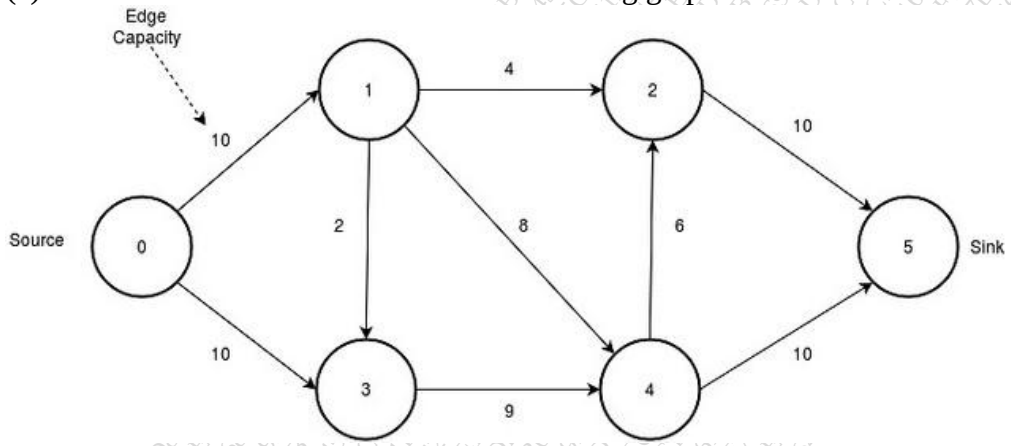
(Time: 3 Hours) Total Marks: 80

N.B.: (1) Question No.1 is compulsory.
(2) Attempt any three questions from the remaining five questions.
(3) Make suitable assumptions wherever necessary but justify your assumptions.

1. (a) Solve the following Recurrences using Recursion-Tree Method.
   i. $T(n) = 2T(n/2) + n^2$ 05
   ii. $T(n) = T(n/3) + T(2n/3) + n$

   (b) Explain the Line Segment Properties. 05
   (c) Suppose that a node x is inserted into a red-black tree with RB-Insert and then immediately deleted with RB-Delete. Is the resulting red-black tree the same as the initial red-black tree? Justify your answer. 05
   (d) Discuss P, NP, NP-complete and NP-Hard problems. 05

2. (a) Evaluate the maximum flow for the following graph. 10



   (b) What do you mean by Amortized analysis? Explain the Aggregate Analysis method in detail. 10

3. (a) Illustrate the operations that can be carried out on binomial heap with example. 10
   (b) What is the hiring problem? Discuss the randomized algorithm for the same. 10

4. (a) What is Red-Black tree? Show Red-Black tree that results from successive insertion of keys 5, 10,15,25,20, 30 and successive deletion of keys 30, 25,20,15,10 and 5. 10
   (b) Explain the Graham's scan algorithm for finding the convex hull.

5. (a) What is Randomized algorithm? Differentiate Las Vegas and Monte Carlo algorithm. 10
   (b) Explain closest pair of points using divide and conquer. 10

6. (a) Explain with example Maximum Biparite matching. 10
   (b) Prove Travelling Salesman Problem as NP complete. 10

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66136