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

N.B. 1. Question No 1 is compulsory.
2. Solve any **three** questions out of remaining five questions.
3. Assume suitable data if necessary.
4. Figures to right indicate marks.

Q. 1. Solve any **four** out of five. (4*5=20)

a) Draw and explain memory hierarchy.

b) Differentiate between MIN and MAX mode of 8086 Microprocessor.

c) Discuss the importance of Nano Programming.

d) Express $(15.125)_{10}$ in IEE 754 single precision floating point representation.

e) Explain following instructions of 8086 microprocessor – OR, DAA, INC, JNZ, POP

Q. 2 a) Draw and explain internal architecture of 8086 microprocessor. . [10]

b) Draw the flowchart of Booths algorithm and perform -7 X 3. [10]

Q. 3 a) Perform 18 divided by 5 using Restoring division algorithm. [10]

b) What is the need of DMA in computer system? Explain in detail its operation in various modes.. [10]

Q. 4 a) Discuss various memory characteristics in detail. [10]

b) Compare Hardwired and Microprogrammed Control Unit. [10]

Q. 5 a) Explain Direct Cache Memory mapping in detail with example. [10]

b) Write assembly language program for 8086 microprocessor to find whether a 8 bit number stored at 1000H is even or odd number. Store the 00H or 01H at 1001H if the number is even or odd respectively. [10]

Q. 6 a) Explain with example addressing modes of 8086 microprocessor [10]

b) Draw and explain the various pipeline hazards. [10]

(3 Hours) **Total Marks: 80**

N.B. 1) Question **no.1 is compulsory**

2) Solve any **Three** questions from remaining five.

3) Assume suitable data wherever required.

Q1. Define Operating System and also explain objectives and functions of O.S. **10**

a.

b. Consider the following set of processes, with the arrival times and the CPU burst times given in milliseconds. **10**

Process	Burst Time	Arrival Time
PI	15	0
P2	5	0
P3	13	0

Draw Gantt chart, calculate Turnaround Time, Waiting Time, Average Turnaround Time and Average Waiting Time for:
i) First-Come First-Served.
ii) Shortest Job First.

Q2. What are the four conditions that create deadlock? Explain deadlock Prevention and avoidance techniques. **10**

A

B What is Scheduling? Also explain Short Term, Mid Term and Long Term Scheduling. **10**

Q3 Given memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB(in order), how would each off the first-fit, best-fit, and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order) ? Which algorithm makes the most efficient use of memory? **10**

A

B Explain demand paging with suitable example. **10**

Q4 What is RAID? What are the different RAID levels? **10**

A

B Compare State full Server v/s Stateless Server with a proper example. **10**

Q5 Why there is need for communication between two processes? Explain various modes of communication. **10**

A

b Explain the page replacement policies implement LRU, OPT, FIFO for the following Sequence : 0, 1, 2, 4, 3, 7, 1, 4, 2, 3.
Also calculate hits and faults. **10**

Q6 What are preemptive and non-preemptive algorithms? Explain any two with the help of example. **10**

A

B Write short notes on Network O.S vs. Distributed O.S. **10**

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

Please check whether you have got the right question paper.

N.B: 1. Q.1 is compulsory
2. Attempt any three out of remaining five question
3. Rights indicate full marks.

1. a. Find greatest common divisor of the following pairs of integer, using Euclidean algorithm. **05**
(3083, 2893)

b. Given two lines regression **05**
$6y = 5x + 90, 15x = 8y + 130,\ \sigma_x^2 = 16$
Find (i) $\bar{x}$ and $\bar{y}$ (ii) Find r

c. Prove that A={1, 2, 3, 4, 5, 6 } is a finite abelian group under multiplication modulo 7 **05**

d. A random variable x has the following probability function **05**

x:	1	2	3	4	5	6	7
p(x)	K	2 K	3K	K^2	K^2+k	$2K^2$	$4K^2$

Find (I) k (II) p (x<5)

2. a. Calculate coefficient of correlation between x and y **06**

x:	3	6	4	5	7
y:	2	4	5	3	6

b. A random sample of size 16 from a normal population. Showed a mean of 103.75 cm and sum of squares of deviation from the mean 843.75 cm^2 can we say that the population has mean of 108.75 cm? **06**

c. Prove that G= $\{1, -1, i, -i\}$ is a group under usual multiplication of complex numbers. **08**

3. a. Draw Hasse diagram for (D_{75}, ≤) , check whether it is a lattice **06**

b. Out of 1000 families of 3 children each how many would you expect to have 2 boys and 1 girl? **06**

c. i. Find last digit of base 7 expansion of 3^{100} i.e. 3^{100} (mod 7) by using Fermat's theorem **08**
ii. Find the Legendre's symbol $\left(\frac{19}{23}\right)$

4. a. Can a complete graph with 8 vertices have 40 edges excluding self-loop **06**

b. Find remainder when 2^{50} and 41^{65} are divisible by 7 **06**

c. Investigate the association between darkness of eye colour in father and son from the following data **06**

		father's eye		
		Dark	Not Dark	Total
Son's eye	Dark	48	90	138
	Not dark	80	782	862
		128	872	1000

5. a. Let L={1, 2, 3, 4, 12} and the relation be "is divisible by" write compliments of L **06**

b. If x is a Poisson variate and p (x=0) = 6 p (x=3) Find P (x=2) **06**

c. Define the following terms giving illustration **08**

1.	Simple graph	2.	Complete graph
3.	Bipartite graph	4.	Planar graph

6. a. Solve $x \equiv 1 \pmod 5$
$x \equiv 2 \pmod 6$
$x \equiv 3 \pmod 7$ **06**

b. A certain injection administered to 12 patients resulted in following changes of blood pressure (5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4) can it be concluded that injection will be in general accompanied by an increase in blood pressure? **06**

c. i. Write the following permutation as product of disjoint cycles **08**
f = (1 3 2 5) (1 4 5) (2 5 1)

ii. simplifies sum of product
$(A+B)\ (A+B^1)\ (A^1+B)\ (A^1+B^1)$

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(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) Compare Ring and Star topology **5**
b) Use RLE method of compression to compress the following data:
Data: AAAACCBBBDDDDDEFF **5**
c) Explain the TCP connection establishment with relevant diagram **5**
d) Compare LAN MAN and WAN **5**

2. a) What is the OSI Model? Give functions and services of each layer. **10**
b) Discuss the different networking devices used for internetworking. **10**

3. a) What is Domain Name system? How does it work? Explain the resolution process **10**
b) Explain the different transmission media in networking. **10**

4. a) What is congestion and what are its causes? Explain Token bucket algorithm for congestion control **10**
b) Explain the TCP header format **10**

5. a) Compare Static and Dynamic Routing and explain any one with an example. **10**
b) Explain stop and wait protocol. What are its drawbacks? How can they be overcome? **10**

6. Write a note on **(any two)** **20**
a. RPC
b. CSMA/CD
c. IP Addressing

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(3 Hours) Marks:80

Note: Question **No. 1** is **Compulsory**
Attempt **any three** out of the remaining **five** questions
Assumptions made should be clearly stated

Q.1 Attempt any four sub-questions.

a) Construct the Finite Automata for binary umber divisible by 2 (**05**)

b) Design FA for decimal number divisible by 5 (**05**)

c) Give formal definition of Turing Machine (**05**)

d) State and explain closure properties of regular languages (**05**)

e) Construct DFA accepting all the strings corresponding to the Regular expression
1* 0 1 (0 + 11) * (**05**)

Q2. a) Construct the following grammar to CNF (**10**)

S→ Ba / aB
A→bAA / aS / a
B→aBB / bS / b

b) Design Moore machine for binary adder. (**10**)

Q3.a) Design a DFA corresponding to the regular expression (a+b)* aba (a+b)* (**10**)

b) Define CFG, obtain CGF for the following grammar (**10**)
(110+11)* (10)*

Q4.a) Design a PDA for CFL that checks the well formedness of parenthesis i.e. the language L of all balanced string of two types of parenthesis "( )" and "[ ]".Trace the sequence of moves made corresponding to input string [( ) (( ))]. (**10**)

b) Construct a TM for 2's complement of a binary number. Simulate it for 1 0 1 0 (**10**)

Q5. a) Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse tree for the string 001222. (**10**)

G: $S \rightarrow 0S \mid 1A \mid 2B \mid \varepsilon$
$A \rightarrow 1A \mid 2B \mid \varepsilon$
$B \rightarrow 2B \mid \varepsilon$

b) Consider the CFG S→aSb | bSa | SS | ε , consider the string ***babbabaaaababb*** .prove that given grammar is ambiguous by generating more than one parse tree for a given string (**10**)

Q6. Write short notes on **(20)**

a) Applications of Automata Theory
b) Chomsky Hierarchy
c) Power and limitations of PDA
d) Halting Problem.
