(3 Hours)   [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
     (2) Attempt any **four** questions out of remaining **six** questions.
     (3) Assume **suitable** data, if **required**.

1. (a) Explain central limit theorem.   20
    (b) Compare MSK and QPSK.
    (c) Compare Energy signal and power signal.
    (d) Draw power spectra for MSK, QPSK and BPSK.

2. (a) What is Huffman code ? Explain the algorithm of code shown in table :– 12

Symbol	M1	M2	M3	M4	M5	M6
Probability	0·3	0·25	0·15	0·12	0·10	0·08

    Find –
      (i) Average length of this Huffman code.
      (ii) The entropy of the source.
      (iii) The code efficiency.
      (iv) The redundancy of a code.
    (b) Explain in detail convolution coding.   8

3. (a) What is line coding ? Draw the waveforms for different line coding. Assume   10
     the binary sequence 10110101.
    (b) Explain the following :–   10
      (i) Shannon-Hartley capacity theorem
      (ii) Shannon limit.

4. (a) Explain the modified Duo binary encoding with precoder. 8
   (b) Explain BFSK transmitter and receiver system. 12

5. (a) Explain CDF and PDF. 6
   (b) For a (6, 3) code, the generator matrix G is given by :– 14

$$G = \begin{bmatrix} 1\ 0\ 0\ 1\ 0\ 1 \\ 0\ 1\ 0\ 0\ 1\ 1 \\ 0\ 0\ 1\ 1\ 1\ 0 \end{bmatrix}$$

   (i) Realise an Encoder for this code.
   (ii) Verify that this code is single error correcting code.
   (iii) If received code word is 100011, find the syndrome.
   (iv) For above received codeword, if the maximum likelihood decision
        is used, determine the corresponding data word.
   (v) Give the scheme for the decoder.

6. (a) Explain Quadrature Amplitude Shift Keying (QASK). 10
   (b) Explain in detail DPCM. 10

7. Write a short notes on any two :– 20
   (a) MSK
   (b) Equalizers
   (c) Viterbi Decoding
   (d) Intersymbol Interference and Interchannel Interference.

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Con. 3402-11.   (REVISED COURSE)   RK-2085

(3 Hours)   [Total Marks : 100

N.B. : (1) Attempt any **five** questions from the following.

(2) Assume any **suitable** data if **necessary** and **clearly** state it.

1. a) Explain with suitable examples: Aggregation, Specialization and Generalization
      in EER diagrams.   **10**
   b) In SQL3 how type inheritance and table inheritance is implemented? Explain
      with suitable example.   **10**

2. Consider a university database that keeps track of student and their majors,
   transcripts and registration and the university's courses. Several sections of each
   course are offered and each section is related to the instructor who is teaching. It
   also keeps track of the sponsored research projects of faculty and graduate
   students of the academic departments of the particular collage. The database also
   keeps track of research grants and contracts awarded to the university. A grant is
   related to one principle investigator and to all researchers it supports.
   (i) Draw an EER diagram for the above statement.   **06**
   (ii) Design Object Oriented Database Schema for the same.   **08**
   (ii) Answer the following queries in Object Query Language:-   **06**
       1) Extract the names of the students who have completed the course "ADB"
       2) Retrieve the names of all departments in the course of Engineering.

3. a) The company database keeps track of a company's employees, departments and
      projects. An employee is assigned to one department but may work on several
      projects. A department controls a number of projects. The manager manages the
      department and the supervisor supervises each employee. A department may
      have several locations. We want to keep track of the dependents of each
      employee for insurance purposes. For this statement of the problem, answer the
      following:
      i) Design a suitable global distributed database schema for this problem.   **05**
      ii) Clearly identify the Fragmentation schema and the guard conditions for each
          fragment.   **05**
   b) Describe the steps used to perform JOINS in a Parallel Database.   **10**

4. a) Explain concurrency control and recovery in distributed data base management
      system.   **10**
   b) Give the general architecture of mobile computing using wireless and client
      network relationship.   **10**

[TURN OVER

5. a) University database Contains information about the courses and the professors who teach the courses in each Semester. Each course must also have information about the number of students enrolled, Room no., Date and Time (where and when the course is conducted)

    i) Write DTD rules for above XML document.　　　　　　05

    ii) Create an XML schema for above XML document.　　　　　　05

  b) Explain nested relation in ORDBMS with suitable example.　　　　　　10

6. The Mumbai University wants you to help to design a star schema to record grades for course completed by the students. There are four dimensional tables namely, Course_section, Professor, Student and Period with attributes as follows:

- **Course_section**(*Course_ID, Section_No., Units, Room-Id, Room_Capacity*) During a given semester the college offers an average of 500 course sections.
- **Professor**(*Prof_ID, Prof_Name, Title, Department-ID, Department_Name*)
- **Student** (*Student_ID, Student_Name, Major*). Each course section has an average of 60 students.
- **Period**(*Semester_ID, Year*). The database will contain data for 30 months periods. The only fact that is to be recorded in the fact table is Course_Grade.

Answer the following questions:

    i) Design the star schema for building a data warehouse.　　　　　　10

    ii) Using examples describe how mining can be useful in the above application.　　　　　　10

7. Write a short note on the following : –　　　　　　20

    a) Persistent object

    b) Types of Multimedia sources

    c) Temporal DB

    d) Geographical Information System .

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
    (2) Attempt any **four** questions from the **remaining**.
    (3) Draw **neat** diagrams wherever **required**.

1. (a) Explain the difference between OSI and TCP/IP Model. (05)

   (b) Explain different framing methods. (05)

   (c) Explain ALOHA in detail. (05)

   (d) Differentiate TCP and UDP. (05)

2. (a) Describe OSI Reference Model with a neat diagram. (10)

   (b) Explain sliding window protocol using Go Back-N technique. (10)

3. (a) Explain any five functions of Data Link layer with suitable example (10)

   (b) Explain the working of network components and state in which layer (10)
      they work. Repeaters, Hubs, Bridges, Switches, Routers, Gateways.

4. (a) Differentiate between Virtual Circuit and Datagram Networks. (10)

   (b) Explain Distance Vector Routing and its count to infinity problem. (10)

5. (a) What is IPv4 protocol? Explain the IPv4 Header format with diagram. (10)

   (b) Explain three way Handshake techniques in TCP. (10)

6. (a) For the message frame 1101011011 and $G(x) = x^4 + x + 1$, Show the (10)
      transmitted frame.

   (b) Explain Classless Inter Domain Routing (CIDR). (10)

7.   Write short notes on (any two); (20)
 (a)   HDLC.
 (b)   BLUETOOTH.
 (c)   QoS of internetworking.
 (d)   Digital Subscriber Line (DSL) & its types.

Con. 3817–11.   RK–2092

(3 Hours)   [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory.**
      (2) Attempt any **four** questions out of the remaining **six** questions.

1. Design a 8086 Based system consisting of the following :–   20
      (a) 8086 microprocessor working at 8 MHz.
      (b) EPROM of 64 kB using 32 kB devices.
      (c) SRAM of 64 kB using 16 kB devices.
      (d) One input and one output port (both 16 bit) interrupt driven.
    Explain the design. Also show the memory and I/O map.

2. (a) Explain the Initialization Command Words (ICWs) and Operational Command 10
          Words (OCWs) of the 8259 PIC.
    (b) What is segmented memory ? State the advantages of segmentation with 10
          reference to the 8086 microprocessor.
          Also, explain the default segment assignments.

3. (a) Explain the Programmer's model of the Inter 8085 microprocessor.   10
    (b) Describe the various system bus arbitration schemes in loosely coupled 10
          systems.

4. (a) Explain the interrupt structure of the 8086. Discuss the functions of the 10
          pre-defined/dedicated interrupts.
    (b) Write a detailed note on the 8289 Bus arbiter. Emphasise on its role in a 10
          multiprocessor system.

5. (a) Explain the operating modes of the 8255 PPI. Also, explain the handshaking 10
          operation for input and output in model.
    (b) Compare the 8085 and 8086 microprocessor w.r.t. architecture, instruction, 10
          set, speed, memory organization.

6. (a) What is meant by Direct Memory Access ? Show as interfacing diagram 10
          of 8086 microprocessor with 8237 DMD controller.
    (b) Write a detailed note on the Branch instructions of the 8086.   10

7. Write short notes on :–   20
      (a) IEEE–488 GPIB standard
      (b) Addressing modes in the 8086
      (c) 8284 clock generator
      (d) Modes of operation of the 8253-PIT.

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Con. 3239-11.   RK-2082

(3 Hours)   [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
     (2) Attempt any **four** questions from remaining **six** questions.
     (3) **All** questions carry **equal** marks.
     (4) Assume **suitable** data if **necessary**.

1. Write a code in HTML which displays the following :   20

Name	Roll Number	Marks		
		Term Test 1	Term Test 2	Average
	1			
	2			
	.			
	.			
	.			
	20			

Enter appropriate data and complete the code.

2. (a) Define Web Engineering.   2
   (b) Explain characteristics of Web Engineering.   10
   (c) Explain Evolution of Web Engineering.   8

3. (a) Explain Principles of Requirements Engineering for web application.   10
   (b) Explain adapting Requirements Engineering methods to web application development 10
      for requirements types.

4. (a) Explain modeling requirements for online conference paper reviewing system.   12
   (b) Explain presentation Modeling.   8

5. (a) What is Architecture ? Explain important properties of software architecture.   10
   (b) Explain Basic components of web application architecture.   10

6. (a) Explain Basic elements of hypertext documents.   10
   (b) Explain functional design for communication paradigm and middleware.   10

7. (a) Explain SMIL with example.   10
   (b) Explain WSDL web Service Description language.   10

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Con. 3499-11.

T.E (COMP V (Rev)
Theory of Computer Science

RK-2088

(3 Hours) [Total Marks : 100]

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Draw suitable **diagrams** wherever **necessary**.
(4) Assume suitable data, if **necessary**.

1. (a) Differentiate between— 5
    (i) NFA and DFA
    (ii) Moore and Mealy Machines. 5
  (b) Design a Mealy machine for the language $(0 + 1)^*(00 + 11)$ and convert it to a 10
    Moore machine.

2. (a) Design a DFA to accept the following languages over the alphabet $\{0,1\}$ 10
    (i) {w I w starts with zero and has odd length or starts with one and has even length }
    (ii) { w I every odd position of w is 1 }
  (b) Find a minimum state finite automata equivalent to the following automata— 10

	0	1
→a	b	a
b	a	c
c	d	b
*d	d	a
e	d	f
f	g	e
g	f	g
h	g	d

3. (a) Give and explain the formal statement of Pumping Lemma for regular languages 10
    and use it to prove that the following language is not regular—
    $L = \{ a^n b^{2n} \mid n > 0 \}$
  (b) Convert the following NFA with epsilon moves to a minimum state DFA accepting 10
    the same language :—
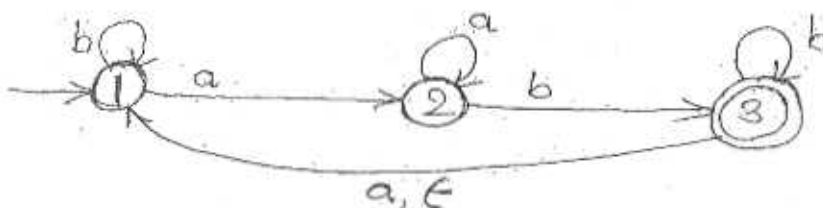
4. (a) Design a PDA for the language L = { WCW^R | W ε {a, b}* }   10

   (b) Design a PDA for the following grammar and test whether 010^4 is in the language   10
       defined by that PDA.

       S → 0BB

       B → 0S | 1S | 0

5. (a) Reduce the following grammars to GNF

       (i)   S → AB   5
             A → BSB | BB | b
       (ii) B aAb | a   5
             S → AA | 1
             A → SS | 1

   (b) Convert the following grammars to CNF   10

       A → aBb | bBa

       B → aB | bB | ε

6. (a) Design a Turing machine to accept the language L = { a^n b^n | n >= 1 }   10
   (b) Design a Turing machine that computes a function f(m, n) = m + n for the addition   10
       of 2 integers.

7. Write short notes on (any **three**) :—   20

   (a) Halting problem
   (b) Post Correspondence Problem
   (c) Chomsky Hierarchy
   (d) Intractable Problems
   (e) Greibach Theorem.