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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.]- DECEMBER 2010

Paper Code: IT301 **Subject: Theory of Computation**
Paper ID: 15301

Time : 3 Hours **Maximum Marks : 60**

Note: Attempt all questions. Internal choice is indicated.

Q1 Attempt **any three** parts of the following:-

(a) Define deterministic and nondeterministic finite automata mathematically. Consider the following DFA over the alphabet $\sum = \{0,1\}$. Construct a minimal equivalent DFA. (4)

	0	1
A (start)	B	A
B	C	D
C (final)	F	E
D	E	A
E	F	D
F (final)	F	B

(b) Define Pumping Lemma for regular languages and show the language $L = \{a^n b^n | n >= 1\}$ is Nonregular. (4)

(c) Draw a Deterministic Finite Automaton to accept the following regular expression and succinctly describe the set in English $[00+11+(01+10)(00+11)*(01+10)]*$ (4)

(d) Define pushdown automata mathematically. Construct a PDA A accepting $L = \{wcw^r | we\{a,b\}*\}$ by final state. (4)

Q2 Attempts **any three** parts of the following:-

(a) Consider the following grammar G:

$S \rightarrow 0A0|1B1|BB$

$A \rightarrow C$

$B \rightarrow S|A$

$C \rightarrow S|\varepsilon$

Simplify the above grammar. What is L(G)? What is correct order of the steps: (1) eliminate useless symbols (2) eliminate ε-productions (3) eliminate unit productions, in simplification of a context free grammar in general? (4)

(b) Let M1 and M2 be the two Finite automata's accepting the language L1 and L2 respectively. Design an automata recognize the language (i) $L1 \cap L2$ (ii) $L1 - L2$. Where L1=(No. of a's in the string defined over a, b is even) and L2={no. of b's in the string defined over a,b is odd}. (4)

(c) Show that two CFL's L1 and L2 are closed under Union but they are not closed under intersection. (4)

(d) Design a Turing machine to delete a symbol under the R/w head. (4)

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Q3 Attempt **any two** parts of the following:-

(a) What is Parsing? Consider the following grammar $S \rightarrow 0S0|1S1|10$. Construct the SLR Parsing Table for this grammar and show all moves for the parsing of input string 0100 using this table. **(6)**

(b) Define Pumping Lemma for Context Free Languages. **(6)**

(c) Consider the language: $L = \{(k, w) | \textit{Turing machine } T_k \textit{ will halt on input } w.\}$. Prove that L is Undecidable. **(6)**

Q4 Attempt **any two** parts of the following:-

(a) Prove that NSPACE(f(N)) is equivalent to SPACE(f^2(N)). **(6)**

(b) Prove that Multi-tape Turing machine is computationally equivalent to standard Turing Machine. Consider L as recursive enumerable and complement of L is also recursive enumerable then show that L is a recursive language. **(6)**

(c) Write short comments on the following:-
(i) L and NL (ii) PSPACE AND NPSPACE (iii) Churche-Turing thesis **(6)**

Q5 Attempt **any one** part of the following:-

(a) Prove that CNF satisfiability is NP-complete. **(12)**

(b) Prove that True quantifier Boolean formula satisfiability is PSPACE complete. **(12)**

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.]- DECEMBER 2010

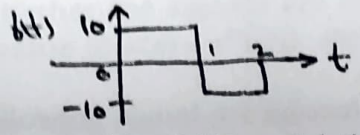
Paper Code: IT303 **Subject: Analog & Digital Communication**
Paper ID: 15303
Time : 3 Hours **Maximum Marks : 60**

Note: Attempt any five questions including Q.1 which is compulsory. Attempt one question from each unit.

Q1 (a) Give the general block diagram of a typical electrical communication system. (2)
(b) Explain the physical significance of (i) Convolution between two signals (ii) Auto-correlation function. (3)
(c) Give the representation of following signals in time domain:- (3)
(i) AM-DSB/SC (ii) FM signal (3)
(d) Explain the features of asynchronous multiplexing. (3)
(e) What is the difference between coherent and incoherent detection of digital carrier modulation systems? (3)
(f) Explain the terms (i) rate of information (ii) entropy. (3)
(g) What is meant by (i) noise figure (ii) equivalent noise temperature of a communication system? (3)

UNIT-I

Q2 (a) A rectangular pulse is given by $f(t) = A; \quad -T/2 < t < +T/2$ $= 0; \quad otherwise$ find (i) auto-correlation (ii) spectral density. (5)
(b) Find the Fourier transform of the signal given in fig.1 (5)



Q3 (a) Explain the basic principle of AM modulation and demodulation using diode. Give neat circuit diagrams and necessary waveforms. (7)
(b) List the power and bandwidth requirements for various types of AM signals. (3)

UNIT-II

Q4 (a) State and explain Sampling Theorem for band-limited signals. A signal is given by $f(t) = 2\cos^2 100\pi t + 10\sin 200\pi t.\cos 400\pi t$. Find Nyquist rate of sampling. (3)
(b) Explain the difference between (i) narrowband FM (ii) wideband FM. (3)
(c) Compare the features of AM, FM and PM. (4)

Q5 Explain the method of generation of various pulse modulated signals. How will you regenerate the baseband signal from these pulse modulated signals? Give the principle of time-division multiplexing with reference to pulse modulated signals. (10)

UNIT-III

Q6 (a) What are the advantages of digital communication over analog communications? (3)
(b) Compare the features of DM, ADM and ADPCM systems. (7)

Q7 Using block diagrams and necessary waveforms, explain the generation and demodulation of following signals (a) DPSK (b) QPSK. (10)

UNIT-IV

Q8 (a) Find (i) Shannon Fano's Codes (ii) Huffman's Codes, for following symbols with probabilities mentioned: (7)
$P(A) = 0.4; \quad P(B) = 0.2; \quad P(C) = 0.25;$
$P(D) = 0.1; \quad P(E) = 0.045; \quad P(F) = 0.005$
(b) Why coding of signals is required in digital communication systems? Explain by taking suitable examples. (3)

Q9 List various error detection and correction codes. What are the features and typical applications of (a) Block codes (b) Convolution codes? Give typical suitable examples. (10)

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END TERM EXAMINATION

SEVENTH SEMESTER [B.TECH./M.TECH.]- DECEMBER 2010

Paper Code: IT401 **Subject: Digital Signal Processing**
Paper ID: 15401

Time : 3 Hours **Maximum Marks : 60**

Note: Attempt five questions including Q.1 which is compulsory.

Q1 (a) Discuss minimum phase and maximum phase transfer function. **(5)**

(b) A linear time invariant system is characterized by system function $H(z)=\frac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$. Determine h(n). **(5)**

(c) Check if the system is LTI or not (i) $y(n)=\sum_{K=-\infty}^{n}x(k)$ (ii) y(n)=x(-n). **(5)**

(d) Derive the relationship between DFT (i) Z-transform (ii) Fourier series. **(5)**

Q2 (a) Compute the convolution y(n)=x(n)*h(n), $x(n)=\begin{cases}1 & n=-2,0,1\\ 2 & n=-1\\ 0 & elsewhere\end{cases}$,

$h(n)=\delta(n)-\delta(n-1)+\delta(n-4)+\delta(n-5)$. **(8)**

(b) Determine whether the signals are energy or power signal and also compute its value (i) $x(n)=e^{2n}u(n)$ (ii) $x(n)=(1/3)^n u(n)$. **(2)**

Q3 (a) Check if lt following signal are causal or not:- **(3)**

(i) $y(n)=x(n)+x^2(n-1)$

(ii) $y(n)=x(2n)$

(iii) $y(n)=\sum_{K=-\infty}^{n+1}x(k)$

(b) Discuss sampling theory in frequency domain. **(2)**

(c) Find the cross correlation of two finite length sequence x(n)={1,2,1,1} and y(n)={1,1,2,1}. Also, show that $r_{xy}(l)=x(l)*y(-l)$. **(5)**

Q4 (a) Given the sequence $x_1(n)$={1,2,3,4}, $x_2(n)$={1,1,2,2}. Compute- **(8)**

(i) $x_3(n)=x_1(n)\ \ x_2(n)$.

(ii) Linear convolution using circular convolution.

(b) Derive the parseval's theorem. **(2)**

Q5 (a) Determine the causal signal x(n) having Z-transform $X(Z)=\frac{1}{(1-2z^{-1})(1-z^{-1})^2}$. **(6)**

(b) Prove the following property of DFT where X(K) is the N point DFT of x(n). if x(n) is real and even then X(K) is real and even. **(4)**

Q6 Find the DFT of a sequence x(n)={1,2,3,4,4,3,2,1} using OIT algorithm. Draw the structure and also show bit reversal. **(10)**

Q7 Find the IDFT of the sequence X(K)={4, 1-j2.414, 0, 1-j0.414, 0, 1+j0.414, 0, 1+j2.414} using DIF algorithm. **(10)**

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Q8 Draw the direct form II, cascade and parallel structure for the system described by the difference equation

$$y(n)=\frac{3}{4}y(n-1)-\frac{1}{8}y(n-2)+x(n)+\frac{1}{3}x(n-1).$$ **(10)**

Q9 (a) Explain the design of IIR filter using (i) impulse invariance method (ii) Bilinear transformation method. **(4)**

(b) Realize the following system function using minimum no. of multipliers:- **(6)**

(i) $H(z)=1+\frac{1}{3}z^{-1}+\frac{1}{4}z^{-2}+\frac{1}{4}z^{-3}+\frac{1}{3}z^{-4}+z^{-5}$

(ii) $H(z)=(1+z^{-1})\left(1+\frac{1}{2}z^{-1}+\frac{1}{2}z^{-2}+z^{-3}\right)$

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.]- DECEMBER 2010

Paper Code: IT305 **Subject: Computer Architecture**

Paper ID: 15305

Time : 3 Hours **Maximum Marks : 60**

Note: Attempt any five questions.

Q1 What do you mean by micro-operations? State their significance. What are the various types? Illustrate the implementation of each category of micro-operations through its block digram(s). **(12)**

Q2 (a) Write a short note on microprogrammed control unit architecture. **(7)**

(b) Write a short note on DMA. **(5)**

Q3 (a) Why do we require addressing modes? Explain autoincrement, implied and relative addressing mode. **(6)**

(b) Discuss the difference between RAM and ROM. Explain the various types of RAM used in computer. **(6)**

Q4 (a) What are the different stages of an instruction cycle? **(5)**

(b) What are I/O processors? What is their role? Show CPU-IOP communication? **(7)**

Q5 (a) List and explain the various ports/pins of 8085 microprocessor. **(5)**

(b) Design parallel priority interrupt hardware for a system with six interrupt sources. **(7)**

Q6 (a) With the help of an example, perform the multiplication of two unsigned numbers, using shift and add method. **(7)**

(b) What are the advantages and disadvantage of 2's complement representation over sign magnitude representation? **(5)**

Q7 (a) Differentiate between programmed versus interrupt driven I/O. (5)

(b) Define Virtual memory. How is it implemented? Explain in detail. (7)

Q8 Write short notes on **any three** of the following:- **(3x4=12)**

(a) RS-232-C

(b) Bus Arbitration Logic

(c) High Speed Memories

(d) Levels of programming languages

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.] DECEMBER 2010

Paper Code: IT307 **Subject: Digital Signal Processing**
Paper ID: 15307

Time : 3 Hours **Maximum Marks : 60**

Note: Attempt any five questions.

Q1 Define (a) linearity (b) shift-invariance (c) causality and (d) stability of a discrete time system. Verify these conditions for the following systems:- **(12)**

(i) $T[x(n)] = \sum_{k=n_0}^{n} x(k)$

(ii) $T[x(n)] = \sum_{k=n-n_0}^{n+n_0} x(k)$

(iii) $T[x(n)] = x(n-n_0)$

(iv) $T[x(n)] = e^{x(n)}$

Q2 (a) Define z-transform. Determine the z-transform of the following sequences and give their region of convergence:- **(6)**

(i) $\left(\frac{1}{2}\right)^n u(n)$ (ii) $\left(\frac{1}{2}\right)^n (u(n)-u(n-10))$

(b) Discuss the z-transform theorems and properties. **(6)**

Q3 (a) Explain DFT. Give matrix relations for computing DFT and IDFT. **(6)**
(b) Define circular convolution. Evaluate circular convolution of the following sequences- x(n)={1 3 4 2 1} and h(n)={2 0 1 0 1}. **(6)**

Q4 (a) Explain the Overlap-Add method for evaluating convolution of infinite length sequence with finite length sequence. **(6)**
(b) Give the symmetry property of the DFT of a complex sequence and explain them. **(6)**

Q5 (a) Give and explain the network structures for IIR filters. **(6)**
(b) Discuss the polyphase realization of FIR filters. **(6)**

Q6 (a) How digital filter specifications are given? Explain with the help of magnitude response specifications. **(4)**
(b) Explain the process of IIR filter design using bilinear transformation. **(8)**

Q7 What are the approaches for decreasing the computational complexity of the DFT? Explain decimation-in-time FFT algorithm with the help of an example. **(12)**

Q8 (a) Compare IIR and FIR filters. **(4)**
(b) Describe procedure for designing FIR filters using windows. **(8)**

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.]- DECEMBER 2010

Paper Code: IT309 **Subject: Object Oriented Software Engineering**
Paper ID: 15309

Time : 3 Hours **Maximum Marks : 60**

Note: Q.1 is compulsory. Attempt one question from each unit.

Q1 Consider the interactive application of railway reservation system. Design the following:-
(a) Entity relationship diagram. (3)
(b) Use case diagram. (3)
(c) Description of any one use case. (3)
(d) Sequence diagram and a corresponding collaboration diagram. (5)
(e) State chart diagram. (3)
(f) Activity diagram. (3)

UNIT-I

Q2 (a) What are various software engineering development activities? What is the role of software life cycle models? Explain by using Spiral model. (7)
(b) Compare following giving examples:- (3)
(i) System and models
(ii) Activity and tasks
(iii)Method and methodology

OR

Q3 (a) What do you mean by requirement elicitation? Discuss various activities of requirement elicitation. (7)
(b) Compare the following giving examples:- (3)
(i) Functional Requirements
(ii) Non-Functional requirements
(iii)Pseudo requirements

UNIT-II

Q4 (a) Define model architecture. Discuss in brief design model with proper example. (5)
(b) Describe the activities that transform the use cases and scenarios produced during requirements elicitation into an analysis model. (5)

OR

Q5 (a) Describe various architecture models and their features in brief. (6)
(b) Can an object stand alone? Justify your answer with an example. (4)

UNIT-III

Q6 (a) Draw a class diagram representing a book defined by the following statement: "A book is composed of a number of parts, which in turn are composed of a number of chapters. Chapters are composed of sections." Focus only on classes and relationships. (5)
(b) What is Generalization and association of classes? Extend the class diagram of Q.6(a) and include the following attributes:- (5)
- a book includes a publisher, publication date and an ISBN,
- a part includes a title and a number,
- a chapter includes a title, a number and an abstract and
- a section includes a title and a number.

OR

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Q7 (a) What are the basic building blocks of UML? **(3)**
(b) What are the four common mechanisms in UML? **(3)**
(c) Explain the architecture of a software intensive system described by five interlocking views. **(4)**

UNIT-IV

Q8 Buiid the statechart diagram corresponding to the PurchaseTicket use case of figure-1. Generate test cases based on the statechart diagram using the state-based testing technique. **(10)**

User case name	PurchaseTicket
Entry condition	The Passenger standing in front of ticket Distributor. The Passenger has sufficient money to purchase ticket.
Flow of events	1. The Passenger selects the number of zones to be traveled. If the Passenger presses multiple zone buttons, only the last button pressed is considered by the Distributor. 2. The Distributor displays the amount due. 3. The Passenger inserts money. 4. If the Passenger selects a new zone before inserting sufficient money, the Distributor returns all the coins and bills inserted by the Passenger. 5. If the Passenger inserted more money than the amount due, the Distributor returns excess change. 6. The Distributor issues ticket. 7. The Passenger picks up the change and the ticket.
Exit condition	The Passenger has the selected ticket.

Figure-1

OR

Q9 (a) Give a brief description of various testing activities and techniques. **(3)**
(b) There are three ways by which the client evaluates a system during acceptance testing as mentioned. Define them with example. **(3)**
(i) Shadow testing
(ii) Benchmark testing
(iii)Competitor testing
(c) Give an outline for following test documents:- **(2+2)**
(i) Test plan
(ii) Test case specifications

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P2/P2

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH./M.TECH.]- DECEMBER 2010

Paper Code: IT311 **Subject: Digital System Design Using VHDL**

Paper ID: 15311

Time : 3 Hours **Maximum Marks : 60**

Note: Attempt any five questions including Q.1 which is compulsory.

Q1 (a) What is Behavioral and structural modeling? Give example using Full subtractor.
(b) Give the declaration and specification of user defined attributes. Give an example using enumerated encoding.
(c) Compare Moore and Melay state model. Give example using a serial adder.
(d) What is GENERIC? Design a generic parity detector.
(e) Give the VHDL code for designing signed comparator. **(4x5=20)**

Q2 (a) Which standard gave standardization to VHDL language? Give the summary of VHDL design synthesis using a block diagram. **(3)**
(b) Give VHDL code for binary to grey code converter. **(4)**
(c) Compare Array, Port array and Records. Give VHDL code in support of your statements. **(3)**

Q3 (a) Can addition between data type of BIT is possible? How do you allow addition between value of type BIT_VECTOR? Explain by giving example. Use the same technique to add an integer to a binary 1 bit number. Give VHDL code for the same. **(4)**
(b) Design and implement an Arithmetic logic unit using multiplexer. Write the VHDL code for it. **(6)**

Q4 (a) What is PROCESS? Design a DFF using PROCESS. **(2)**
(b) Write VHDL code for 8-bit unsigned carry ripple adder. **(6)**
(c) Explain the role of GENERATE statement in VHDL. **(2)**

Q5 (a) Compare Inertial Delay, delta delay and Transport delay. Give example. **(3)**
(b) Design a circuitry for a RAM with separate input output data buses. Give VHDL code for the implementation. **(7)**

Q6 Write VHDL program for **any two** of the following;- **(5+5)**
(a) Signed Multiplier
(b) 8-bit register
(c) Floating point adder
(d) BCD counter

Q7 Using the FSM approach design a traffic light controller. Assume that a 60Hz clock is available. **(10)**

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