(Please write your Exam Roll No.)

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] DECEMBER 2019

Paper Code: IT 301 **Subject: Theory of computation**

Time : 3 Hours **Maximum Marks :75**

Note: Attempt five questions including Q. NO. 1 which is compulsory. Select one question from each unit.

Q1. Attempt any five of the following: ***(5*5=25)***

a) Prove that $L=\{ a^n b^n \mid n>=1\}$ is non-regular.

b) Show that the context free languages are not closed under intersection

c) What is probabilistic Turing machine?

d) Prove that a problem solvable in the space of O(f(n)) requires worst case time of the order of $O(2^{f(n)})$ [*Make necessary assumptions*].

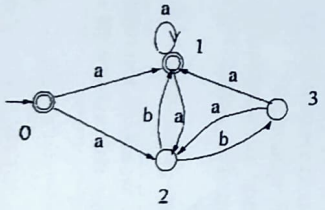
e) Prove that vertex cover problem is poly-time reducible to clique problem.

f) What is parsing? Define LL(1) parsing technique.

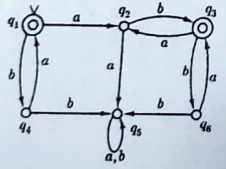
g) Define any two variants of standard turing machine.

Unit-I

Q2. Differentiate in between deterministic and non-deterministic finite automata. Convert following NDFA into DFA. **(12.5)**



Q3. Explain the process of minimizing number of states of a DFA. Minimize the number of states of following DFA. **(12.5)**



Unit II

Q4. What is context free grammar? Explain pumping lemma for context free language through an example. **(12.5)**

Q5. Define Pushdown automata (PDA). Create a pushdown automaton that accepts the language $(0^{2n}1^n \mid n > 0)$. Show that your PDA accepts **000011** and that it rejects **0001.** **(12.5)**

Unit III

Q6. Can you write a program which outputs itself? if 'yes' then give an example. Define Recursion theorem and show that construction of **'SELF'** Turing machine is possible. **(12.5)**

Q7. Differentiate in between computationally intractable and Undecidable problems. Prove that Halting problem is undeciadable. **(12.5)**

Unit IV

Q8. Define IP and BPP complexity classes? Prove that $NSPACE(f(n)) = SPACE(f(n)^2)$. **(12.5)**

Q9. Discuss the proof outline of Cook-levin theorem. State whether following statements are TRUE or FALSE with justifications. **(12.5)**

(a) Some problems in NP complete can not be transformed into satisfiability problem in Polynomial time.

(b) Non deterministic RAM may give different results for the same decision problem.

(c) A problem with exponentially possible solutions can only be in P if P=NP.

d) Every problem who solution requires exponential time on the deterministic RAM can be made to run in polynomial time on deterministic RAM.

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END TERM EXAMINATION

FIFTH SEMESTER [B.TECH.] DEC.-2019

Paper Code: IT303 **Subject: Analog & Digital Communications**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions in all including Q. No. 1 which is compulsory. Assume suitable missing data if any

Q1. i) What is code rate & constraint length in error correcting codes. List their significance.
ii) Define source entropy. When is it maximum.
iii) Compare coherent, incoherent & partially coherent reception along with their merits/ demerits.
iv) Sketch the auto correlation & PSD for while noise.
v) What is adoptive PCM. Why is it needed. **(5x3=15)**

Q2. a) Compare & constant the various signal types: Analog, Pulse & Digital & then associated communication schemes. What is the great benefit of Digital over Analog & what is the disadvantage of Digital Signaling. **(9)**

b) What is meant by PSD. Draw the PSD for a Gate function & AWGN & label the axes. **(6)**

Q3. a) Explain the need for modulation. State & prove the frequency shifting property of fourier transform. **(9)**

b) Sketch & work out the Autocorrelation & Crosscorrelation between $\sin \omega_0 t$ & $\cos \omega_0 t$. Are they orthogonal? **(6)**

Q4. a) Explain with neatly labeled B.D.s any one means of generating & demodulating AM. **(10)**

b) Show that the carrier occupies at least $2/3^{rd}$ of power in DSB-FC **(5)**

Q5. a) What is Narrow Band & Wide Band FM. State the Carrons Rule for FM bandwidth. **(5)**

b) State & Prove the sampling theorem for band limited signals. What is an Antialiasing fitter. **(10)**

Q6. a) If 20 baseband signals each 1 MHz wide (videosignals) are multiplexed using TDM, find the bandwidth consumed by the TDM signals. **(5)**

b) Show that SNR of a uniform Quantizer varies as $1/\Delta^2$ where Δ is the step size. **(10)**

Q7. a) What is DPCM. Explain its key principles & show how it can be refined further using a predictor. Give relevant B.D. & necessary mathematical expressions. **(5)**

b) With a neat B.D. explain the working of a BPSK Modem. Why are modems used in computer data transmission. Draw the signal constellation of BPSK . **(10)**

Q8. a) Show how Shannon – Fano coding can help compact a digital source representation. Take a suitable example. **(9)**

b) How many errors can a 7 bit Hamming Code detect and correct. Explain using codeword space. **(6)**

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(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH(IT)] DECEMBER- 2019

Paper Code: IT-305 **Subject: Computer Architecture**

Time : 3 Hours **Maximum Marks :75**

Note: Attempt any five questions including Q. No.1 which is compulsory.

Q1 Explain following in brief:- **(any five)** **(5x5=25)**

(a) What is Cyclic Stealing? Why it is required?
(b) What is opcode, operand and opcode mnemonic? Give example.
(c) Why is cache memory faster than RAM?
(d) What is in memory cache?
(e) Why RAM is not suitable for permanent storage?
(f) Explain virtual memory in brief.

Q2 (a) How the data is transferred between accumulator, bus and memory? What is the role of PC, IR, MBR and MAR during this process? Do they work as multiplexer or decoder? Explain. **(6)**

(b) Explain Arithmetic micro operations in detail with suitable example. **(6.5)**

Q3 Explain following micro operations using example: **(any five)** **(5x2.5=12.5)**

(a) Selective set and Selective complement
(b) Mask Operations
(c) Insert Operation
(d) Clear Operations
(e) Arithmetic Shift left Micro operation and Arithmetic Shift Right Micro operation.
(f) AND, OR and NOT, NAND and NOR, ExOR and Ex-NOR operations

Q4 (a) Draw and explain instruction cycle and interrupt cycle. **(6)**

(b) What is Bus arbitration? Explain four types of bus arbitration? Differentiate between centralized bus arbitration and inter-processor arbitration? **(6.5)**

Q5 (a) Explain Interrupt Driven I/O Basic Operation. What is Input Output Multiple Interrupts and how they are handled? Discuss the input output modes of transfer in brief. **(6)**

(b) Distinguish between Programmed I/O and DMA and gives Disadvantage and advantages of each method. What is the role of DMA controller? **(6.5)**

Q6 (a) What is the instruction format in computer architecture? What are the types of operands? Discuss its parts and explain different types of instruction format? **(6)**

(b) Discuss Addressing modes and elaborate the difference between Absolute addressing, Base addressing, Relative addressing and Indirect addressing. **(6.5)**

Q7 (a) Differentiate between hardwired control unit and Micro programmed control unit. **(6)**

(b) Which kind of memories are considered as high speed memory and why? Can a computer run without cache memory? What are the different types of cache memory available in industry? Where is cache memory located? Differentiate between cache and RAM memory in brief. **(6.5)**

Q8 Write short note on following: **(5x2.5=12.5)**

(a) UART
(b) RS-232 and RS-422 standard
(c) First pass and second pass assembler
(d) IEEE 754 floating point standard
(e) Signed and unsigned notations

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1/9/28

(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] NOVEMBER –DECEMBER 2019

Paper Code: IT 307 **Subject: Digital Signal Processing**

Time : 3 Hours **Maximum Marks :75**

Note: Attempt any five questions including Q. No. 1 which is compulsory. Assume missing data if any.

Q1. a) Compare between DFT and FFT. **(5)**

b) Define linearity and shift invariance properties of the discrete time systems verify there conditions for the following systems: **(5)**

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

c) Describe methods for finding Inverse Z- bantam. **(5)**

d) Discuss the design for FIR differentiator. **(5)**

e) Compare FIR and IIR system. **(5)**

Q2. a) Discuss the Z-transform theorems and properties. **(6)**

b) Perform linear convolution for the input sequence:- X(n)= {1, 2,3,1,4} and h(n)={ 1,2,3,4}. **(6.5)**

Q3. a) Explain DFT. Prove the following properties of DFT when x(k) is the N-point. **(6)**
i) If x(n) is real and odd.
ii) If x(n) is imaginary and odd.

b) Determine the Z-transform of the following sequences and give their region of convergence: **(6.5)**

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

Q4. Explain decimation in-time FFT algorithm for computing DFT. Compute DFT for the sequence {1,4,8,6,3,5,6,2} using FFT algorithm. **(12.5)**

Q5. a) Give the symmetry properties of the DFT of a complex sequence and explain them. **(6)**

b) What are the sample-hold circuits? Explain with the help of an example. **(6.5)**

Q6. a) Discuss the frequency response of the discrete-time system. **(6)**

P.T.O.

b) A casual linear shift invariant filter system has the system function. **(6.5)**

$$H(z) = \frac{1+0.875Z^{-1}}{(1+0.2Z^{-1}+0.9Z^{-2})(1-0.7Z^{-1})}$$

Draw the signal flow graph using

i) Direct form –II
ii) Cascade of the first and second order systems in transposed direct form II.

Q7. Implement the all pass filter $H_a P(Z) = \frac{-0.5120Z^{-1}-0.8Z^{-2}+Z^{-3}}{1-0.8Z^{-1}+0.6402Z^{-2}-0.512Z^{-3}}$ using a lattice filter structure. **(12.5)**

Q8. a) How digital filter specification are given? Explain with the help of magnitude response specifications. **(6)**

b) Explain the process of IIR filter design using a bilinear transformation. **(6.5)**

Q9. Discuss the cascade, parallel and transposed terms of the IIR filter structure. **(12.5)**

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IT-307