41 : 2nd half.11-AM(d)

**Con. 6152-11.**          (OLD COURSE)          **MP-4525**

(3 Hours)          [ Total Marks : 100

N.B. :  (1)  Question No. 1 is **compulsory**.
        (2)  Attempt any **four** questions out of remaining **six** questions.
        (3)  Assumptions made should be **clearly** stated.
        (4)  **Figures** to the **right** indicate **full** marks.

1.  (a)  Compare Active and Passive Filter.                                                    5
    (b)  Find the value of a fifth order Chebyshev polynomial at $\omega = 0.7$ rad/sec and    5
         $\omega = 1.2$ rad/sec.
    (c)  Explain the principle of realization of a resistor in a switched capacitor filter.    5
    (d)  Realize a third order active low pass filter. Assume appropriate data if required.    5

2.  (a)  By using method of constraint derive expression for voltage transfer function of     10
         a $II^{nd}$ order finite gain high pass filter.
    (b)  Design a $II^{nd}$ order high pass Sallen and Key filter for the given requirements.  10
         $|H_0| = 2$
         $\omega_n = 1$ rad/sec
         $Q = 2$
         Develop a normalized design.

3.  (a)  Explain with the help of circuit diagram the working of Tow-Thomas Filter. Derive    10
         voltage transfer function for low pass and band pass filter.
    (b)  Explain and draw neat circuit diagram of inverting, non-inverting and lossy           10
         Integrators using parasitic insensitive switched capacitors.

4.  (a)  Determine the order of Butterworth response that realise the following specifications 10
         and also find the Butterworth function.
         $\omega_p = 1$ rad/sec          $K_p = 3.0103$ dB
         $\omega_s = 2$ rad/sec          $K_s = 25$ dB.
    (b)  Compare Butterworth and Chebyshev approximations.                                     10

5.  (a)  Derive the expression for a state variable configuration using three op-amp. Derive   10
         expression for High Pass, Low Pass and Band Pass output.
    (b)  What are coupled resonators ? List their advantages.                                  10

6.  (a)  How Leap-frog structure is developed ? Use this concept to realize a third order      10
         low pass filter.
    (b)  Realize the following transfer function using an LC network terminated in a 1 Ω       10
         resistor

$$T(s) = \frac{Hs\left(s^2 + \frac{1}{4}\right)}{2s^3 + s^2 + 8s + 1}$$

Find value of 'H'. Draw a neat Pole Zero diagram.

7.  (a)  Draw the circuit configuration for Generalized Impedance Converter (GIC). Analyse     10
         it and determine transmission parameters.
    (b)  Write a short note on Frequency Transformation.                                       10

29/11/11. Scm-X . I.T. (OLD)

Digital. Communication.

**Con.6095-11.**                                           **MP-4570**

## (OLD COURSE)

(3 Hours)                                    [ Total Marks : 100

**N.B.:** (1) Question No.1 is **compulsory**. Solve any **four** questions from the remaining **six**.

(2) **Figures** to **right** indicate **full** marks.

(3) Make **suitable** assumptions where **necessary**.

1. (a) Explain PDF and CDF.                                                5
   (b) Compare ISI and ICI.                                                5
   (c) Explain the Substitution method of encryption.                     5
   (d) Compare Systematic and Non-systematic codes.                       5

2. (a) What is an equalizer ? Explain transversal equalizer in detail.    10
   (b) Explain the losses occuring in a link design of a communication system.   10

3. (a) Draw a neat block diagram for a orthogonal QPSK Transmitter and receiver   10
       and explain the working.
   (b) A bit sequence 10011001 is to be transmitted.                      10
       Draw the wave form for :—
           (i) NRZ-S
           (ii) Polar RZ
           (iii) AMI
           (iv) Split Phase Manchester
           (v) Unipolar RZ.

4. (a) Explain the following terms :—                                     10
           (i) Information
           (ii) Entropy
           (iii) Joint Entropy
           (iv) Rate of information
           (v) Conditional Entropy.
   (b) What is Source Coding ? Explain Huffman code in detail.            10

5. (a) Derive an expression for the probability of error for binary phase shift keying  10
       receiver.
   (b) For a systematic (7, 4) cyclic code, find the generator matrix and the parity check  10
       matrix. Given :G (D) = $D^3 + D + 1$

6. (a) Explain signature authentication using public key crypto system.   10
   (b) Compare BPSK, DPSK and DEPSK.                                      10

7. Write short note on :—                                                 20
   (a) Autocorelation
   (b) Linear block codes
   (c) Pulse code modulation.

9|12|11 TC (EXTC) Sem - V (OTR)
Computer Architecture & Organisation

**Con. 6099-11.** (OLD COURSE) MP–4552

(3 Hours) [ Total Marks : 100

**N.B. :** (1) Question No. **1** is **compulsory**.
(2) Out of remaining **six** questions, attempt any **four** questions.
(3) Draw **neat** labelled diagram wherever **necessary**.
(4) Answers to **each** new question to be started on a **fresh page**.

Q1 a) Explain with suitable examples the difference between computer  5
architecture and computer organization.

b) What is Bus? Explain PCI bus architecture with uniprocessor and  15
multiprocessor system

Q2 a) List the different mapping techniques of cache memory. Explain  10
set-associative mapping techniques with an example?

b) A two level memory (M1 , M2) has the access times $tA1=10^{-8}$ s and  10
$tA2=10^{-3}$ s. What must be the hit ratio H in order for the access efficiency
to be atleast 65 % of it's maximum possible value?

Q3 a) A block set associative cache consists of a total of 256 cache block with  10
two blocks/set .The main memory containing 4 K blocks with 16 words/
block. Draw a figure explaining the mapping and show the partitions of an
address into TAG,SET, and WORD bit)?

b) Explain with  diagram DMA data transfer techniques.  10

Q4 a) Distinguish between memory mapped I/O and I/O mapped I/O?  10

b) Explain Interrupt  driven I/O with an example?  10

Q5 a) Explain with neat diagram the difference between  micro programmed  10
and  hardwired control unit organization?

b) What is virtual memory? Describe how a virtual address generated  10
by the CPU is translated into a physical main memory address.

Q6 a) Explain Booth Multiplication Algorithm and implement for the  10
following  numbers:

**-10 * 3**

b) Explain the  Flynn's Classification for parallel processing system ?.  10

Q7 Write a short note on : (Any two)  20
  a) MIMD
  b) IOP and CPU interaction
  c) RAID levels.

**Con. 6105–11.**               (OLD COURSE)                **MP–4540**

(3 Hours)                    **[Total Marks : 100**

**N.B. :** (1) Question No. **1** is **compulsory**.

(2) Attempt any **four** questions out of remaining **six** questions.

(3) Assumptions made should be **clearly** stated.

(4) Figures to **right** indicate **full** marks.

1. (a) Prove that IF L is a regular language over alphabet $\Sigma$, then $\overline{L} = \Sigma^* - L$ is also     **5**
   a regular language.

   (b) State and prove the statement of pumping lemma for context-free-language.     **5**

   (c) Prove that Every language accepted by a multitape TM is recursively     **5**
   enumerable.

   (d) Prove that $P \subseteq CO-NP$.     **5**

2. (a) Contract a recursive descent parser for the arithmatic expressions using     **10**
   '+', '*', '∧' operators.

   (b) What is ambiguous grammer ? Eliminate ambiguities for the grammar.     **10**

   $E \rightarrow E + E / E * E / (E) / id$

3. (a) Prove the following.     **10**
   (i)   $L = \{ a^p / P \text{ is prime } \}$ is not context free.
   (ii)  $L = \{ (ab)^n a^k / n > k, k \geq 0 \}$ is not regular.

   (b) Explain the working of operator precedence parser.     **10**

4. (a) Design a TM to recognize the language $L = \{ a^n b^n c^n / n \geq 1 \}$.     **10**

   (b) Design a context free grammars for the following languages.     **10**
   (i)   $L = \{ a^i b^j c^k / i = j = k \}$
   (ii)  $L = \{ a^i b^j / i \leq 2j \}$

5. (a) Begin with the grammars.     **12**

   $S \rightarrow ABC / BaB$

   $A \rightarrow aA / BaC / aaa$

   $B \rightarrow bBb / a / D$

   $C \rightarrow CA / AC$

   $D \rightarrow \in (Epsilon)$

   (i)   Eliminate $\in$ – productions
   (ii)  Eliminate any unit production in the resulting grammar.
   (iii) Eliminate any useless symbols in the resulting grammar.
   (iv)  Put the resulting grammar into Chomsky Normal form.

**[ TURN OVER**

    (b)  Give DFA's accepting the following languages over the alphabet (0, 1).   **8**

       (i)   The set of all the strings begining with ⊥ that, when interpreted as a binary integer, is a multiple of 5. (For example, strings 101, 1010, and 1111 are in the language ; 0, 100 and 111 are not )

      (ii)   The set of all string that, when interpreted in reverse as a binary integer, is divisible by 5. (Example of the strings in the language are 0, 10011, 1001100 and 0101)
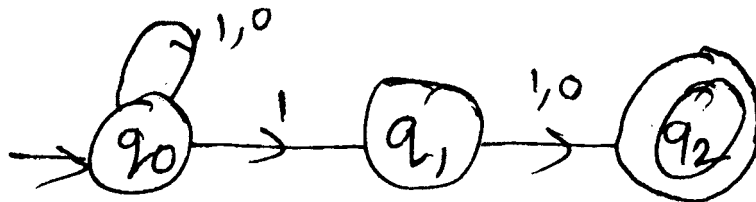
6.  (a)  Convert to GNF the grammar $G = (\{ A_1, A_2, A_3 \}, \{ a, b \}, P, A)$ where P is :  **10**

$$A_1 \to A_2 A_3$$
$$A_2 \to A_3 A_1 \,/\, b$$
$$A_3 \to A_1 A_2 \,/\, q$$

    (b)  Convert the given NFA into Equivalent DFA.  **10**



7.  (a)  Using the defination of Asymptotic notation prove that.  **10**

      (i)   $F_1(n) = 10n^3 + 5n^2 + 17 \in 0\,(n^3)$

      (ii)  $F_2(n) = 3n + 4 \in 0\,(n^2)$

    (b)  Design a PDA to accept language of odd length palindromes where $\Sigma = \{ 0, 1 \}$  **10**

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(3 Hours)                          [ Total Marks : 100

**N.B. :** (1) Question No. **1** is **compulsory**.
      (2) Attempt any four question out of remaining **six** question.
      (3) Draw **suitable** diagrams whenever **necessary**.
      (4) Assume **suitable** data if **necessary**.

**Q.1)** Attempt any four:                                          (20)
  a) Explain in brief about Time Averaging & Ergodicity.
  b) Describe Bit Error Probability V/s Symbol Error Probability for Multiple Phase Signaling.
  c) Compare PSK and M-ary PSK by five points.
  d) State any five major sources signal loss & noise is communication link.
  e) With neat sketch, explain working of Transversal equilizer.

**Q. 2)** Answer the following:
  a) Explain effect of intersymbol interference. Draw Power Spectra for QASK, MSK, QPSK and BPSK.                                          (12)
  b) Illustrate the duo-binary coding & decoding rules using the differential pre-coding for the sequence 0010110.                                          (08)

**Q. 3)** Answer the following:
  a) Explain $\mu$-law and A-law companding characteristics with Plot.                                          (06)
  b) For the binary sequence – 110001101, sketch following PCM waveforms          (08)
      i.   NRZ – S
      ii.  Bipolar – RZ
      iii. Manchester Coding
      iv. Delay Modulation
  c) Explain in brief about granular noise and slope overload distortion.                                          (06)

**Q. 4)** Answer the following:
  a) With block diagram, explain Noncoherent detection of FSK using envelope detector.                                          (06)
  b) Prove that BPSK & QPSK have the same Bit Error Probability.                                          (06)
  c) In case of MFSK signaling, What is the minimum tone spacing that insures signals orthogonality?                                          (08)

**[ TURN OVER**

**Con. 6094-MP–4585-11.**

Q. 5) Solve

a) A cyclic code is generated to encode the message Vector m = 1011 into a (7,4) codeword using the generator $g(x) = x^3 + x + 1$. Draw the circuit to generate this code and show how parity bits are generated for the given message vector. (10)

b) For convolutional encoding, the generator sequences are $g_1 = [1\ 1\ 1]$ & $g_2 = [1\ 0\ 1]$, Draw & explain the following: (10)
   i.   Encoder State diagram
   ii.  Tree diagram
   iii. Trelli's diagram

Q. 6) Explain the following:

a) Explain Shannon Capacity theorem, Derive an expression for the channel capacity for channels of infinite bandwidth. (10)

b) With reference to Practical security of Encryption & Decryption, Explain – (10)
   i.   Permutation          ii.   Product Cipher System

Q. 7) Write Short Note on any Four: (20)

a) BCH Codes
b) Relation between Probability & Probability density
c) Noise figure, Noise bandwidth & Noise Temperature
d) Binary Frequency shift keying
e) Differential Pulse Code Modulation .

A. M - V    TE ETRX,
CMPN, IT EXTC
Sem -V' (OTR)

**Con. 6936–11.**          (OLD COURSE)          **MP–4532**

(3 Hours)                    [ **Total Marks : 100**

**N.B. :**(1)  Question No. 1 is Compulsory.
    (2)  Attempt any four questions out of the remaining six questions.
    (3)  Figures to right indicate full marks.

Q.1.  (a)  A random sample of 50 items gives the mean 6.2 and S. D. 1.24. Can it be    5
            regarded as drawn from a normal population with mean 5.5.

     (b)  If Eight persons are chosen from any group, Show that at least two    5
            of them will have the birthday on the same day of the week.

    ( c)  The probability density function of a random variable X is    5

| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| $P(X = x)$ | k | 2k | 3k | $k^2$ | $k^2 + k$ | $2k^2$ | $4k^2$ |

            Find  i) k, ii) $P(X<5)$.

    (d)  Prove that $-1 < r < 1$, with usual notation.    5

Q.2.  (a)  Find Mean and Variance of Binomial Distribution.    6

     (b)  A continuous random variable has probability density function    6

$$f(x) = 6(x - x^2)  \quad 0 \le x \le 1$$

            Find (i) mean , ii) variance.

    ( c)  For the following data    8

| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Y | 9 | 8 | 10 | 12 | 11 | 13 | 15 | 16 |

            Find the lines of regressions.

Q.3.  (a)  In the normal distribution ,the mean is 6 and S. D. is 1.2 .Find $P(4.5 < x < 7..7)$,    6
            $P(x >7)$ and $P(2 < x < 8.25)$.

     (b)  Let A = { 2,3, 6, 12, 24, 36} and R be the relation 'is divisible by ' i. e. aRb    6
            means a/b .Obtain the relation matrix and draw Hass diagram.

    ( c)  Show that the set F = { $a + b\sqrt{2}$ }, where a and b are rational numbers is a    8
            field under addition and multiplication.

Q.4.(a)  A samples of 200 fishes of a particular kind taken as random from one end    6
            of a lake had mean weight of 20 lbs & S. D. of 2 lbs. At the other end of the lake ,
            a sample of 180 fish of the same kind had mean weight of 20 lbs. and S. D. of 2 lbs.
            Is the difference between the mean weights significant?

    (b)  Find the probability that at most 4 defective bulbs will be found in a box of    6
            200 bulbs if is known that 2 percent of the bulbs are defective.

    ( c)  For the following data    8

| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Y | 9 | 8 | 10 | 12 | 11 | 13 | 15 | 16 | 15 |

            Find the lines of regressions.

Q.5.  (a)  If f and g are defined as    6
            $f : R \to R$, $f(x) = 3x + 1$
            $g : R \to R$, $g(x) = 5x - 3$
            Find fog, $f^{-1}$, $g^{-1}$.

     (b)  Sandal powder is packed into packets by a machine. A random sample of 10    6
            Packets is drawn and their weights are found to be 0.47, 0.48, 0.49, 0.50,
            0.51, 0.49, 0.48, 0.50, 0.51, 0.48 kg . Test if the average packing can be taken
            as 0.45 by using student's t-test.

**[ TURN OVER**

( c) The following data is collected on two characters. Based on this , can you say   8
that there is no relation between smoking and literacy

|            | Smokers | Non-Smokers | Total |
|------------|---------|-------------|-------|
| Literates  | 83      | 57          | 140   |
| Illiterates| 45      | 65          | 110   |
| Total      | 128     | 122         | 250   |

Q. 6. ( a) An Accident occurred on the road are follows the poison distribution with mean 2
Per Day .What is the probability that i) one accident , ii) Two accidents iii) no
Accidents Happens per day?                                                6
(b) Find Mean and Variance of Poisson Distribution.                       6
(c ) Calculate the coefficient of correlation for the following data :     8
      x: 36  56   20  42  33  44  50  15  60
      y: 50  35   70  58  75  60  45  80  38

Q.7. (a)  Fit Poisson Distribution of the following :                      6

| X    | 0   | 1  | 2  | 3 | 4 | Total |
|------|-----|----|----|---|---|-------|
| F(x) | 109 | 65 | 22 | 3 | 1 | 200   |

(b ) Obtain the rank correlation coefficient  from the data                6
    X:  10    12     18     19    15    40
    Y:  12    18    25    27    50    26
(c)   Show that the set $F = \{ 1, -1, i, -i \}$ is a group under multiplication.   8