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

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

(2) Answer any three questions from Q.2 to Q.6

(3) Use of stastical Tables permitted.

(4) Figures to the right indicate full marks

1. (a) Evaluate the line integral $\int_0^{1+i}(x^2 - iy)dz$ along the path $y = x$  5

(b) State Cayley-Hamilton theorem & verify the same for $A = \begin{bmatrix} 1 & 3 \\ 2 & 2 \end{bmatrix}$  5

(c) The probability density function of a random variable $x$ is

| $x$ | −2 | −1 | 0 | 1 | 2 | 3 |
|------|-----|-----|-----|-----|-----|-----|
| $P(x)$ | 0.1 | k | 0.2 | 2k | 0.3 | K |

Find i) k   ii) mean   iii) variance  5

(d) Find all the basic solutions to the following problem

Maximize $z = x_1 + 3x_2 + 3x_3$

Subject to $x_1 + 2x_2 + 3x_3 = 4$

$2x_1 + 3x_2 + 5x_3 = 7$

and $x_1, x_2, x_3 \geq 0$  5

2. (a) Find the Eigen values and the Eigen vectors of the matrix $\begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$  6

(b) Evaluate $\oint_c \dfrac{dz}{z^3(z+4)}$ where c is the circle $|z| = 2$  6

(c) If the heights of 500 students is normally distributed with mean 68 inches and standard deviation of 4 inches, estimate the number of students having heights i) less than 62 inches, ii) between 65 and 71 inches.  8

[TURN OVER

MD-Con. 8175-15.

3. (a) Calculate the coefficient of correlation from the following data

| x | 30 | 33 | 25 | 10 | 33 | 75 | 40 | 85 | 90 | 95 | 65 | 55 |
|---|----|----|----|----|----|----|----|----|----|----|----|----|
| y | 68 | 65 | 80 | 85 | 70 | 30 | 55 | 18 | 15 | 10 | 35 | 45 |

6

(b) In sampling a large number of parts manufactured by a machine, the mean

number of defectives in a sample of 20 is 2. Out of 100 such samples, how many

would you expect to contain 3 defectives i) using the Binomial distribution,

ii) Poisson distribution. 6

(c) Show that the matrix $\begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalizable. Find the transforming

matrix and the diagonal matrix. 8

4. (a) Fit a Poisson distribution to the following data

| x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|----|-----|-----|----|----|----|---|---|---|
| f | 56 | 156 | 132 | 92 | 37 | 22 | 4 | 0 | 1 |

6

(b) Solve the following LPP using Simplex method

Maximize $z = 6x_1 - 2x_2 + 3x_3$

Subject to $2x_1 - x_2 + 2x_3 \leq 2$

$x_1 + 4x_3 \leq 4$

$x_1, x_2, x_3 \geq 0$

6

(c) Expand $f(z) = \dfrac{2}{(z-2)(z-1)}$ in the regions

i) $|z| < 1$ ii) $1 < |z| < 2$, iii) $|z| > 2$ 8

5. (a) Evaluate using Cauchy's Residue theorem $\oint_c \dfrac{1-2z}{z(z-1)(z-2)} dz$ where c is

6

$|z| = 1.5$

**[TURN OVER**

(b) The average of marks scored by 32 boys is 72 with standard deviation 8 while that
of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether
the boys perform better than the girls.                                          6

(c) Solve the following LPP using the Dual Simplex method

Minimize $z = 2x_1 + 2x_2 + 4x_3$

Subject to    $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 \leq 3$

$x_1 + 4x_2 + 6x_3 \leq 5$

$x_1, x_2, x_3 \geq 0$.                                                          8

6.  (a) Solve the following NLPP using Kuhn-Tucker conditions

Maximize $z = 10x_1 + 4x_2 - 2x_1^2 - x_2^2$

Subject to   $2x_1 + x_2 \leq 5$;   and   $x_1, x_2 \geq 0$                       6

(b) In an experiment on immunization of cattle from Tuberculosis the following
results were obtained

|                | Affected | Not Affected | Total |
|----------------|----------|--------------|-------|
| Inoculated     | 267      | 27           | 294   |
| Not Inoculated | 757      | 155          | 912   |
| Total          | 1024     | 182          | 1206  |

Use $\chi^2$ Test to determine the efficacy of vaccine in preventing tuberculosis.   6

(c) i) The regression lines of a sample are $x + 6y = 6$ and $3x + 2y = 10$
find a) sample means $\bar{x}$ and $\bar{y}$ b) coefficient of correlation between $x$ and $y$   4

ii) If two independent random samples of sizes 15 & 8 have respectively the
means and population standard deviations as

$\bar{x}_1 = 980, \bar{x}_2 = 1012$ :  $\sigma_1 = 75,$  $\sigma_2 = 80$

Test the hypothesis that $\mu_1 = \mu_2$ at 5% level of significance.                4

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**MD-Con. 8175-15.**

(3 Hours) [Total Marks : 80

N.B. : (1) Question No. 1 is **compulsory**.
    (2) Attempt any **three** questions from remaining five questions.
    (3) Make **suitable assumption** if necessary and state it **clearly**.

1. (a) Derive expression for entropy ?     5
  (b) What is lossless compresion ?     5
  (c) List attacks threatening security goals.     5
  (d) Explain the role of digital signature.     5

2. (a) Explain LZW compression algorithm with example.     10
  (b) For DES symmetric algorithm, explain main steps involved showing block   10
    size, cipher key size and round key size.

3. (a) For (7, 4) cyclic code, find out the generator matrix if $G(D) = 1 + D + D^3$   10
  (b) Describe Huffman decoding procedure with example.     10

4. (a) Explain Diffie-Hellman algorithm. Which attack is it valnerable to ?     10
  (b) Describe convolution code in brief.     10

5. (a) State Fermat's Little Theorem with example and its applications.     10
  (b) Describe lossy compression methods. Where we use lossy compression methods ?   10
    How do we are it ?

6. (a) Describe Chinese-Remainder Theorem and its applications.     10
  (b) Define : (i) Hamming distance     10
         (ii) Hamming Weight
         (iii) Syndrome
         (iv) Linear properties of code
         (v) Code rate

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**QP Code : 5503**

Duration: 3Hrs.          Total Marks : 80

N.B.: -          1. Question No. 1 is compulsory.
                2. Answer any three out of remaining questions.
                3. Figures to the right indicate full marks.
                4. Assume any suitable data if necessary.

1  (a)   Explain three tier architecture of web application.                                      5

   (b)   What is XSLT? Explain with example.                                                      5

   (c)   Explain web services.                                                                    5

   (d)   Differentiate between GET and POST.                                                      5

2  (a)   Explain JavaScript objects Window and Document.                                          10

   (b)   What is session? What are the ways to do session tracking? Explain session              10
         handling using cookies.

3  (a)   What is valid XML document? Design DTD for address book XML document.                    10

   (b)   What is JQUERY? Illustrate the use of JQUERY for form validation.                        10

4  (a)   Explain AJAX – PHP framework.                                                            10

   (b)   Write JavaScript program to validate a form which accepts Name, Date of Birth,          10
         email and Phone Number of a student.

5  (a)   Write the HTML code to display class timetable.                                          10

   (b)   Write an ASP.NET program to insert a new record ( Name, Date of Birth, email            10
         and Phone Number of a student ) in the database using C#.

6  (a)   What is CSS? Explain the ways by which CSS is included in the web page.                  10

   (b)   Write JavaScript code to display today's day (eg. Sunday, Monday, . . .).                10

**MD-Con. 11589-15.**

Q.P. Code : **5461**

(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.

1. Solve any **four** out of five. 20
   (a) Differentiate between RISC and CISC
   (b) What are the functions of following registers?
       (i) PC (ii) SP (iii) MAR (iv) MDR (v) IR
   (c) Write a note on interrupt execution.
   (d) Define Stored Program Concept and draw Von-Neumann's architecture.
   (e) What is meant by nanoprogramming?

2. (a) Multiply (-3) and (4) using Booth's Algorithm. 10
   (b) Explain 6 stage instruction pipeline with suitable diagram. 10

3. (a) Compare SRAM & DRAM. 10
   (b) Consider the string 1,3,2,4,2,1,5,1,3,2,6,7,5,4,3,2,4,2,3,1,4 10
       Find the page faults for 3 frames using FIFO and LRU page replacement
       algorithms.

4. (a) Divide 11 by 2 using restoring division algorithm. 10
   (b) What is meant by Fetch cycle, Instruction cycle, Machine cycle and interrupt 10
       cycle? Explain in brief.

5. (a) Explain different mapping techniques of Cache memory. 10
   (b) What is virtual memory? Explain the role of paging and segmentation in 10
       virtual memory.

6. (a) Explain different addressing modes with example. 10
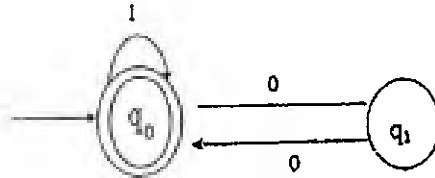   (b) What is the need of DMA? Explain its various techniques of data transfer. 10

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**MD-Con. 10800-15.**

QP Code : **5419**

(3 Hours) [ Total Marks : 80

**N. B. :** (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from the entire paper.
(3) Draw **diagrams** wherever **necessary**.

1. (a) (2) Explain if the following machine $M$ is a DFA? Is it NFA? Write formally a definition for this $M$.



(b) Design moore machine to convert each occurrence of 100 to 101  3
(c) Write a CFG to generate strings Starting and ending with different letter  3
over the $\Sigma$ ={a,b}
(d) What is Multi-Tape Turing Machine  3
(e) Difference between FA and PDA  4
(f) Give a regular expression for the language over the alphabet $\Sigma$ = {a,b}  3
containing at most two a's.

2. (a) Construct a minimal DFA which accepts $L=\{a^n b^m c^l \mid n,m,l >= 0\}$  5
(b) State and explain Turing Machine Formalism. 5  5
(c) If $L(r)$= { aaa,aab,aba,abb,baa,bab,bba,bbb} ,find the regular expression  5
r which represents $L(r)$.
(d) Explain Chomsky Hierarchy.  5

3. (a) Construct a TM for accepting palindromes.  10
(b) Design PDA For recognizing $L= \{a^m b^n c^{m+n} \mid m,n >= 1\}$  10

4. (a) Convert the following grammar to Chomsky Normal Form. Show all  10
the relevant Steps briefly.
$S \rightarrow bA \mid aB$
$A \rightarrow bAA \mid aS \mid a$
$B \rightarrow aBB \mid bS \mid b$

[ TURN OVER

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(b) Convert the following Grammar G to GNF.  10

$G=\{(A_1, A_2, A_3) ,(a,b) ,P, A_1\}$

Where , P consist of the Following Productions:

$A_1 \rightarrow A_2 A_3$

$A_2 \rightarrow A_3 A_1 \mid b$

$A_3 \rightarrow A_1 A_2 \mid a$

5. (a) State and Prove pumping lemma for regular languages and prove that following language is regular or not

$L=\{a^n b^n \mid n>=1\}$

(b) Construct NFA,DFA for the regular Expression $R=ab(a+b)+abb$. Obtain  10
minimized DFA

7. Write short notes on:- ( any two)  20

(a) Simplification OfCFG

(b) Recursive and Recursively enumerable languages

(c) Universal TM

(d) Halting Problem