S.E./ SEM IV (CBSGS) COMPUTER/I.T. NOV '16

APPLIED MATHS IV

**QP Code : 541304**

(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
(5) Assume suitable data wherever applicable.

1. (a) Find the Eigenvalues and eigenvectors of the matrix. **5**

$$A=\begin{bmatrix}2 & 1 & 0\\ 0 & 2 & 1\\ 0 & 0 & 2\end{bmatrix}$$

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

(c) Find k and then E (x) for the p.d.f. **5**

$$f(x) = \begin{cases} k(x-x^2) & ,0\le x\le 1,\ k>0 \\ 0 & ,\text{otherwise} \end{cases}$$

(d) Calculate Karl pearson's coefficient of correlation from the following data. **5**

| x | 100 | 200 | 300 | 400 | 500 |
|---|---|---|---|---|---|
| y | 30 | 40 | 50 | 60 | 70 |

2. (a) Show that the matrix $A=\begin{bmatrix}2 & -2 & 3\\ 1 & 1 & 1\\ 1 & 3 & -1\end{bmatrix}$ is non- derogatory. **6**

(b) Evaluate $\int\frac{e^{2z}}{(z+1)^4}dz$ where C is the circle $|z-1|=3$ **6**

(c) If x is a normal variate with mean 10 and standard deviation 4 find **8**
(i) $P(|x-14|<1)$ (ii) $P(5\le x\le 18)$ (ii) $P(x\le 12)$

3. (a) Find the relative maximum or minimum (if any) of the function $Z= x_1^2+x_2^2+x_3^2-4x_1-8x_2-12x_3+100$ 6

(b) If x is Binomial distributed with E (x) =2 and V (x) = 4/3, find the probability distribution of x. 6

(c) If $A=\begin{bmatrix}2 & 1\\ 1 & 2\end{bmatrix}$, find $A^{50}$. 8

4. (a) Solve the following L.P.P. by simplex method 6

Minimize $z = 3x_1 + 2x_2$

Subject to $3x_1 + 2x_2 \leq 18$

$0 \leq x_1 \leq 4$

$0 \leq x_2 \leq 6$

$x_1, x_2 \geq 0.$

(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) Find Laurent's series which represents the function $f(z)=\frac{2}{(z-1)(z-2)}$ 8

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

5. (a) Evaluate $\int_c \frac{z^2}{(z-1)^2(z+1)}\,dz$ where C is $|z| =2$ using residue theorem 6

(b) The regression lines of a sample are x+6y=6 and 3x+2y=10 Find 6

(i) Sample means $\bar{x}$ and $\bar{y}$

(ii) Correlation coefficient between x and y. Also estimate y When x = 12

(c) A die was thrown 132 times and the following frequencies were observed 8

| No.obtained | 1 | 2 | 3 | 4 | 5 | 6 | Total |
|---|---|---|---|---|---|---|---|
| Frequency | 15 | 20 | 25 | 15 | 29 | 28 | 132 |

Using $\chi^2$ -test examine the hypothesis that the die is unbiased.

6. (a) Evaluate $\int_{-\infty}^{\infty} \frac{x^2+x+2}{x^4+10x^2+9}\,dx$ using contour integration. 6

(b) If a random variable x follows Poisson distribution such that P (x =1) =2 P (x =2) Find the mean and the variance of the distribution. Also find P (x=3). 6

(c) Use Penalty method to solve the following L.P.P. 8

Minimize $z = 2x_1 + 3x_2$

Subject to $x_1 + x_2 \geq 5$

$x_1 + 2x_2 \geq 6$

$x_1, x_2 \geq 0.$

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S.E. / Sem IV (CBSGS) Computer Nov '16

Analysis Of Algorithm

**QP Code : 541400**

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

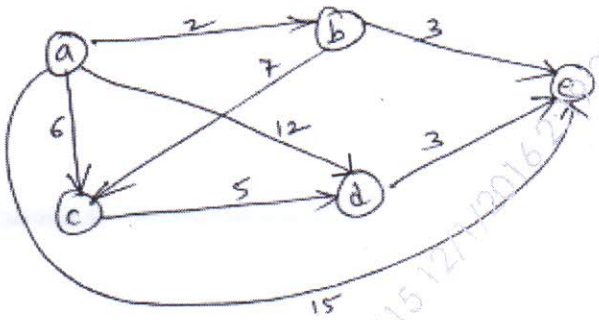
**N.B.:** (1) Q.1 is Compulsory.
(2) Attempt any three from remaining five questions.

1. (a) Which are the different methods of solving recurrences. Explain with examples. **10**

   (b) Compare Greedy and dynamic programing approach for algorithm Design. Explain How both can be used to solve Knapsack problem? **10**

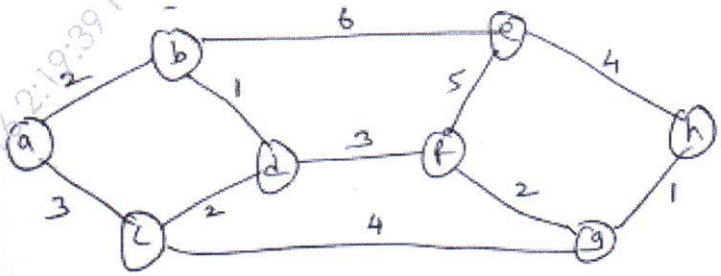
2. (a) Explain the anlaysis of quick sort and apply the same to sort following data. [ 10 7 5 9 12 3 ] **10**

   (b) Write single source shortest path algorithm & apply the same for following. **10**




3. (a) Explain string matching with finite automata and apply the same technique to match following pattern. **10**
   txt [ ] = UNIVERSITY OF MUMBAI
   pat [ ] = MBA

   (b) Compare Prims & Kruskal's method for finding Minimum spanning Tree find MST for following using prims method. **10**




**[ TURN OVER**

4. (a) Explain with example how divide and conquer stratergy is used in binary search? **10**

(b) Solve sum of subsets problem for following **10**

N = 6 W = { 3, 5, 7, 8, 9, 15 } & M = 20

Also write the Algorithm for it.

5. (a) Explain longest common subsequence problem with example. **10**

(b) What is backtracking method? How it is used in graph coloring problem? **10**

6. Write short notes on **(Any Four)** **20**

(1) 8 queens problem

(2) Job sequencing with deadlines

(3) Flow shop scheduling

(4) Multistage Graphs

(5) A symptotic Notations

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S.E./CMPN/SEM IV (CBSGS) NOV/DEC '16

DATABASE MGMT SYSTEMS

**Q.P. Code : 541603**

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

**N.B.:** (1) Question No.1 is **compulsory**.
(2) Solve any **three** questions out of the remaining questions.
(3) Make **suitable** assumptions if **needed**.

1. (a) Give the advantages of DBMS over File Processing Systems. **5**
   (b) What are the steps involved in Query Processing. **5**
   (c) Explain Shadow Paging in brief. **5**
   (d) Define Super Key and Candidate Key with an example. **5**

2. (a) Discuss conflict serializability and view serializability with examples. **10**
   (b) Describe the overall architecture of DBMS with suitable diagram. **10**

3. (a) Explain the following Relational Algebra Operations with example: **10**
      i. Natural Join iii. Project
      ii. Union iv. Select
   (b) Explain types of integrity constraints with example. **10**

4. (a) What is Normalization? Explain 1NF, 2NF, 3NF and BCNF giving examples. **10**
   (b) Consider the following database schema: **10**

   Employee( employee_name, street, city, date_of_join )
   Works(employee_name ,company_name, salary )
   Company(company_name, city)
   Manages(employee_name, manager_name)
   Solve the following queries using SQL:
   i. Give all employee of ABC Company a 25% rise.
   ii. Find all employees who live in the same cities and on the same street as their manager.
   iii. Find all employees who join in the month of April.
   iv. Delete the Smith belonging to XYZ Company.

5. (a) What is an attribute? Discuss various types of attributes with examples. **10**
   (b) Explain Security and Authorization in DBMS. **10**

6. Write Short notes on: **20**
   (a) Total and Partial Participation
   (b) Data Independence
   (c) ACID Properties
   (d) Aggregate Functions in SQL

S.E./COMP./SEM IV (CBSGS) NOV/DEC '16

THEORETICAL COMP. SC. **QP Code:541703**

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

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

1. (a) Design a DFA over an alphabet $\Sigma = \{a, b\}$ to recognize a language in which every 'a' is followed by 'b'. **5**
   (b) Give formal definition of a Push Down Automata. **5**
   (c) State and explain the power and limitations of a Turing machine **5**
   (d) Design a mealy machine to determine the residue mod 3 of a binary number. **5**

2. (a) Convert the following NFA to an equivalent DFA **10**

| State | a | b | ε |
|---|---|---|---|
| $\rightarrow q_0$ | $\{q_0, q_1\}$ | $q_1$ | {} |
| $q_1$ | $\{q_2\}$ | $\{q_1, q_2\}$ | {} |
| $*q_2$ | $\{q_0\}$ | $\{q_2\}$ | $\{q_1\}$ |

   (b) State and explain pumping lemma for regular languages. Using pumping lemma prove that the language $L = \{0^n 1^n \mid n \geq 0\}$ is not regular. **10**

3. (a) Design a Turing machine that computes a function f(m,n) = m + n i.e. addition of two integers **10**
   (b) Design a Turing machine to accept the language $0^n 1^n 2^n$ **10**

4. (a) Draw a state diagram and construct a regular expression corresponding to the following state transition table. **10**

| State | 0 | 1 |
|---|---|---|
| $\rightarrow *q_1$ | $q_1$ | $q_2$ |
| $q_2$ | $q_3$ | $q_2$ |
| $q_3$ | $q_1$ | $q_2$ |

   (b) State and explain decision properties of regular languages **10**

**[Turn Over**

5. (a) (i) Convert the following CFG to GNF 10

$S \rightarrow AA|a$

$A \rightarrow SS \mid b$

(b) Design a PDA corresponding to the grammar 10

$S \rightarrow aSA \mid \varepsilon$

$A \rightarrow bB$

$B \rightarrow b$

6. Write detailed notes on (any **two**):- 20

(a) Recursive and Recursively Enumerable Languages.

(b) Chomsky Hierarchy

(c) Rice's Theorem

(d) Halting problem

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