

Sem-IV  
Comp (CBGS)  
Applied Maths-4

24/11/2016

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 statistical 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

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

- (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  
(i)  $P(|x-14| < 1)$  (ii)  $P(5 \leq x \leq 18)$  (ii)  $P(x \leq 12)$

8

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  $A^{30}$ . 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  $P(x=1) = 2P(x=2)$  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  $x_1 + x_2 \geq 5$   
 $x_1 + 2x_2 \geq 6$   
 $x_1, x_2 \geq 0$ .



QP Code : 541400

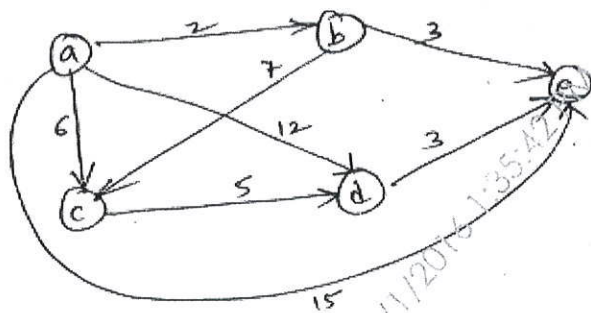
( 3 Hours )

[ Total Marks: 80

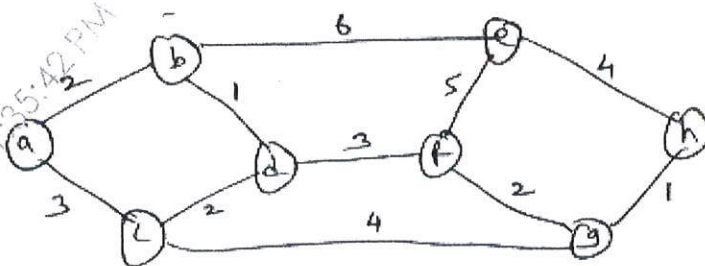
**N.B.:** (1) Q.1 is Compulsory.

(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 programming approach for algorithm Design. Explain How both can be used to solve Knapsack problem? **10**
2. (a) Explain the analysis 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 Prim's & Kruskal's method for finding Minimum spanning Tree find MST for following using prim's method. **10**



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4. (a) Explain with example how divide and conquer strategy 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) Asymptotic Notations
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Q.P. Code : 541502

(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. Attempt **any four** out of **five** questions. 5
  - (a) Explain Von Neumann architecture in detail. 5
  - (b) Explain various pipeline hazards with example. 5
  - (c) Differentiate between Computer Organization & Architecture. 5
  - (d) Explain Flynn's Classification. 5
  - (e) What are the differences between RISC and CISC processors. 5
2. (a) Convert  $(127.125)_{10}$  in IEEE-754 single and double precision floating point representation. 10
- (b) Explain micro instruction sequencing and execution. 10
3. (a) Calculate the hit and miss using various page replacement policies LRU, OPTIMAL, FIFO for following sequence (page frame size = 3) 4, 7, 3, 0, 1, 7, 3, 8, 5, 4, 5, 3, 4, 7. State which one is best for above example? 10
- (b) Explain the importance of multiple bus hierarchies with the help of suitable diagram. 10
4. (a) Describe Hardwired Control Unit and specify its advantages. 10
- (b) Describe the characteristics of Memory. 10
5. (a) Explain DMA based data transfer technique for I/O devices. 10
- (b) Multiply (-7) with (4) by using Booth's algorithm of Multiplication. 10
6. Write short notes on (**any four**) : 20
  - (a) Types of ROM
  - (b) Cache Coherency
  - (c) Scanner
  - (d) Interrupt driven I/O
  - (e) Nano Programming





S.E. Sem-IV  
Comp (CBGS)  
DBMS

15/12/2016

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



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	$\epsilon$
$\rightarrow q_0$	$\{q_0, q_1\}$	$q_1$	$\{\}$
$q_1$	$\{q_2\}$	$\{q_1, q_2\}$	$\{\}$
$*q_2$	$\{q_0\}$	$\{q_2\}$	$\{q_1\}$

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

3. (a) Design a Turing machine that computes a function  $f(m,n) = m + n$  i.e. addition 10  
 of two integers

- (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 10  
 the following state transition table.

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

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5. (a) (i) Convert the following CFG to GNF 10  
 $S \rightarrow AA|a$   
 $A \rightarrow SS | b$
- (b) Design a PDA corresponding to the grammar 10  
 $S \rightarrow aSA | \epsilon$   
 $A \rightarrow bB$   
 $B \rightarrow b$
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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**Q. P.Code : 541800**

**Duration: 3 Hours**

**Total Marks assigned: 80**

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

(2) Attempt any **three** of remaining **five** questions.

(3) Assume any suitable **data** if necessary and clearly state it.

1. (a) What is aliasing? Explain any two anti-aliasing techniques. [05]  
(b) Explain OpenGL basic primitives. [05]  
(c) Show that the composition of two successive rotation are additive  
i.e.  $R(\theta_1) \cdot R(\theta_2) = R(\theta_1 + \theta_2)$  [05]  
(d) What is the purpose of Inside-Outside Tests? Explain with an example. [05]
2. (a) Write the mid-point circle drawing algorithm. Using mid-point circle algorithm  
Plot the circle whose radius = 10 units. [10]  
(b) Apply the Cohen – Sutherland line clipping algorithm to clip the line with  
coordinates (30, 60) and (60, 25) against the window with  $(X_{wmin}, Y_{wmin}) =$   
(10, 10) and  $(X_{wmax}, Y_{wmax}) = (50, 50)$  [10]
3. (a) Explain Weiler–Atherton polygon clipping algorithm in detail. [10]  
(b) Explain Back Surface detection method in detail with an example. [10]
4. (a) Explain and compare Goraud Shading and Phong Shading. [10]  
(b) What are Parallel and Perspective projections and derive the matrix for  
perspective projection. [10]
5. (a) Derive the matrix that represents scaling of an object with respect to any fixed  
point? Use that matrix to find  $P^1$  for the given point  $P(6, 8)$ ,  $S_x = 2$ ,  $S_y = 3$  and  
fixed point (2, 2). [10]  
(b) Explain the properties of Bezier curves [10]
6. Write a short note on any two of the following [20]  
(a) Comparison of 3D object representation methods  
(b) Construction of Koch curve  
(c) Halftone and Dithering techniques

