

May - 2017

QP Code : 541301

(3 Hours)

[Total Marks : 80]

- N.B.: (1) Questions no. 1 is compulsory.
 (2) Attempt any three questions from Q. 2 to Q. 6
 (3) Use of statistical table permitted.
 (4) Figures to the right indicate full marks.

1. (a) Evaluate $\int_C (z - z^2) dz$, where C is the upper half of the circle $|z| = 1$. 5

(b) If $A = \begin{bmatrix} 2 & 4 \\ 0 & 3 \end{bmatrix}$, then find the eigen values of $6A^{-1} + A^3 + 2I$. 5

(c) State whether the following statement is true or false with reasoning: "The regression coefficients between $2x$ and $2y$ are the same as those between x and y ." 5

(d) Construct the dual of the following L.P.P. 5

Maximise $Z = 3x_1 + 17x_2 + 9x_3$

Subject to $x_1 - x_2 + x_3 \geq 3$

$-3x_1 + 2x_3 \leq 1$

$2x_1 + x_2 - 5x_3 = 1$

$x_1, x_2, x_3 \geq 0$

2. (a) Evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$, where C is the circle $|z - 1| = 3$. 6

(b) Show that the matrix $A = \begin{bmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{bmatrix}$ is derogatory. 6

(c) A manufacturer knows from his experience that the resistance of resistors he produces is normal with $\mu = 100$ ohms and standard deviation $\sigma = 2$ ohms. What percentage of resistors will have resistance between 98 ohms and 102 ohms? 8

3. (a) A discrete random variable has the probability distribution given below: 6

x	-2	-1	0	1	2	3
p(x)	0.2	k	0.1	2k	0.1	2k

Find k, the mean and variance

[TURN OVER]

(b) Solve the following L.P.P. by simplex method

Maximise $Z = 3x_1 + 2x_2$

Subject to $x_1 + x_2 \leq 4$

$x_1 \cdot x_2 \leq 2$

$x_1, x_2 \geq 0$

(c) Expand $f(z) = \frac{z^2 - 1}{z^2 + 5z + 6}$ around $z = 0$, indicating region of convergence.

4. (a) Find the first two moments about the origin of Poisson distribution and hence find mean and variance.

(b) Calculate R and r from the following data :

x	12	17	22	27	32
y	113	119	117	115	121

(R - the rank correlation coefficient, r - correlation coefficient)

(c) Show that the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ is diagonalisable.

Find the transforming matrix and the diagonal matrix.

5. (a) A tyre company claims that the lives of tyres have mean 42,000 kms with S.D of 4000 kms. A change in the production process is believed to result in better product. A test sample of 81 new tyres has a mean life of 42,500 kms. Test at 5% level of significance that the new product is significantly better than the old one.

(b) Evaluate $\int_0^{2\pi} \frac{d\theta}{5 + 3\sin \theta}$ using Cauchy's residue theorem.

(c) Using the Kuhn-Tucker conditions solve the following N.L.P.P.

Minimise $Z = 7x_1^2 + 5x_2^2 - 6x_1$

Subject to $x_1 + 2x_2 \leq 10$

$x_1 + 3x_2 \leq 9$

$x_1, x_2 \geq 0$

[TURN OVER

Q.P. Code :13174

[Time: Three Hours]

[Marks:80]

Please check whether you have got the right question paper.

N.B: Subject AOA CSC 402 CBSGS R-12 SE comp SEM IV CBSGS

1. Q.1 is compulsory.
2. Solve any three from Remaining

Q.1

Answer any four

20

- a) Write an algorithm for finding maximum and minimum number from given set.
- b) Write the algorithm and derived the complexity of Binary Search algorithm.
- c) Explain masters method with example
- d) Write a note on flow shop scheduling
- e) Compare divide and conquer, dynamic programming and Backtracking approach used for algorithm design.

Q.2

- a) Write and explain string matching with finite automata with an example
- b) Explain how branch and bound strategy can be used in 15 puzzle problem.

10

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Q.3

- a) What is 0/1 knapsack and fractional knapsack problem.

10

Solve following using 0/1 knapsack method

Item (i)	Value (vi)	Weight(wi)
1	18	3
2	25	5
3	27	4
4	10	3
5	15	6

Knapsack capacity=12.

- b) Explain insertion sort and derive its complexity

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Q.4

- a) What is a binary search tree? How to generate optimal binary search tree
- b) What is a longest common subsequence problem? Find LCS for following string X = ACB AED
Y = ABC ABE

10

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Q.5

- a) Explain Job Sequencing with deadlines.
Let $n=4$, $(P_1 P_2 P_3 P_4) = (100, 10, 15, 27)$ and $(d_1 d_2 d_3 d_4) = (2, 1, 2, 1)$ find feasible solution.

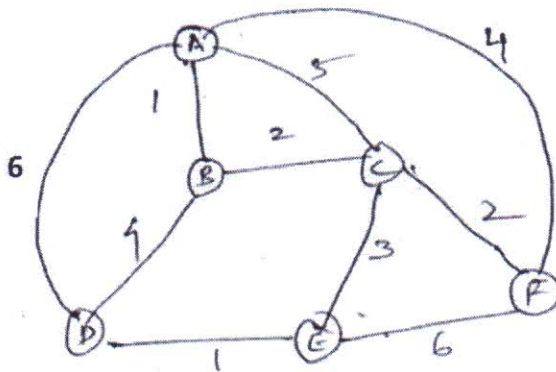
10

- b) Explain prims algorithm and find minimum spanning tree for the following graph.

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(P.T.O)

Q.P. Code :13174



Q.6

Write short notes (any three):-

- Problem of multiplying Long Integers
- Strassen's matrix multiplication
- Knuth Morris Pratt's Pattern matching
- Multi stage Graphs

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Q.P. Code :13085

[Time: Three Hours]

[Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question no 1 is compulsory.
 2. Attempt any three questions from remaining five questions.
 3. Assume suitable data if required.
 4. Draw neat diagram wherever necessary.

Q1 Solve any four out of five.

20

- A. Explain Virtual Memory.
- B. What is IO buffering?
- C. Write a note on scanner.
- D. What is Segmentation?
- E. What is TLB?

Q2 A. I) Draw the flow chart for Restore Division Algorithm.

04

II) Divide using restore division method 7/3

06

B. Describe hard-wire control unit and specify its advantages.

10

Q3 A. Multiply (-5) and (2) using Booth's Algorithm.

10

B. A block set associative cache consists of 64 blocks divided in 4 block sets. The main memory contains 4096 blocks, each 128 words of 16bit length.

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1) How many bits are there in main memory address?

2) How many bits are there in cache memory address (tag, set, and word fields)?

Q4 A. Differentiate between I: RISC and CISC processor.

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B. Explain Flynn's classification.

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Q5 A. Discuss the functions of 8089 I/O processor.

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B. Show IEEE 754 standards for Binary Floating Point Representation for 32 bit single format and 64 bit double format.

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Q6 A. Explain different pipelining hazards.

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B. Discuss the functions of 8089 I/O processor

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Q. P. Code: 18323

Time: 3 Hours

Marks: 80

N.B. : (1) Question Number 1 is compulsory

(2) Solve any three question from the remaining questions

(3) Make suitable assumptions if needed

1. (a) Construct an ER diagram for a hospital with a set of patients and a set of medical doctors. Associated with each patient a log of various tests and examination conducted. 10
 - (b) Explain lossless join decomposition and dependency preserving decomposition 5
 - (c) List four significant differences between file processing system and database management system 5
 2. (a) What is a deadlock? How is it detected? Discuss different types of deadlock prevention scheme. 10
 - (b) Write SQL queries for the given database 10
- Employee(eid,ename,street,city)
Works(eid,cid,salary)
Company(cid,cname,city)
- (i) Modify the database so that Jack now lives in 'Mumbai'
 - (ii) Give all employees of 'ANZ Corporation' a 10% raise in salary
 - (iii) Find all employee id who live in same cities as the company for which they work
 - (iv) Give total number of employees
 - (v) Find the highest paid employee
3. (a) What is an attribute? Explain different types of attributes with examples. 10
 - (b) Companies manufacture ranges of products which are purchased by customers. The relation schema for this operation is given as :- 10

Company(company_code,company_name,director#,director_name,{product name, cost, {cust#, customer_name, address}}) where { } represents a repeating groups and company_code, director# and cust# contains unique values. Normalize this relation to third normal form.

TURN OVER

Q. P. Code: 18323

4. (a) Explain following relational algebra operations with examples 10
- (i) set intersection
 - (ii) Generalized projection
 - (iii) Natural Join
 - (iv) Aggregation operator
- 4 (b) Explain nested loop join and block nested loop join algorithm in query processing. 10
- 5 (a) Explain Timestamp ordering protocol and Thomas write rule 10
- (b) Describe the three level schema architecture of DBMS. State different level of dependencies in this architecture. 10
- 6 (a) Explain log based recovery 10
- (b) Explain Hash join algorithm in query processing 10
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[Time: Three Hours]

[Marks:80]

Please check whether you have got the right question paper.

N.B:

1. Question No. 1 is compulsory.
2. Attempt any **three** out of remaining **five** questions.
3. Assumptions made should be clearly stated.
4. Figures to the right indicate full marks.
5. Assume suitable data whenever required but justify that.

- Q1 a) Differentiate between NFA and DFA 5
b) Explain Chomsky Hierarchy 5
c) Explain Rice's Theorem 5
d) Explain Pumping Lemma for CFG 5
- Q2 a) Design FA to check divisibility by 3 to binary number. 10
b) Using Pumping Lemma prove that following language is not regular: $L = \{ 0^m 1^{m+1} \mid m > 0 \}$ 10
- Q3 a) Design Moore Machine to generate output A if string is ending with abb, B if string ending with aba and C otherwise over alphabet (a,b). And Convert it to Mealy machine. 10
b) Simplify the given grammar. $S \rightarrow aAa/bBb/BB \quad A \rightarrow CB \rightarrow A/SC \rightarrow S/\epsilon$. 10
- Q4 a) Construct NFA for Given Regular expressions: 10
i) $(a+b)^*ab$,
ii) $aa(a+b)^*b$,
iii) $aba(a+b)^*$,
iv) $(ab/ba)^*/(aa/bb)^*$
b) Construct PDA accepting the language $L = \{ a^{2n}b^n \mid n > 0 \}$. 10
- Q5 a) Design minimized DFA for accepting strings ending with 100 over alphabet (0,1). 10
b) Design Turing machine to recognize wellformedness of parenthesis. 10
- Q6 Write short note on (any four) 20
a) Greibach Normal form
b) Deterministic PDA and Multistack PDA
c) Variants of Turing Machine
d) Halting Problem
e) Church-Turing Thesis

X

Q.P. Code: 16435

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 justify the same.

1. (a) Compare Raster and Random Scan Techniques [05]
 (b) What are the disadvantages of DDA algorithm? [05]
 (c) Derive the matrix for 2D rotation about an arbitrary point. [05]
 (d) Write a boundary fill procedure to fill 8-connected region. [05]
2. (a) Explain Bresenham's Circle drawing algorithm in detail. [10]
 (b) Derive the transformation matrix to magnify the triangle with vertices A(0,0), B(1,2), C(3,2) to twice its size so that the point C(3,2) remain fixed. [10]
3. (a) Explain Cohen-Sutherland clipping algorithm for line with suitable example. [10]
 (b) Explain Weiler-Atherton algorithm for polygon clipping. What are the advantages over the other polygon clipping algorithm. Explain its working with an example. [10]
4. (a) Define window, viewport and derive window to viewport transformation. [10]
 (b) Differentiate between parallel and perspective projection. Explain with the help of examples. [10]
5. (a) Explain Back Surface Detection method in detail with an example. [10]
 (b) Discuss Halftoning and Dithering techniques. [10]
6. Write a short note on any two of the following [20]
 (a) B-Spline curves.
 (b) 3-D rotation.
 (c) Fractals.

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