

S.G. Sem. IV Computer (R) -  
Analog & digital comm

3015/12

AGJ 1st half (I) 11

Con. 4491-12.

(3 Hours)

GN-8432

[ Total Marks : 100

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

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

1. Explain any four of the following :- 20
  - (a) Thermal noise
  - (b) TDM
  - (c) Concept of Eye Pattern
  - (d) Shannon limit
  - (e) Intersymbol Interference.
  
2. (a) An A.F. signal  $20 \sin(2\pi \times 500t)$  is used to amplitude modulate a carrier of  $50 \sin(2\pi \times 10^5 t)$ . Calculate :- 10
  - (i) Modulation index
  - (ii) Sideband frequencies
  - (iii) Amplitude of each sideband frequency
  - (iv) Bandwidth required
  - (v) Total power delivered into a load of  $600\Omega$ .
- (b) Explain the working of Ratio-detector. Compare its performance with that of Foster-Seeley discriminator. 10
  
3. (a) State and prove the sampling theorem for band pass filters. 10
- (b) Explain PWM modulation and demodulation. 10
  
4. (a) Explain Match filter and optimum receiver. 10
- (b) Consider that the bit sequence given below is to be transmitted. 10

Bit sequence = 10110010

Draw the resulting waveform if the sequence is transmitted using :

  - (i) Unipolar Rz
  - (ii) Polar Rz
  - (iii) AMI
  - (iv) Split phase Manchester
  - (v) M-ary where  $M = 4$ .
  
5. (a) For the following input binary sequence  $b(k) = \{ 1, -1, 1, -1, -1, -1, 1, 1 \}$  find the transmitted phase sequence and sketch the transmitted waveform for QPSK. 10
- (b) Explain block diagram of M-ary PSK and find the Eculidean distance for 8-ary PSK. 10

[ TURN OVER

6. (a) An error control code has the following parity check matrix. 10

$$H = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

- (i) Determine the generator matrix G.
- (ii) Find the codeword that begin with 101
- (iii) Decode the received code word 110110. Comment on error detection capability of this Code.

- (b) Explain :- 10

- (i) Cyclic codes
- (ii) Viterbi Algorithm.

7. Write short notes on any **four** of the following :- 20

- (a) Short Noise
- (b) Image frequency and its rejection
- (c) Quantization
- (d) Superheterodyne receiver
- (e) DEPSK.

21 : 1st half.12-AM(w)

Con. 3577-12.

GN-5543

(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is compulsory.  
 (2) Attempt any four questions out of remaining questions.

1. (a) Construct dual of the following LPP : 5  
 Max  $z = 8x_1 + 3x_2$   
 Subject to  $x_1 - 6x_2 \geq 2$   
 $5x_1 + 7x_2 = -4$ ,  $x_1, x_2 \geq 0$
- (b) Find the orthogonal trajectory of the family of curves given by : 5  
 $2x - x^3 + 3xy^2 = a$
- (c) Evaluate  $\int_c \frac{1}{z} dz$  where c is the upper half of  $|z|=1$ . 5
- (d) Show that every Skew-Hermitian matrix can be expressed in the form  $P + iQ$  5  
 Where P is real Skew-Symmetric and Q is real Symmetric matrix.
2. (a) Determine the analytic function  $f(z)$  where  $u = -r^3 \sin 3\theta$  6
- (b) Show that  $A = \begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$  is derogatory 6
- (c) Use simplex method to solve the LPP Max  $z = 3x_1 + 5x_2 + 4x_3$  subject to the 8  
 constraints  
 $2x_1 + 3x_2 \leq 8$ ,  $2x_2 + 5x_3 \leq 10$   
 $3x_1 + 2x_2 + 4x_3 \leq 15$ ,  $x_1, x_2, x_3 \geq 0$
3. (a) Evaluate  $\int_{-\infty}^{\infty} \frac{x^2 - x + 2}{x^4 + 10x^2 + 9} dx$  using contour integration. 6
- (b) Find Eigen values and Eigen vectors of  $A^3$  where  $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$  6
- (c) Use Penalty method (Big M) to solve Mini  $z = 4x + y$  subject to  $3x + y = 3$ , 8  
 $4x + 3y \geq 6$ ,  $x + 2y \leq 4$ ,  $x, y \geq 0$

4. (a) If  $w = f(z)$  then prove that  $\frac{dw}{dz} = (\cos \theta - i \sin \theta) \frac{\partial w}{\partial r}$  6

(b) If  $A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 3a \\ 2 & 1 & 3b \\ 2 & -2 & 3c \end{bmatrix}$  is orthogonal find  $a, b, c$ . Also find  $A^{-1}$  6

(c) Use Dual Simplex method to solve the LPP 8

Minimise  $z = 6x_1 + 7x_2 + 3x_3 + 5x_4$

subject to  $5x_1 + 6x_2 - 3x_3 + 4x_4 \geq 12$

$$x_2 + 5x_3 - 6x_4 \geq 10$$

$$2x_1 + 5x_2 + x_3 + x_4 \geq 8$$

$$x_1, x_2, x_3, x_4 \geq 0$$

[ TURN OVER

5. (a) If  $A = \begin{bmatrix} -1 & 4 \\ 2 & 1 \end{bmatrix}$  then prove that  $3 \cdot \tan A = A \cdot \tan 3A$  6

(b) Find the image of the line  $y - x + 1 = 0$  under the transformation  $w = \frac{1}{z}$ . Also find the image of the line  $y = x$  under the same transformation. Draw rough sketches. 6

(c) Solve the NLPP using the method of Lagrangian Multipliers. 8

$$\text{Minimize } z = x_1^2 + x_2^2 + x_3^2$$

$$\text{subject to } x_1 + x_2 + 3x_3 = 2, \quad 5x_1 + 2x_2 + x_3 = 5,$$

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

6. (a) Verify Cayley-Hamilton theorem for  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  and hence find  $A^{-1}$ ,  $A^3 - 5A^2$  6

(b) Find the bilinear transformation that maps the points  $\infty, i, 0$  onto the points  $0, i, \infty$ . Find the fixed points. 6

(c) State and prove Cauchy's integral formula and hence evaluate  $\int_c \cot z \, dz$  where 8

$$c \text{ is } \left| z + \frac{1}{z} \right| = \frac{1}{3}$$

7. (a) Obtain two Laurents series for : 6

$$\frac{(z-2)(z+2)}{(z+1)(z+4)}$$

(b) Evaluate  $\int_0^{2\pi} \frac{\cos 2\theta}{1-2a \cos \theta + a^2} d\theta$  using residues. 6

(c) Solve the following N. L. P. P. using Kuhn-Tucker conditions 8

$$\text{Minimise } z = 7x_1^2 + 5x_2^2 - 6x_1$$

$$\text{Subject to } x_1 + 2x_2 \leq 10$$

$$x_1 + 3x_2 \leq 9$$

$$x_1, x_2 \geq 0$$

SEL CMPN1 IV (REV) 21/5/12  
Database Management Systems.

AGJ 1st half (j)-Con-Cod 3

Con. 3796-12.

GN-5537

(3 Hours)

[ Total Marks : 100

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

- Q1. a) Describe the different database users. 5  
b) Define Normalization. Explain 1NF, 2NF with suitable examples. 5  
c) Define Entity Integrity and Referential integrity with examples. 5  
d) What is a schedule? What is a serializable schedule? 5
- Q2 a) Give the advantages of DBMS over File system. 10  
b) Explain in detail log based recovery. 10
- Q3 a) Explain view serializability and Conflict serializability with proper examples. 10  
b) What is a transaction? Discuss ACID properties of a transaction. 10
- Q4 a) Draw an E-R diagram for a university database consisting of 4 entities :- 10  
(i) Student (ii) Class (iii) Department (iv) Faculty  
and convert it to tables.  
• A student has a unique id, the student can enroll for multiple classes and has at-most one major.  
• Faculty must belong to department and faculty can take multiple classes.  
• Every student will get a grade for the class he/she has enrolled.  
b) What do you mean by deadlock? What are the different techniques for deadlock detection and prevention? 10
- Q5 a) Explain insertion of an entry in a B<sup>+</sup> tree 10  
b) Describe the overall architecture of a DBMS with suitable diagram. 10
- Q6 a) For the following given database, write SQL queries :-  
person (driver\_id #, name, address)  
car (license, model, year)  
accident (reportCno, date, location)  
owns (driver\_id #, license)  
participated (drivecid, car, report\_number, damage\_amount)
- (i) Find the total number of people who owned cars that were involved in an accident in 2007.  
(ii) Find the number of accidents in which the cars belonging to "Ajay." were involved. .  
(iii) Find the number of accidents that were reported in Mumbai region in the year 2004.
- b) Explain recovery using Shadow paging. 10

- Q7 a) Explain following relational algebra operations with suitable example :- 10
- (i) Natural Join
  - (ii) Rename
  - (iii) Set Difference
  - (iv) Generalized Projection.
- b) Write a short note on any two: 10
- 1) Constraints of Generalization and Specialization
  - 2) Buffer Management
  - 3) Security and Authorization in DBMS
  - 4) Hashing

- N.B. :** (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **four** out of remaining questions.  
 (3) Assume **suitable** data if **necessary**.  
 (4) **Figures** to the **right** indicate **full** marks.  
 (5) Illustrate answers with diagrams wherever **required**.

- |    |                                                                                                                                                |    |
|----|------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1. | (a) What are the applications of Computer Graphics.                                                                                            | 5  |
|    | (b) Explain frame by frame Animation.                                                                                                          | 5  |
|    | (c) Explain Ray Tracing.                                                                                                                       | 5  |
|    | (d) Explain Antialiasing Techniques.                                                                                                           | 5  |
| 2. | (a) Write Bresenham's line drawing algorithm. Also write mathematical derivations for the same.                                                | 10 |
|    | (b) Explain 4-connected and 8-connected methods. Also explain flood fill and boundary fill algorithms.                                         | 10 |
| 3. | (a) What is segment ? Explain segment table and any four operations which can be performed on segments.                                        | 10 |
|    | (b) Explain Liang Barsky line clipping algorithm.                                                                                              | 10 |
| 4. | (a) Explain Sutherland - Hodgeman polygon clipping algorithm. How Welier - Athorton algorithm solves the problem of concave ploygon clipping ? | 12 |
|    | (b) Describe HSV and RGB color model.                                                                                                          | 8  |
| 5. | (a) Explain the rotation of an object about an arbitrary point. Derive composite matrix for the same.                                          | 10 |
|    | (b) Describe 3D clipping of an object.                                                                                                         | 10 |
| 6. | (a) Explain Painter's Algorithm.                                                                                                               | 10 |
|    | (b) Explain the bezier curve and write the properties of bezier curve.                                                                         | 10 |
| 7. | (a) Explain and compare Phong Shading and Gaurard Shading.                                                                                     | 10 |
|    | (b) Describe diffuse illumination and point-source illumination.                                                                               | 10 |



4/6/2012

SEM-IV (R) - Comp - May 2012  
Analysis of algorithms & design.

1: 1st half-12-(Con-4608)JP

Con. 4608-12.

GN-8795

(3 Hours)

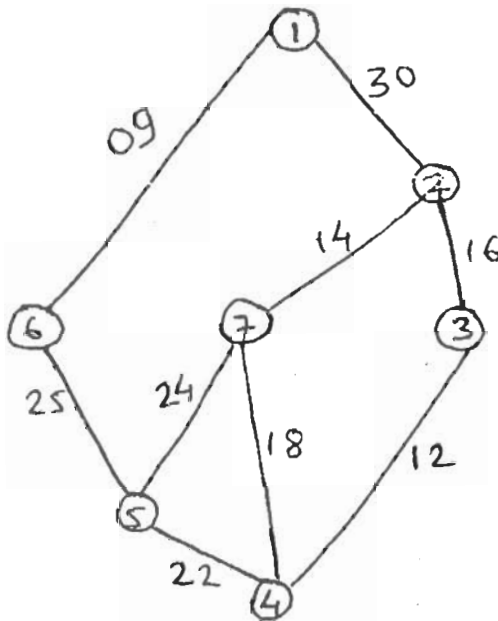
[ Total Marks : 100

- N.B.** (1) Question No. 1 is **compulsory**.  
(2) Attempt any **four** questions from remaining **six** questions.  
(3) Assumption made should be **clearly** stated.  
(4) Assume **suitable** data whenever **required**.

1. (a) Explain Big-oh, Omega and Theta Notations with help of example. How do we analyse and measure time and space complexity of algorithms? **10**  
(b) Construct the Optimal Binary Search Tree for the identifier set **10**  
( $a_1, a_2, a_3, a_4$ ) = (cout, float, if, while).

$$\text{with } P(1:4) = \left( \frac{1}{20}, \frac{1}{5}, \frac{1}{10}, \frac{1}{20} \right) \text{ and } q(0:4) = \left( \frac{1}{5}, \frac{1}{10}, \frac{1}{5}, \frac{1}{20}, \frac{1}{20} \right).$$

2. (a) Explain Flow Shop Scheduling with help of suitable examples. **10**  
(b) Write down Prim's Algorithm and solve following problem :— **10**



3. (a) Write Randomized Quick Sort Algorithm and explain with help of example. **10**  
(b) Explain 0/1 Knapsack problem using Branch and Bound Method. **10**

[ TURN OVER

**Con. 4608–GN–8795–12.**

2

4. (a) Describe Traveling Salesperson Problem. Explain how to solve using Branch and Bound Method. **10**  
(b) Write algorithm of Sum of Subsets. Solve following problem and draw portion of state space tree. **10**  
 $w = \{5, 7, 10, 12, 15, 18, 20\}$  and  $m = 35$ . Find all possible subsets of  $w$  that sum to  $m$ .
5. (a) Explain Strassen's Matrix multiplication and derived its time complexity. **10**  
(b) Write down Knuth-Morris-Pratt Algorithm. **10**
6. (a) Write algorithm of Job Sequencing with Deadlines. Solve the following problem **10**  
 $n = 5$ .  
 $(P_1, P_2, P_3, P_4, P_5) = (20, 15, 10, 5, 1)$  and  
 $(d_1, d_2, d_3, d_4, d_5) = (2, 2, 1, 3, 3)$ .  
(b) Explain Hamiltonian Cycles Algorithm, and draw static space tree. **10**
7. Write short notes on (Any four) :— **20**  
(a) Tries  
(b) Randomized Algorithm  
(c) N-Queens Problem  
(d) Bellman and Ford Algorithm  
(e) Optimal Storage on Tapes.
-

- N.B (1) Question No.1 is compulsory  
(2) Answer any four out of remaining six questions.

- 1.a) What is an operating system? Discuss various characteristics of modern operating Systems. 10  
b) Explain the role of PCB? Discuss why are two modes of execution needed. 10
- 2.a) Explain different system calls of O.S. Differentiate monolithic and layered structure of O.S. 10  
b) What is deadlock? Explain various deadlock prevention techniques. 10
- 3.a) Consider the following set of processes with the length of the CPU burst time given in milliseconds :

Process	Burst time(ms)	Arrival time (ms)	Priority
P1	24	0	5
P2	7	3	3
P3	6	5	2
P4	10	10	1

- i) Draw the Gantt Chart for FCFS, SJF, Priority (preemptive), Round robin(quantum=4) scheduling. 4  
Note: A smaller priority number implies higher priority.
- ii) Calculate average waiting time for each of the above algorithms. 4  
iii) Calculate average turnaround time for each of the above algorithms. 4
- b) Explain how a readers/writers problem can be solved using semaphores. 8
- 4.a) Explain paging in detail. Describe how logical address is converted into physical address. 10  
b) Explain the following page replacement algorithms : 10  
i) FIFO ii) LRU iii) OPT

5.a) Explain file allocation in detail.

10

b) Consider the following snapshot of a system .

Processes	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Apply Banker's Algorithm and

- i) Calculate the need matrix . ( 03 marks)
- ii) Is the system in a safe state ? ( 03 marks)
- iii) If a request from process P1 (0, 4, 2,0) arrives , then can the request be granted . ( 04 marks)

6.a) Explain different techniques of disk scheduling .

10

b) Explain how memory management takes place in linux.

10

7.a) Write short notes on:

20

- i) I/O Buffering
- ii) Unix File system
- iii) Mobile OS
- iv) Process and Thread Management in windows