SE | sem - IV | INFT | C-2019 | Dec. 2023

Time: 3 hrs **Marks: 80**

Note :

1) **Q. No. 01 is compulsory.**
2) **Solve any three from Q. No. 02 to 06.**
3) **Numbers to the right indicate full marks.**
4) **Use of statistical tables is allowed.**

Q.1. Solve.

a) If $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ find the sum and product of Eigen values A. 5

b) Integrate the function $f(z) = z^2$ from A(0, 0) to B(1, 1) along straight line AB. 5

c) Find the Z-Transform of $(k) = a^k$, k < 0. 5

d) A transmission channel has a per-digit error probability p = 0.01. Calculate the probability of more than 1 error in 10 received digits using Poisson distribution. 5

Q.2.

a) Find the Eigenvalues and Eigenvectors of the matrix $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$. 6

b) Find the Z-Transform of $\text{Cos}\left(\frac{k\pi}{4} + \alpha\right)$ $k \geq 0$. 6

c) Use the dual simplex method to solve the LPP
Min.. $Z = 2X_1 + 2X_2 + 4X_3$
$2X_1 + 3X_2 + 5X_3 \geq 2$, $3X_1 + X_2 + 7X_3 \leq 3$, $X_1 + 4X_2 + 6X_3 \leq 5$ $X_1, X_2, X_3 \geq 0$ 8

Q.3.

a) Evaluate $\int_C \frac{z^2}{(z-1)(z-2)} dz$ Where C is a circle $|z - 1| = 1$. 6

b) Verify Caley-Hamilton theorem and hence find A^{-1} and A^4 where $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$. 6

c) Solve the LPP by Big -M method
Maximize $Z = 3X_1 - 2X_2$
subject to $2X_1 + X_2 \leq 2$, $X_1 + 3 \geq 3$, $X_1, X_2, \geq 0$. 8

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Q. 4.

a) Find inverse Z transform of $F(z) = \frac{1}{(z-1)(z-3)}$ for i) $|z| < 1$, ii) $1 < |z| < 3$. 6

b) The following data represent the marks obtained by 12 students in two tests, one held before the coaching and the other after the coaching. 6

Test I : 55, 60, 65, 75, 49, 25, 18, 30, 35, 51, 61, 72.

Test II : 63, 70, 70, 81, 54, 29, 21, 38, 32, 50, 70, 80.

Do the data indicate that the coaching was effective in improving the performance of the students?

c) Find all possible Laurent's series expansions of the function $f(z) = \frac{1}{(z-1)(z+2)}$ about $z = 0$ indicating the region of convergence in each case. 8

Q. 5.

a) Determine all basic solutions to the following problem 6

Max. $Z = x_1 - 2x_2 + 4x_3$

$x_1 + 2x_2 + 3x_3 = 7$, $3x_1 + 4x_2 + 6x_3 = 15$, $x_1, x_2, x_3 \geq 0$.

b) Using Normal distribution, find the probability of getting 55 heads in the toss of 100 fair coins. 6

c) Solve the NLPP 8

Optimize $Z = 10x_1 + 8x_2 + 6x_3 + 2{x_1}^2 + {x_2}^2 + 3{x_3}^2 - 100$

Subject to $x_1 + x_2 + x_3 = 20$, $x_1, x_2, x_3 \geq 0$

Q. 6.

a) Show that the given matrix is diagonalizable and hence find diagonal form and transforming matrix where $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$. 6

b) Of the 64 off springs of a certain cross between guinea pigs 34 were red, 10 were black and 20 were white. According to the generic model these numbers should be in the ratio 9 : 3 : 4. Use 2- test to check whether the data are consistent with the model. 6

c) Max. $Z = 4x_1 + 6x_2 - {x_1}^2 - {x_2}^2 - {x_3}^2$, Subject to $x_1 + x_2 \leq 2$ and $2x_1 + 3x_2 \leq 12$, $x_1, x_2 \geq 0$ by K-T condition. 8

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

N.B.: **(1) Question No.1 is compulsory.**
(2) Attempt any three questions from the remaining five questions.
(3) Make suitable assumptions wherever necessary but justify your assumptions.

Q.1. a. Compare Bus and Star topology 05 M
b. List the internetworking devices and explain any one 05 M
c. Explain RLE with an example 05 M
d. Draw the UDP Header with its fields. 05 M

Q.2.a. Draw and explain the OSI model briefly. 10 M
Q.2. b. Compare the switching technologies 10 M

Q.3.a. Explain the Sliding Window Protocol with suitable diagrams 10 M
Q.3.b. Draw and explain the Fiber Optic Media and compare it with Twisted Pair 10 M

Q.4.a. What is controlled media access? Explain the controlled media access techniques. 10 M
Q.4.b. Draw the IPv4 Header and explain the header format. 10 M

Q.5.a. Compare TCP/IP and OSI 10 M
Q.5.b. Explain the distance vector routing with an example. 10 M

Q.6.Write a short note on (Any Two) 20 M
a. Leaky bucket
b. SMTP
c. VLAN
d. Image Compression Techniques

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Time: 3 Hours Max. Marks: 80

N.B.: 1) Question No.1 is **compulsory**.
2) Attempt any **THREE** questions out of remaining **FIVE** questions.
3) **Figures** to the **right** indicates **full** marks.
4) Assume suitable data if **necessary**.

Q1	**Answer any FOUR**	20
a	Explain memory fragmentation.	
b	Compare process scheduling and process switching.	
c	Describe the implementation of file allocation techniques?	
d	Explain process state model.	
e	Explain about IPC.	
Q.2		
a	Explain RAID with different levels.	10
b	What is a process? Explain Process control block in detail.	10
Q.3		
a	What are different types of process scheduling algorithms? Explain anyone scheduling algorithm with example.	10
b	What is a critical region? Explain necessary conditions for deadlock.	10
Q.4		
a	Give detail comparison of user level and kernel level threads.	10
b	What is an Operating System? Explain structure of Operating System.	10
Q.5		
a	Explain objectives and characteristics of modern operating system. Explain Network OS.	10
b	List page replacement algorithms? Explain anyone page replacement algorithms with example.	10
Q.6	**Write short notes on any FOUR**	20
a	Deadlock recovery	
b	Real Time OS	
c	Semaphores	
d	Virtual Memory	
e	Android	
f	File Allocation Methods	

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(3 Hours) [Marks: 80]

N.B.: 1) All Question carry equal Marks.
2) Solve any Four from the six questions.
3) Assume suitable data if necessary.
4) Figures to the right indicate full marks.

Q.1) Answer the following questions:

a) Define the following terms and give an example of each: Automata, String, Language, Alphabet, Grammar [05]

a) What are the limitations of Finite Automata? [05]

b) What do you mean by ambiguous grammar? [05]

c) Design Turing Machine to add two unary numbers. [05]

Q.2) a) I) Describe the language of the following regular expressions as concisely as possible. [05]

i. 1(0+1)*0

ii. (aa)*(bb)*(b)

iii. (ab+ba)*

iv. (A-Z) (a-z) *(a+e+i+o+u)

v. (a-z) (a-z | 0-9)*

II) Write down the regular expression for the following language. [05]

i. L is a language for all strings over {0,1} having an odd number of 1s and any number of 0s.

ii. L is language for all strings over {0,1} having number of 10 or 11

b) What is a compiler? Describe the different phases of a compiler. [10]

Q.3) a) Design Push Down Automata (PDA) for the language [10]

$L=\{a^n ba^{2n} | n \geq 0\}$

b) What do you mean by Deterministic Finite Automata (DFA)? [10]

Design DFA for the language defined over $\sum\{0, 1\}$ and consists of the strings ending with 10.

Q.4) a) Consider the grammar $S \rightarrow 0S0 \mid 1S1 \mid SS \mid \lambda$. [10]

Given the string 0101101110, find a leftmost and rightmost derivations with corresponding parse trees.

Paper / Subject Code: 41025 / Computer Organization & Architecture

SE/Sem-IV/INFT/C-2019/Dec-2023

Time: 3 Hours **Max Marks:80**

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

Q. 1. Solve **any four** out of five. **(4*5=20)**

a. With the help of a diagram, explain Von-Neumann's architecture.

b. Explain the working of SR flip-flop.

c. Convert $(-28.125)_{10}$ in the IEEE 754 double precision standard.

d. Describe the six stage instruction pipeline.

e. Compare SRAM and DRAM.

Q. 2. a) Draw the flowchart of Booth's Algorithm and multiply (-7) and (6) using the same. **(10)**

b) Explain Multiplexer and Demultiplexer with one example. **(10)**

Q. 3. a) Reduce given Boolean expression using K-Map method.

$f(A,B,C,D) = \sum (0, 2, 3, 4, 5, 8, 9, 10, 12, 14, 15)$ **(10)**

b) Write an assembly language program for an 8086 microprocessor to find the largest of given ten, 8 bit binary numbers. **(10)**

Q. 4. a) Compare Direct and Set associative cache mapping techniques in detail. **(10)**

b) Discuss various pipeline hazards with example. **(10)**

Q. 5. a) Discuss the various characteristics of Memory. **(10)**

b) Explain design of control unit w.r.t. microprogrammed and hardwired approach. **(10)**

Q. 6. a) Explain different addressing modes of 8086 microprocessors with examples. **(10)**

b) Discuss the need of DMA and explain its various techniques of data transfer. **(10)**

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