Knowledge Resource & Relay Centre (KRRC)

AIKTC/KRRC/SoET/ACKN/QUES/2022-23/   Date: 25/01/23

School: **SoET-REV. C-Scheme**   Branch: **COMP. ENGG.**   SEM: **IV**

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format SC	Format HC	No. of Copies
1	Engineering Mathematics-IV	CSC401		✓	
2	Analysis Of Algorithms	CSC402		✓	
3	Database Management System	CSC403		✓	
4	Operating System	CSC404		✓	
5	Microprocessor	CSC405		✓	

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

8/12/22

CO-R-19

Sem-IV- CBCS-19- KT

(Time: 3 hours)   Max. Marks: 80

N.B.   (1) Question No. 1 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.

Q1 a) If $A = \begin{bmatrix} 2 & 4 \\ 0 & 3 \end{bmatrix}$ then find the Eigen values of $A^3 + 6A^{-1} + 2I$ [5]

b) Evaluate $\int_0^{1+i}(x^2 + iy)\,dz$,along the path $(i)\,y = x$, $(ii)\,y = x^2$ [5]

c) Write the dual of the following problem   [5]

Maximise $z = 3x_1 + 10x_2 + 2x_3$

subject to $2x_1 + 3x_2 + 2x_3 \le 8$

$3x_1 - 2x_2 + 4x_3 = 4$

$x_1, x_2, x_3 \ge 0$

d) A certain drug administered to 12 patients resulted in the following change in their Blood Pressure

5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4   [5]

Can we conclude that drug increase the Blood Pressure?

Q2 (a) Using Cauchy's residue theorem evaluate   [6]

$\int_C \frac{1-2z}{z(z-1)(z-2)}\,dz$, Where c is |z|=1.5

(b) Verify Cayley-Hamilton theorem and find A^{-1} for $A = \begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$. Hence, find $2A^3 - A^2 - 35A - 44I$.   [6]

(c) Solve by Simplex Method   [8]

Maximise $z = 4x_1 + 10x_2$

Subject to $2x_1 + x_2 \le 50$

$2x_1 + 5x_2 \le 100$

$2x_1 + 3x_2 \le 90$

$x_1, x_2 \ge 0$

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Q3 a) Based on the following data determine if there is a relation between literacy and smoking

[6]

	Smokers	Non-smokers
Literates	83	57
Illiterates	45	68

(Given that Critical value of chi-square 1 d. f and 5% L.O.S is 3.841

b) Obtain Laurent's series expansion of $f(z) = \frac{1}{z^2+4z+3}$ [6]

when $(i)\ |z| < 1 \quad (ii)\ 1 < |z| < 3 \quad (ii)\ |z| > 3$

c) Using the method of Lagrangian multipliers solve the following N.L.P.P [8]

Optimise $\qquad z = x_1{}^2 + x_2{}^2 + x_3^2$

$\quad$ Subject to $\qquad x_1 + x_2 + 3x_3 = 2$

$$5x_1 + 2x_2 + x_3 = 5$$

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

Q4a) Using the method of Lagrange's multipliers solve the following N.L.P.P [6]

Optimise $z = x_1{}^2 + x_2{}^2 + x_3{}^2 - 10x_1 - 6x_2 - 4x_3$

$\qquad$ Subject to $\qquad x_1 + x_2 + x_3 = 7$

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

b) Find the inverse Z-transform of $\frac{1}{z^2-3z+2}$, *if ROC is* $(i)\quad |z| < 1 \quad (ii)\ |z| > 2$ [6]

c) Show that the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ is diagonalizable. Find the transforming matrix and the diagonal matrix. [8]

Q5a) Find $Z\{f(k) * g(k)\}$ *if* $f(k) = \left(\frac{1}{2}\right)^k$, $g(k) = \cos\pi k$ [6]

b) Find the Eigen values and Eigen Vectors of the following matrix. [6]

$$A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$$

c) Solve by the dual Simplex Method [8]

Minimise $z = x_1 + x_2$

Subject to $\quad 2x_1 + x_2 \geq 2$

$\qquad\qquad -x_1 - x_2 \geq 1$

$\qquad\qquad x_1, x_2 \geq 0$

Q6a) Find $Z\{2^k \cos(3k + 2)\}, k \geq 0.$ [6]

b) If the heights of 500 students is normally distributed with mean 68 inches and standard deviation 4 inches, estimate the number of students having heights (i) greater than 72 inches

(ii) less than 62 inches (iii) between 65 and 71 inches [6]

c) Using Kuhn Tucker conditions, solve the following NLPP [8]

Maximise $\qquad z = 2x_1{}^2 - 7x_2{}^2 + 12x_1x_2$

Subject to $\quad 2x_1 + 5x_2 \leq 98$

$\qquad\qquad x_1, x_2 \geq 0$

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11991

Sem-IV- CBCS-19- KT

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

N.B: (1) Question No. 1 is compulsory.
     (2) Attempt any three from the remaining questions.
     (3) Figures to the right indicate full marks.

1. Attempt any four
   (a) Explain Best Case, Average Case and Worst Case.   **(05)**
   (b) Explain Multistage graphs.   **(05)**
   (c) Explain Binary search algorithm.   **(05)**
   (d) Define NP Class, NP hard, NP complete.   **(05)**
   (e) What is greedy algorithm?   **(05)**

2.
   (a) Write and explain sum of subset algorithm for n=5, W= {2,7,8,9,15}, M=17.
                                                                          (10)
   (b) Obtain the solution to the following knapsack problem using Greedy method: n=7, m=15
   (p1,p2.....p7) = (10,5,15,7,6,18,3), (w1,w2,.....,w7) = (2,3, 5,7,1,4,1).   **(10)**

3.
   (a) What is the Longest Common Subsequence problem? Find the LCS for following strings
                                                                          (10)

                     String 1- ACBAED
                     String 2- ABCABE
   (b) Explain quick sort with algorithm and example.   **(10)**

4.
   (a)What is Knuth Morris Pratt Method of Pattern Matching? Give Examples.
                                                                          (10)
   (b) Solve the following Recurrence using Substitution Method.   **(10)**

$$T(n) = \begin{cases} 1, & \text{if } n=1 \\ 2\,T(n/2) + Cn, & \text{if } n>1 \end{cases}$$

5.
   (a) Find the Dijkstra's shortest path from vertex 1 to vertex 4 for the following graph.
                                                                          (10)
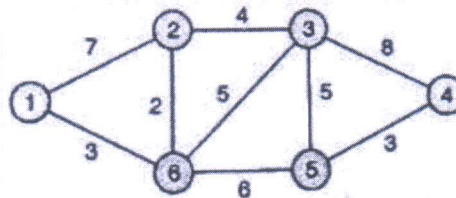
   (b) Apply Merge sort algorithm to sort the following numbers. Show each step clearly. 10, 5, 7, 6, 1, 4, 8, 3, 2, 9.   **(10)**

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

   (a) Find Minimum and Maximum elements of an array X[0 : 9] = (45, 83, 75, 17, 43, 37, 80, 53, 61, 22) using divide and conquer strategy.
   (b) Naïve string matching algorithm with example.
   (c) N-queen problem algorithm with example.

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Sem - IV - CBCS-18 - KT

[Time: 3 Hours]   [Marks:80]

Instructions

(1) Q.1 is Compulsory.
(2) Solve any three from remaining questions.
(3) Draw neat diagrams whenever necessary.

Q.1 a) What is data abstraction and data independence.   (10)
    b) Draw Extended E-R diagram for Hospital Management System.   (10)

Q.2   a) Explain types of joins with suitable example.   (10)
      b) Write SQL expression for the following queries
   Consider Employee relation (Emp_no, Emp_name,Emp_add, ph_no,email_id,salary)
   i)   List the employee whose employee number is 100.
   ii)   List the Employee whose salary is between 50 K to 1 Lac.
   iii)   List the Employees whose name starts with 'Ami'.
   iv)   Find 2nd highest salary of Employees.
   v)   Create two views on employee table.   (10)

Q.3 a) Explain any five relational algebra operators with suitable example.   (10)
    b) Define deadlock and Explain deadlock handling.   (10)

Q.4 a) What is 2PL. Exapain its types.   (10)
    b) What is Trigger. Explain with Syntax and example.   (10)

Q.5 a) Explain view and conflict serializability with suitable example.   (10)
    b) What is normalization. Explain 1NF,2NF,3NF with suitable example.   (10)

Q.6   Write note on any two   (20)
      a) ACID properties of transaction with example.
      b) Transaction state diagram and explain TCL commands
      c) Types of users in DBMS.

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CO (R-19)

Duration: 3hrs   Sem-IV - CBCS - KT   [Max Marks: 80]

16/12/22

N.B.: (1) Question No 1 is Compulsory.
        (2) Attempt any three questions out of the remaining five.
        (3) All questions carry equal marks.
        (4) Assume suitable data, if required and state it clearly.

1		Attempt any FOUR	[20]
	a	What is an Operating System? Explain its basic functions	
	b	Explain in brief the types of CPU schedulers with a diagram.	
	c	Define Thread. Mention benefits of Multithreading	
	d	What is a Deadlock? Explain the necessary conditions for a deadlock to take place.	
	e	Explain MFT with an example.	
2	a	Discuss various CPU scheduling criteria	[10]
	b	Explain concept of Paging with an example.	[10]
3	a	Explain File Allocation methods in detail.	[10]
	b	Explain the Five-State Process State Transition Diagram	[10]
4	a	What is Deadlock Avoidance? Explain the algorithm with an example	[10]
	b	Suppose the following disk request sequence (track numbers) for a disk with 100 tracks is given as :45, 20, 90, 10, 50, 60, 80, 25, 70. Assume that initial head position of the R/W head is on track 50. Count the additional distance that will be traversed by the head when SSTF algorithm is used as compared to the SCAN algorithm (assuming SCAN moves towards 100 when it starts execution).	[10]
5	a	Explain Round Robin Algorithm with a suitable example	[10]
	b	Explain difference between External fragmentation and Internal Fragmentation. How to solve the fragmentation problem using Paging?	[10]
6	a	Explain the Critical Section Problem. Explain the Hardware solution proposed to achieve the same	[10]
	b	Consider the following snapshot of the system.	[10]

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

  i.   Determine the total number of instances of each type A, B, C, D   (2M)
  ii.   Find the content of the Need Matrix   (2M)
  iii. Determine if the system is in Safe State. If so, find the Safe Sequence   (6M)

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19/12/22

50 pm.

CO (R-19)

Sem-IV-CBCS-K-T

Duration: 3hrs   [Max Marks:80]

N.B. : (1) Question No 1 is Compulsory.
     (2) Attempt any three questions out of the remaining five.
     (3) All questions carry equal marks.
     (4) Assume suitable data, if required and state it clearly.

1   Attempt **any FOUR**   [20]

  a Explain the Floating point Pipeline of Pentium Processor.

  b What is the advantage of Memory Banking in 8086 Processor?Justify with example.

  c Write an assembly language program for searching a Character in a Given String.(Consider your own String)

  d Explain the following instructions: XLAT, DAA,LAHF,AAA related to 8086.

  e Differentiate between real Mode , Virtual Mode and Protected Mode of 80386 Processor.

2 a Draw and explain write operation Timing diagram of 8086 Processor in Maximum mode. [10]

  b Draw and Explain the Master Slave Mode of 8259 Processor with Suitable example. Consider Slave 8259 connected to IR0 and IR4 of master. [10]

3 a Design 8086 microprocessor-based on following Specifications: [10]
      1. MP 8086 working at 10MHz minimum mode.
      2. 64 KB ROM using 16KB Devices
      3. 32KB RAM using 16KB chips

  b Explain Mode 2 of 8255 with a neat block diagram. Show the CWR initialization. [10]

4 a Explain the 8257 DMA controller with the help of neat diagram and explain its Control Register Format. [10]

  b Write an ALP for 8086 to arrange 10 numbers in ascending order.. [10]

5 a Explain the segment descriptor of 80386 processor. [10]

  b Explain the EFLAG REGISTER of 80386 Processor. [10]

6 a Explain the interrupt structure of 8086 processor. [10]

  b Explain the Branch Prediction Mechanism of Pentium Processor. [10]

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