

R20

MCA I SEM

REGULAR & SUPPLEMENTARY EXAMINATIONS

MARCH 2024



Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R20MCA101

MCA - I Semester Regular & Supple Examinations, March-2024

C PROGRAMMING AND DATA STRUCTURES

Time: 3 hours

Max Marks: 60

Question Paper Consists of **Part-A** and **Part-B**

Answering the question in **Part-A** is Compulsory Four Questions should be answered from Part-B

PART-A

- Write a C program to swap two numbers without using third variable.
- Write the difference between break and continue with appropriate example.
- Illustrate command line argument with simple example.
- Write the difference between structure and union with simple example.
- Define the terms space and time complexity.
- Write the difference between BFS and DFS.

[2+2+2+2+2+2]

PART-B

4X 12 = 48

- Illustrate type conversion in C with appropriate example. Also explain the precedence and order of evaluation.
 - Write a C program to accept an integer number and print the digits using words (for example 123 is printed as One Two Three).
- Write a C program to calculate m^n value using 'for', 'while' and 'do-while' loop.
 - Explain the following string handling functions with appropriate code:
(i) strcpy() (ii) strlen() (iii) strcat()
- What are different parameter passing mechanisms exists in C? Explain each method with an example program.
 - Define dynamic memory allocation. Write about the different dynamic memory allocation functions in C with appropriate examples.
- What are the different ways to access the members of structure elements in C. Give example for each case.
 - Write a C program that reads contents of a file and displays them in capital letters if the content is alphabet.
- Explain Binary Search and compare with the linear search.
 - Develop a program to merge two sorted arrays into a single sorted array and trace it with an example.
- The seven elements A, B, C, D, E, F and G are pushed onto a stack in reverse order, i.e., starting from G. The stack is popped five times and each element is inserted into a queue. Two elements are deleted from the queue and pushed back onto the stack. Now, one element is popped from the stack. What is that element? Explain the total process with diagrams and finally write top, front, rear values.
 - Define Binary Tree. Explain the properties and memory representation of a Binary tree.



Subject Code: R20MCA102

MCA - I Semester Regular and Supple Examinations, March-2024

COMPUTER ORGANIZATION

Time: 3 hours

Max Marks: 60M

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory
Four Questions should be answered from **Part-B**

PART-A

1. (a) What are 2's complement and 9's complement of a numbers? Give examples
- (b) Distinguish between canonical and standard forms by giving an example
- (c) What are the advantages of stack memory
- (d) Give example for left and right shift operations
- (e) Differentiate Micro programmed control and Hardwired control
- (f) Write the advantages of DMA

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PART-B

4X 12 = 48

2. (a) Explain different functional units of a digital computer with neat sketch.
(b) Obtain the simplified expression in POS (product of sums) of $F(w,x,y,z)=\pi(1,2,4,7,12,14,15)$ using K-maps.
3. (a) Define a multiplexer? Draw a 4:1 multiplexer for the function $f(a,b,c,d)=\Sigma(0,4,5,10,11,12,15)$
(b) Design a full-adder with two half-adders with neat sketch
4. (a) Explain memory reference instructions with an example each
(b) Explain the addressing modes
5. (a) Distinguish between circular shift and arithmetic shift with proper example
(b) Explain the following with respect to logic micro operations
i) Selective Set ii) Selective Complement iii) Selective Clear
6. (a) Explain the sub routines in address sequencing
(b) Explain the organizations of micro programmed control unit with neat sketch
7. (a) Explain about asynchronous data transfer and asynchronous communication interface.
(b) Distinguish the following mapping functions
i) Associative mapping. ii) Direct mapping



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Subject Code: R20MCA103

MCA - I Semester Regular & Suppl. Examinations, March 2024.

DATA BASE MANAGEMENT SYSTEMS

Time: 3 hours

Max Marks: 60M

Question Paper Consists of Part-A and Part-B
Answering the question in Part-A is Compulsory
Four Questions should be answered from Part-B

PART-A

1. (a) Differences between the file system and database management system.
(b) What is an unsafe query? Give an example for it.
(c) Find Candidate key of given Functional Dependency, $R = ABCDE, F = (A \rightarrow BE, C \rightarrow BE, B \rightarrow D)$.
(d) Provide the relative merits of lock upgrades and lock downgrades.
(e) What SQL commands support index creation?
(f) Why are tree-structured indexes good for searches, especially range selections?

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PART-B

4X 12 = 48

2. (a) With neat sketch, explain the two tier and three tier architectures of Database Management System.
(b) A company database needs to store information about employees (identified by *ssn*, with *salary* and *phone* as attributes); departments (identified by *dno*, with *dname* and *budget* as attributes); and children of employees (with *name* and *age* as attributes). Employees work in departments; each department is managed by an employee; a child must be identified uniquely by *name* when the parent (who is an employee; assume that only one parent works for the company) is known. We are not interested in information about a child once the parent leaves the company. Draw an ER diagram that captures this information.
3. (a) Define all the variations of the Join operation. Why is the join operation given special attention? Cannot we express every join operation in terms of cross-product, selection, and projection?
(b) What are nested queries? What is correlation in nested queries? How would you use the operators IN, EXISTS, UNIQUE, ANY, and ALL in writing nested queries? Why are they useful?
4. (a) Explain about the third normal form with example.
(b) Check whether the below given Student table is in 3NF or not
Student(sid, sname, deptname, age)
Sid, sname -> deptname
Deptname -> age

5. (a) What is a locking protocol? Describe the Strict Two-Phase Locking (STTwoPL) protocol. What can you say about the schedules allowed by this protocol?
(b) What are loser transactions? How are they processed in the Undo phase and in what order? Explain your answer.

6. (a) How is data organized in a hash-based index? When would you use a hash-based index? Explain your answer.

- (b) What is a disk block or page? How are blocks arranged in a disk? How does this affect the time to access a block? Discuss seek time, rotational delay, and transfer time.

7. (a) Describe the B+ tree insertion algorithm and explain how it eliminates overflow pages. Under what conditions can an insert increase the height of the tree?

- (b) What are collisions? Why do we need overflow pages to handle them?



Subject Code: R20MCA104

MCA - I Semester Regular & Supple Examinations, March-2024
OPERATING SYSTEMS

Time: 3 hours

Max Marks: 60M

Question Paper Consists of **Part-A** and **Part-B**

Answering the question in **Part-A** is Compulsory, Four Questions should be answered from Part-B

PART-A

1. (a) What is system call?
- (b) Distinguish process and thread.
- (c) What is Belady Anomaly?
- (d) What is Semaphore?
- (e) What is Copy-on-Write ?
- (f) What are the goals of protection?

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PART-B

4X 12 = 48

2. (a) Explain operating system services.
- (b) Distinguish distributed systems and real time systems .
3. (a) Explain Interprocess communication using client server systems.
- (b) Explain multi threading models.
4. (a) Explain criteria for CPU Scheduling.
- (b) Explain SJF and Round Robin CPU Scheduling algorithms with example.
5. (a) What is critical section ? Explain.
- (b) Explain Critical Section solution for Reader-Writer problem.
6. (a) Explain FIFO and LRU page replacement algorithms.
- (b) Explain file allocation methods.
7. (a) Explain any **ONE** disk scheduling algorithm with example
- (b) Write short notes on any two of the following:
 - (i) Protection
 - (ii) Security
 - (iii) RAID structures



Subject Code: R20MCA105

MCA - I Semester Regular & Supple Examinations, March-2024
MATHEMATICAL AND STATISTICAL FOUNDATIONS

Time: 3 hours

Max Marks: 60M

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory
Four Questions should be answered from Part-B

PART-A

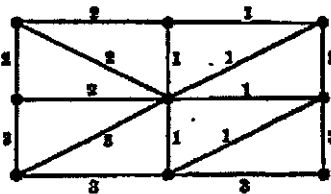
1. (a) Find the conjunction of the propositions p and q where p is the proposition "Today is Friday" and q is the proposition "It is raining today."
- (b) Find the coefficient of X^{23} in the $(1 + X^5 + X^9)^{10}$.
- (c) Define Euler's Path and Euler Circuit.
- (d) Write the samples of size two from the population 4, 8, 12 and 16 without replacement.
- (e) Explain the terms Null Hypothesis and Alternate Hypothesis.
- (f) Explain difference between one way ANOVA and Two way ANOVA?

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PART-B

4X 12 = 48

2. (a) Use truth tables to verify the associative laws $(p \vee q) \vee r \Leftrightarrow p \vee (q \vee r)$. (6M)
- (b) Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction. (6M)
3. (a) Find a general expression for a_n using generating functions $a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0, n \geq 3$. (6M)
- (b) Find all solutions of the recurrence relation $a_n = 3a_{n-1} + 2n$. What is the solution with $a_1 = 3$? (6M)
4. (a) Construct the minimum spanning tree for the following graph using Prim's algorithm. (6M)



- (b) Give an example graph which is Hamiltonian but not Eulerian. (6M)
5. A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size 2 that can be drawn with replacement from this population. Find (a) The mean of the population. (b) The standard deviation of the population. (c) The mean of the sampling distribution of means and (d) The standard deviation of the sampling distribution of means. (12M)
6. (a) A company claims that its light bulbs are superior to those of its mail competitor. A study showed that a sample of 40 of its bulbs had a mean life of 647 hrs with a standard deviation of 27 hrs. Another sample of 40 of its bulbs had a mean life of 638 hrs with a standard deviation of 31 hrs Test the claim at .05 level. (6M)

- (b) In a large city 12 out of a random sample of 400 men were found to be drunkards. After the heavy increase in tax on intoxicants another random sample of 200 men in the same city included 8 drunkards. Was the observation decrease in the proportion of drunkards, after the increase of tax. **(6M)**
7. (a) In one sample of 10 observations, the sum of the squares of the deviations of the sample values from sample mean was 120 and in the other sample of 12 observations, it was 314, test whether the difference is significant at 5% level. **(6M)**
- (b) The following table gives the classification of 100 work according to sex and nature of work. Test whether the nature of work is independent of the sex of the worker. **(6M)**

	Stable	Unstable	Total
Males	40	20	60
Females	10	30	40
	50	50	100
