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Paper Id: 236321

Sub Code: RCAI-401
Roll No. 2100050060020

MCA - INT
(SEM IV) THEORY EXAMINATION 2022-23
COMPUTER BASED STATISTICAL TECHNIQUES

Time: 3 Hours *Total Marks: 70*

Note: Attempt all sections. If require any missing data, then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

(a) Explain the floating-point representation of numbers.

(b) Solve the following

$$(E^{1/2}+E^{-1/2})(1+\Delta)^{1/2} = 2 + \Delta$$

(c) Write down algorithm to compute trapezoidal formula.

(d) Describe Picard formula for solving ordinary differential equation.

(e) What is the principle of least square for curve fitting?

(f) Evaluate the relative error of the number 8.6 if both of its digits are correct.

(g) Differentiate between T test and F test.

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

(a) Find the rate of convergence of Regula Falsi Method .

(b) Using Gauss backward interpolation formula, analyze the population for the year 1936 given that

Year	1901	1911	1921	1931	1941	1951
Population in(Thousand)	12	15	20	27	39	52

(c) A train is moving at the speed of 30m/ sec. Suddenly brakes are applied. The speed of the train per second after t seconds is given by

Time (t) :	0	5	10	15	20	25	30	35	40	45
Speed (v):	30	24	19	16	13	11	10	8	7	5

Analyze Simpson's $3/8^{th}$ rule to determine the distance moved by the train in 45 seconds

(d) Solve the equation $y'=x^2+y$, $y(0)=1$. Evaluate the value of $y(0.02)$ and $y(0.04)$ by Euler's modified method correct up to 4 decimal places.

(e) Define the following term :
(i) degree of freedom
(ii) steps involved in testing of hypothesis

SECTION C

3. **Attempt any *one* part of the following:** 7 x 1 = 7

(a) Evaluate the root of F(x) = x- cosx in the interval [0,1] using Bisection method. The root should be correct to four decimal places.

(b) Analyze the root of equation $F(x) = x\,e^x - 3$ up to four decimal places by Using Regula falsi method. Roots lies between 1 &2.

4. **Attempt any *one* part of the following:** 7 x 1 = 7

(a) Calculate the value of f(x) for x = 2.5 from the following table using Lagrange's interpolation method:

X	1	2	3	4
f(x)	1	8	27	64

(b) Analyze the following result

(i) $\frac{\Delta}{\nabla} - \frac{\nabla}{\Delta} = \Delta + \nabla$

(ii) Analyze and find the production for 1964 and 1966 from the following data:

Year	1961	1962	1963	1964	1965	1966	1967
Production	200	220	260		350	-	430

5. **Attempt any *one* part of the following:** 7 x 1 = 7

(a) Given $\frac{dy}{dx} = y - x$, y(0) =2. Evaluate the value of y(0.1) and y(0.2) correct to four decimal places, by using Runge-Kutta 4th order method.

(b) From the Taylor's series, for y(x), Evaluate y(0.1) correct to four decimal place if y(x) satisfies $\frac{dy}{dx} = x - y^2$ and y(0) =1.

6. **Attempt any *one* part of the following:** 7 x 1 = 7

(a) Evaluate $\int_0^4 \frac{dx}{1+x^2}$ using Boole's rule taking

(i) h = 1 (ii) h = 0.5

Compare the results with the actual value and indicate the error in both.

(b) Evaluate $\int_{0.2}^{1.4} (\sin x - \log_e x + e^x)dx$

Approximately using Simpson's 1/3 rule correct to 4 decimals.

7. **Attempt any *one* part of the following:** 7 x 1 = 7

(a) What is curve fitting? Explain the method of Least square to fit a curve.

(b) Write a short note on

(i) Time series Analysis

(ii) Moving Average method

(iii) Null Hypothesis

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MCA-INT
(SEM IV) THEORY EXAMINATION 2022-23
DATA STRUCTURES USING C

Time: 3 Hours *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

a. Which data structure is needed to convert infix notation to postfix notations?

b. What do we call value of an automatic variable that is declared but not initialized?

c. What do you understand by best case, worst case and average case efficiency of an algorithm?

d. Write the time complexity of Merge Sort algorithm.

e. Define the spanning tree?

f. Define the properties of AVL tree.

g. Define graph. List the various graph traversal techniques.

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a. Discuss the purpose of Data Structure. Explain the factors that influence the choice of a particular data structure?

b. Suppose a linked list consists of some numeric values. Design an algorithm to find maximum value in the list.

c. Draw binary tree for the following expression:
(i) (A+B)*(C+D)
(ii) (A + (B - C) * ((D - E) / (F + G))

d. Write an algorithm to insert an item into a binary search tree.

e. What is Sparse matrix. How sparse matrices could be represented in memory efficiently?

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

a. What do you understand by time complexity of an algorithm? Explain the Big 'O' Notation.

b. Write a program to delete duplicate value from a given array.

4. **Attempt any *one* part of the following:** **7 x 1 = 7**

a. Write C function to implement queues in a linear array with two indices 'front' and 'rear', such that when rear reaches to the end of the array, all the items moved to the front of the array.

b. Write an Algorithm to convert in the Infix Expression to Postfix Expression.

5. **Attempt any *one* part of the following:** **7 x 1 = 7**

a. Draw Binary tree from the following expression & also convert it into Preorder and Postorder traversal.
A – B / (C * D) + (E * F)

b. Draw Binary tree from the given inorder and Postorder traversal.
Inorder : D B F E A G C L J H K
Postorder: D F E B G L J K H C A

6. **Attempt any *one* part of the following:** **7 x 1 = 7**

a. Illustrate the execution of HEAP-SORT in the array.
A = <6,14,3,25,2,10,20,7,6>
Also write the time complexity of Heap-Sort, Heapify and Build Heap procedure.

b. Illustrate the execution of BUBBLE-SORT on the array.
A = <34, 22, 67, 90, 33, 100, 12, 3, 10>

7. **Attempt any *one* part of the following:** **7 x 1 = 7**

a. Explain breadth first search traversal algorithm of a graph.

b. Write an algorithm to delete an item from a binary search tree. Illustrate with a suitable example.

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MCA - INT
(SEM IV) THEORY EXAMINATION 2022-23
FUNDAMENTALS OF E-COMMERCE

Time: 3 Hours *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

a. Explain the term e-commerce.
b. Describe the minimum requirement for doing the commerce electronically.
c. Describe the benefits of mobile commerce.
d. Define core features of strong E-commerce platform.
e. Explain the term decryption and its requirements.
f. Explore the need for data hiding.
g. Describe the challenges of e-banking.

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a. Describe the skills required for getting involved with e-commerce.
b. Explain the usefulness of Wireless Application Protocol for strengthening the e-commerce environment.
c. Explain different security threats to integrity in detail.
d. Explain the secure electronic transaction protocol.
e. Describe different legal issues related to e-commerce.

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

a Explore the role of websites in having greater business volume with examples.
b How e-commerce models are making impacts on the business world.

4. Attempt any *one* part of the following: **7 x 1 = 7**

a Explain B2B and B2C models along with their advantages and disadvantages.
b Explain the use of G2C and G2B models with their benefits.

5. Attempt any *one* part of the following: **7 x 1 = 7**

a Differentiate between DDoS Attacks and DoS Attacks with suitable example.
b Describe the purpose of snooping and traffic analysis to attack the intended security goal along with a suitable example.

6. **Attempt any *one* part of the following:** $7 \times 1 = 7$

a Differentiate between symmetric and asymmetric encryption techniques along with their benefits and shortcomings.

b Explain the working of digital signatures with examples.

7. **Attempt any *one* part of the following:** $7 \times 1 = 7$

a Explain the working of SET Protocol.

b Differentiate between Digital Tokens, Smart Cards and Debit Cards.

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MCA-INT
(SEM IV) THEORY EXAMINATION 2022-23
PRINCIPLES OF MANAGEMENT

Time: 3 Hours *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

a. Define Management.
b. What is meant by delegation of authority?
c. Define performance appraisal.
d. What is selection?
e. What is manpower planning?
f. What is motivation?
g. Define change management.

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a. Discuss the role of managers.
b. What are the objectives of planning? Explain.
c. Discuss the internal and external factors of recruitment.
d. Discuss the different approaches of improving motivation.
e. Explain the importance of communication.

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

a. Discuss the business ethics and tools of ethics.
b. Explain Henri Fayol's 14 principles of management.

4. Attempt any *one* part of the following: **7 x 1 = 7**

a. Explain the steps involved in planning.
b. Difference between authority and responsibility.

5. **Attempt any *one* part of the following:** **7 x 1 = 7**

a. Discuss the different types of on the job training methods.

b. What is the purpose of job design? Discuss.

6. **Attempt any *one* part of the following:** **7 x 1 = 7**

a. What are the different types of leadership styles? Explain.

b. Explain the Maslow's theory of motivation.

7. **Attempt any *one* part of the following:** **7 x 1 = 7**

a. Explain the barriers of communication.

b. Discuss the model of change.

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MCA-INT
(SEM IV) THEORY EXAMINATION 2022-23
OPERATING SYSTEM

Time: 3 Hours *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

(a) Identify the role of dispatcher in OS?
(b) Illustrate why the page sizes are always power of 2.
(c) Conclude whether a cycle in resource allocation graph necessarily mean a deadlock? Give example.
(d) List out delay elements are involved in a disk read or write.
(e) Show that the average search time to find a record in a file is less for an indexed sequential file than for a sequential file.
(f) Discover the various criteria during selection of file organization.
(g) Explain the use of i-node in UNIX.

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

(a) Write short note on following
  (i) SPOOLING
  (ii) Multiprogramming
(b) What is information in the PCB? Discuss it with diagram
(c) Define critical section problem. Explain Peterson's solution to solve critical section problem
(d) Calculate the number of page faults that would occur in case of optimal page replacement algorithm for the following reference string? Assuming the demand paging technique is used by OS 2,3,4,3,4,1,6,7,8,7,1,8,9,8,9,5,4,2,1. Consider the system with 3 page frames.
(e) Suppose that a disk drive has 5000 cylinders. The drive is currently serving a request at cylinder 143 and the previous request was at cylinder 125. The queue of pending request, in FIFO order, is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 compare the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for: (i) SSTF (ii) SCAN

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) Describe operating system functions. Also, explain monolithic, and microkernel systems.
(b) Differentiate between multiprocessor, multiuser, and batch operating system.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) Illustrate process states and process transition diagram.
(b) Consider the set of 4 processes whose arrival time and burst time are given below-

Process No.	Arrival Time	Burst Time		
		CPU Burst	I/O Burst	CPU Burst
P1	0	3	2	2
P2	0	2	4	1
P3	2	1	3	2
P4	5	2	2	1

If the CPU scheduling policy is **Shortest Remaining Time First**, calculate the average waiting time and average turnaround time.

5. **Attempt any *one* part of the following:** **7 x 1 = 7**

(a) Considering a system with five processes P_0 through P_4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time t_0 following snapshot of the system has been taken.

Process	Allocation	Max	Available
	A B C	A B C	A B C
P_0	0 1 0	7 5 3	3 3 2
P_1	2 0 0	3 2 2	
P_2	3 0 2	9 0 2	
P_3	2 1 1	2 2 2	
P_4	0 0 2	4 3 3	

Then,

(i) What will be the content of the Need matrix?

(ii) Is the system in a safe state? If Yes, then what is the safe sequence?

(iii) What will happen if process P_1 requests one additional instance of resource type A and two instances of resource type C?

(b) A shared variable x, initialized to zero, is operated on by four concurrent processes W, X, Y, Z as follows. Each of the processes W and X reads x from memory, increments by one, stores it to memory, and then terminates. Each of the processes Y and Z reads x from memory, decrements by two, stores it to memory, and then terminates. Each process before reading x invokes the P operation (i.e., wait) on a counting semaphore S and invokes the V operation (i.e., signal) on the semaphore S after storing x to memory. Semaphore S is initialized to two. What is the maximum possible value of x after all processes complete execution?

6. **Attempt any *one* part of the following:** **7 x 1 = 7**

(a) Which allocation scheme will minimize the amount of space required in directory structure and why?

(b) Explain the three methods available for allocating disk space?

7. **Attempt any *one* part of the following:** **7 x 1 = 7**

(a) In UNIX System V, the length of a block is 1 Kbyte, and each block can hold a total of 256 block addresses. Using index allocation, estimate maximum size of a file?

(b) Appraise the File system architecture in Unix.