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END SEMESTER Examination 2022

MCA / M.Sc (IT) II

Data Structure and File organization using 'C' language.

Time : Three Hours

Maximum Marks : 100

INSTRUCTIONS TO STUDENTS

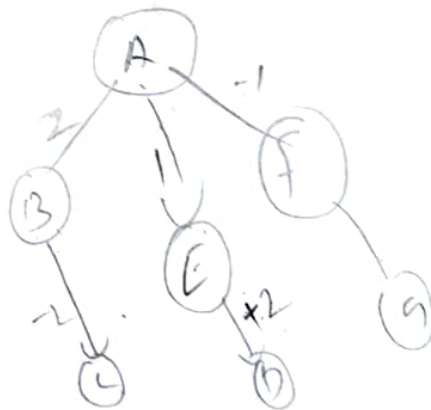
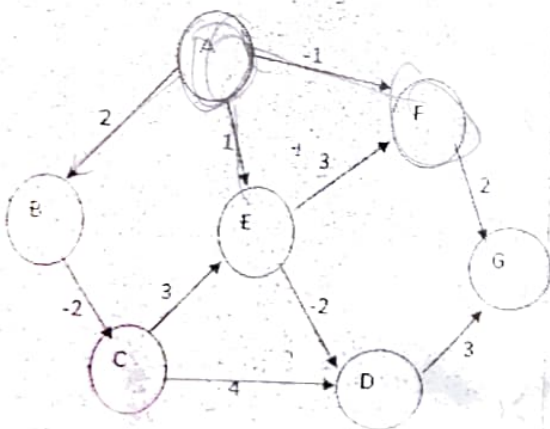
Note:

- (i) All questions are compulsory
- (ii) Answer any two sub questions among a, b & c in each main question.

Q1)

(2X10=20 Marks)(CO2, CO3,CO5)

- a. Write a 'C' function to create a binary search tree and write another function to count total number of leaf nodes(do not use global variables).
- b. Draw the expression tree for the expression $(X*Y-Z)^P * (S-G*H)^AE$
- c. Apply Bellman's Ford algorithm to find the shortest distance to all vertices from source node A.



Free list \rightarrow Heap

disc

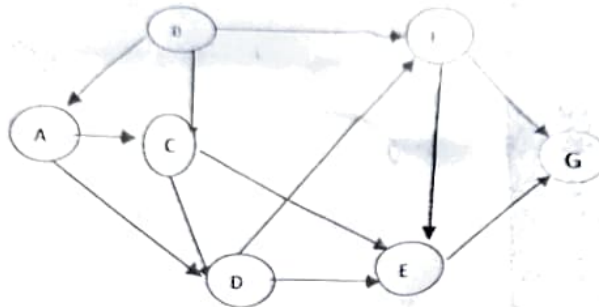
Q2.)

(2X10=20 Marks)((CO3, CO4, CO5)

a. Explain B and B+ tree. Draw a B - tree of order 4 with following keys :

1,3,2,4,6,7,8,11,12,5,9,13,14

b. Give linked representation and memory representation of following graph



c. Write a c function to count total number of nodes in a circular singly linked list.

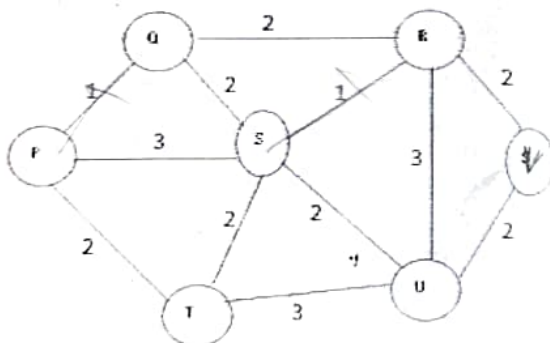
Q3.)

(2X10=20 Marks)(CO2, CO4, CO3)

a. Explain Huffman's algorithm. Apply Huffman's algorithm to encode the following signal.

bccabadeddcffaebedfecb

b. Explain spanning tree. Find minimal spanning tree of following graph, using Kruskal's algorithm.



c. Explain hash collision with an example. Consider a hash table of size (m) 10. Using linear probing technique, insert following keys 11,22,37,46,64,73,72,33 and 411 into the table.

Q4.)

(2X10=20 Marks)((CO1, CO3, CO4)

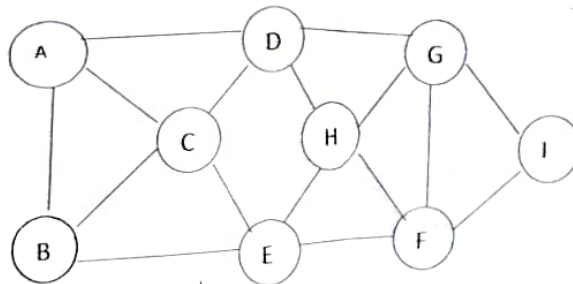
- a. What do mean by an AVL tree? Write advantages of an AVL tree. Draw an AVL tree with following keys: 17, 15, 14, 8, 9, 33, 22, 2, 34, 36.
- b. What do you mean by Time and Space trade off a program? Write a C function to sort an array using quick sort technique.
- c. Evaluate the given post fix expression using stack (Each operator and operand is separated by a comma).

9, 2, +, 3, *, 7, 2, %, 3, 2, ^, *, -

Q5

(2X10=20 Marks)(CO3, CO4, CO5)

- a. Convert the expression $(M-N) * O + (P / Q) ^ (R * S)$ to its equivalent postfix expression using stack(show all steps).
- b. Explain sequential file organization and index file organization with examples
- c. Define DFS and BFS graph traversal techniques. Give name and apply a graph traversal technique on the given graph, to find the one of the possible paths from node A to node I, in the given graph.



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TMC-202

M. C. A. (SECOND SEMESTER)

END SEMESTER EXAMINATION, July/Aug., 2022

OBJECT ORIENTED ANALYSIS AND JAVA PROGRAMMING

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) What are the use of Wrapper classes ? Write a program to show the use of command line arguments in order to check whether any of command line arguments is 100 or not. (CO1)

(b) What are multidimensional arrays in java ? Write a program to initialize 3 by 3 integer array and print sum of both diagonal elements. (CO1, CO2)

(c) How the working of String is different from StringBuffer ? Write a program to print total numbers of vowels using switch case in an entered string. (CO2)

P. T. O.

2. (a) What are different type of streams available in java ? Write a program to show the use of transient keyword in object serialization. (CO2)
- (b) What is the use of subpackage ? Write a program to create an executable jar file in order to create a notepad application. Write complete program. (CO3)
- (c) How interfaces are used in multiple inheritance ? Write a program to differentiate inner class and anonymous inner class. (CO4)
3. (a) What are checked and unchecked exceptions? Write a program to show the use of try with resource properly. (CO2, CO3)
- (b) Define and explain thread life cycle. Write a program to print a random generated number infinitely between 1 to 5 after every 5 milliseconds. (CO3)
- (c) Define and explain the following : (CO4)
- (i) System.gc() method use
 - (ii) Static import use
 - (iii) System.out and System.err
4. (a) Define and explain event Delegation model with the help of proper example. How we can draw a line on applet panel window by clicking mouse two consecutive times ? Line will display between two mouse click positions. (CO4)
- (b) Explain working and use of repaint() method in applet programming. Write a program to show the use of card layout in quiz like application. (CO5)

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(3)

(c) What is the use of URL class in java ? Write a program using socket class to send some text from client to server and server will send its reverse value after eliminating vowels. (CO4)

5. (a) Define and explain collection framework with example. Write a program to show the use of iterator on ArrayList. (CO5)

(b) What is the use of JDBC driver in order to establish connection with database ? Write a program to retrieve those values of all columns which starts with "a" and ends with "a" using execute method. (CO4)

(c) What is the use of CallableStatement in JDBC Api ? Write a program to retrieve an image from database column. (CO5)

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TMC-203

M. C. A. (SECOND SEMESTER)
END SEMESTER EXAMINATION, July/Aug., 2022
COMPUTER NETWORK

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Suppose nodes A, B and C each attach to the same broadcast LAN (through their adapters). If A sends thousands of IP datagrams to B with each encapsulating frame addressed to the MAC address of B, will C's adapter process these frames ? If so, will C's adapter pass the IP datagrams in these frames to the network layer C ? How would your answers change if A sends frames with the MAC broadcast address ?

(CO1, CO2, CO4)

- ✓ (b) Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links, of rates $R_1 = 500$ kbps, $R_2 = 2$ Mbps

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and $R_3 = 1$ Mbps. Assuming no other traffic in the network, what is the throughput for the file transfer ? Suppose the file is 4 million bytes. Dividing the file size by the throughput, roughly how long will it take to transfer the file to Host B ? (CO1, CO2, CO4)

- (c) Consider an application that transmits data at a steady rate (for example, the sender generates an N -bit unit of data every k time units, where k is small and fixed). Also, when such an application starts, it will continue running for a relatively long period of time. Answer the following questions, briefly justifying your answer : Would a packet-switched network or a circuit-switched network is more appropriate for this application ? Why ? Now suppose that a packet-switched network is used and the only traffic on this network comes from such applications as described above. Furthermore, assume that the sum of the application data rates is less than the capacities of each and every link. Is some form of congestion control needed ? Why ? (CO1, CO2, CO4)

2. (a) Consider two hosts, A and B, connected by a single link of rate R bps. Suppose that the two hosts are separated by m meters, and suppose the propagation speed along the link is s meters/sec. Host A is to send a packet of size L bits to Host B. (CO5, CO4, CO6)

- (i) Express the propagation delay, d_{prop} , in terms of m and s .
- (ii) Determine the transmission time of the packet, d_{trans} , in terms of L and R .

- (iii) Ignoring processing and queuing delays, obtain an expression for the end-to-end delay.
- (iv) Suppose Host A begins to transmit the packet at time $t = 0$. At time $t = d_{\text{prop}}$, where is the last bit of the packet?
- (v) Suppose d_{prop} is greater than d_{trans} . At time $t = d_{\text{trans}}$, where is the first bit of the packet?
- (b) Host A and B are communicating over a TCP connection and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302 and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A.
- (CO5, CO4, CO6)
- (i) In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number?
- (ii) If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number and the destination port number?

- (iii) If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?
- (iv) Suppose the two segments sent by A arrive in order at B. The first acknowledgment is lost and the second acknowledgment arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgments sent. (Assume there is no additional packet loss.) For each segment in your figure, provide the sequence number and the number of bytes of data; for each acknowledgment that you add, provide the acknowledgment number.
- (c) Two channels, one with a bit rate of 190 kbps and another with a bit rate of 180 kbps, are to be multiplexed using pulse stuffing TDM with no synchronization bits. Answer the following questions:
- (CO5, CO4, CO6)
- (i) What is the size of a frame in bits?
 - (ii) What is the frame rate?
 - (iii) What is the duration of a frame?
 - (iv) What is the data rate?
- 3 (a) (i) Consider a reliable data transfer protocol that uses only negative acknowledgments. Suppose the sender sends data only infrequently. Would a NAK-only protocol be preferable to a protocol that uses ACKs? Why? Now suppose the sender has a lot of data to send

and the end-to-end connection experiences few losses. In this second case, would a NAK-only protocol be preferable to a protocol that uses ACKs? Why?

- (ii) Calculate the CRC code for a data 1101011111 using the generator $G(x) = x^4 + x + 1$. (CO3, CO2, CO6)

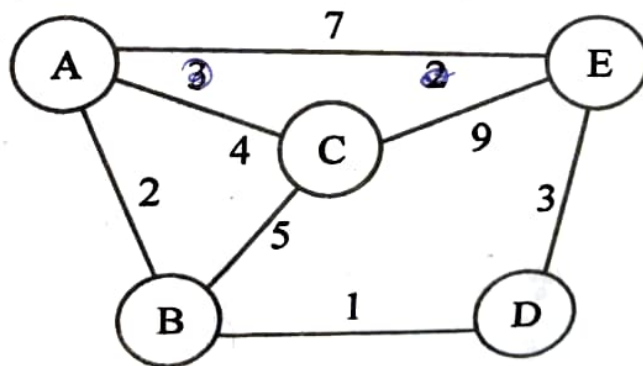
- (b) Explain the IPv4 and IPv6 header formats. (CO3, CO2, CO6)

- (c) Consider the network shown below and assume that each node initially knows the costs to each of its neighbors. Consider the distance vector algorithm and show the distance table entries at node E when :

- (i) Each node knows only the distances to its immediate neighbors.

- (ii) Each node has reported the information it had in the preceding step to its immediate neighbors.

- (iii) Step (ii) happens a second time. (CO3, CO2, CO6)



4. (a) Consider sending a 2400-byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation? (CO5, CO4, CO2)

(6)

- (b) A large number of consecutive IP address are available starting at 199.116.0.0. Suppose that four organizations, A, B, C, and D, request 4000, 2000, 500, 1000 and 7000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned and the mask in the w.x.y.z/s notation.

(CO5, CO4, CO2)

- (c) A router has the following (CIDR) entries in its routing table :

(CO5, CO4, CO2)

Address/mask	Next hop
135.45.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/23	Router 1
default	Router 2

For each of the following IP addresses, what does the router do if a packet with that address arrives ?

- (i) 135.46.63.10
- (ii) 135.46.57.14
- (iii) 135.46.52.2
- (iv) 192.53.40.7
- (v) 192.53.56.7

5. (a) Sixteen stations, numbered 1 through 16, are contending for the use of a shared channel by using the adaptive tree walk protocol. If all the stations whose addresses are one less than the prime numbers suddenly become ready at once, how many bit slots are needed to resolve the contention ? (CO3, CO4, CO5)
- (b) A sender needs to send the four data items 0×3456 , $0 \times ABCC$, $0 \times 02BC$ and $0 \times EEEE$. Find the checksum at the sender site and find the checksum at the receiver site if there is no error. (CO3, CO4, CO5)
- (c) Draw the graph of the Manchester scheme and differential Manchester scheme using each of the following data streams, assuming that the last signal level has been positive : (CO3, CO4, CO5)
- (i) 101100011101
- (ii) 010011101000

TMC-204/TMI-201

M. C. A./M. Sc. (IT) (SECOND SEMESTER)
END SEMESTER EXAMINATION, July/Aug., 2022
DATABASE MANAGEMENT SYSTEM

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) If you have to create and maintain a very large database for an organization, which approach will you follow, file processing or Database System approach ? Justify your answer with proper reasons.

(CO1)

- (b) Write and explain SQL commands with the help of suitable example for applying the following constraints at column level as well as table level :

(CO1)

PIMARY KEY, UNIQUE, NOT NULL and FOREIGN KEY

- (c) Discriminate the following with proper justification : (CO1)
- (i) Partial Participation and Total Participation
 - (ii) Simple Key and Composite Key
 - (iii) Candidate Key and Super Key.
2. (a) Explain the following terms with the help of examples : (CO2)
- Entity, Relationship, Recursive relationship, Generalization, Specialization.
- (b) Draw the basic concept of relational model. What constraints are available in relational model ? Illustrate at least *four* constraints with suitable examples. (CO2)
- (c) Differentiate SQL scalar and group functions. Discuss *three* functions in each category. (CO2)
3. (a) Define and explain the following operations in the context of relational algebra : (CO3)
- Select, Project, Cartesian and Join.
- (b) Consider the following relations and solve the given relational algebra queries : (CO3)
- Student** (Name, St_Roll_No, Course, Address)
- Faculty** (Fac_Name, Fac_ID, Fac_Subject, St_Roll_No)
- Project** (Project_Name, Project_ID, Fac_ID, St_Roll_No)
- (i) Find the name of the faculties who are students also.
 - (ii) Find the name project whose Project_ID is P100PS.

(iii) Find the name of the faculty who is teaching students named 'Rama Shankar'.

(iv) Retrieve the name of faculty who is working on the project named 'Database'.

(v) Retrieve the name of student who is working on the project 'Operation System' under the guidance of faculty name 'Dr. Vinayak Goswami'.

(c) Convince with your arguments that normalization is better for our database. Explain 1st, 2nd, and 3rd Normal Forms with the help of suitable examples. (CO3)

4. (a) Illustrate the concept of Multi-valued dependency. Compare 4th and 5th Normal Forms. (CO4)

(b) Consider the following relation and dependencies :

<u>Emp_ID</u>	<u>Emp_Name</u>	<u>Emp_Address</u>	<u>ProjectID</u>	<u>Project_Name</u>	<u>Project_Hours</u>
101	Amit Kumar Sharma	Dehradun Saharanpur	P111	Database	24
102	Ajai Lal Mishra	Dehradun, Maharashtra	P112	Homepage	23

{Emp_ID, ProjectID} → Project_Hours

Emp_ID → Emp_Name, Emp_Address

Project_ID → Project_Name

Analyze the above relation and dependencies and identify that the above relation is violating conditions of which normal form/forms and normalize the relation accordingly. (CO4)

(c) During its lifetime a transaction holds various states and properties. Write and explain states and properties of a transaction. (CO4)

5. (a) Why do we need concurrency control ? Justify with proper examples. (CO5)
- (b) What is deadlock handling in transactions ? Discuss *two* principal methods for dealing with the deadlock problem. (CO5)
- (c) Check the given schedule for conflict serializable : (CO5)

T1	T2	T3
	Read(Z)	
	Read(Y)	
	Write(Y)	
		Read(Y)
		Read(Z)
Read(X)		
Write(X)		
		Write(Y)
		Write(Z)
	Read(X)	
Read(Y)		
Write(Y)		
	Write(X)	

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TMC-205

M. C. A. (SECOND SEMESTER)
END SEMESTER EXAMINATION, July/Aug., 2022
VIRTUALIZATION AND CLOUD COMPUTING

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Discuss any *two* of the following in brief :

(CO1)

(i) Rapid Elasticity and On Demand Self Service

(ii) Metered Service and Broad Network Access

(iii) History of Cloud Computing

(b) What are the benefits and drawbacks of Cloud Computing ? Explain.

(CO1)

(c) State the use and applications of Cloud with suitable example.

(CO1)

P. T. O.

2. (a) Discuss NIST Cloud reference architecture. Also enlist the essential characteristics of Cloud according to the model. (CO2)
- (b) What are the Service models of Cloud Computing ? Discuss them in brief. (CO2)
- (c) What are cloud deployment models ? Discuss Private cloud model in detail. (CO2)
3. (a) Discuss any *two* of the following in brief : (CO3)
- (i) File System
 - (ii) Parallel file system
 - (iii) Distributed File System.
- (b) What is a data center ? Explain their usage. (CO3)
- (c) Write short notes on any *two* of the following : (CO3)
- (i) DAS
 - (ii) SAN
 - (iii) NAS
 - (iv) RAID
4. (a) Describe the concept of Virtualization. Discuss the need for virtualization. (CO4)
- (b) Differentiate between In-band and Out-of band virtualization. (CO4)
- (c) Differentiate between Para and Full platform virtualization. (CO4)

(3)

5. (a) Explain storage virtualization. Elaborate the different parameter for storage virtualization. (CO5)
- (b) What are Cloud Security Recommendations ? Discuss. (CO5)
- (c) Write short notes on any *two* of the following : (CO5)
- (i) AWS
 - (ii) Google App Engine
 - (iii) Pros and Cons of Virtualization

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TMC-206/TMI-204

M. C. A./M. Sc. (IT) (SECOND SEMESTER)

END SEMESTER EXAMINATION, July/Aug., 2022

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Define Software Engineering. Explain Software Requirement Specification with an example. (CO1)

(b) What are benefits of the Spiral model ? Why Spiral model is called Meta model ? Justify that it is best suitable for large projects. (CO1)

(c) Explain the advantages of Agile model. With reference to Agile model explain extreme programming and pair programming. (CO1)

P. T. O.

2. (a) Explain Project management life cycle. Justify project planning is most important phase of project development. (CO2)
- (b) Describe Basic COCOMO model for evaluating the cost of software project. Provide the estimated effort and duration of a University Information System having 64 KLOC, $a = 2.4$, $b = 1.05$, $c = 2.5$, $d = .38$ for basic COCOMO. (CO2)
- (c) Describe the major software project risks. How these risks are managed effectively through software risk management? (CO2)
3. (a) What strengths has software metrics provided to software engineering teams against software crisis? Describe software quality metrics. (CO3)
- (b) What are the objectives of good software design? Explain Strong Cohesion and Weak Coupling the desired property of a good software design. (CO3)
- (c) Draw the control flow graph for the following code and calculate Cyclomatic: (CO3)

```
int Compute_GCD (int x, int y) {  
    while (x != y) {  
        if (x > y) then  
            x = x - y;  
        else  
            y = y - x;  
    }  
    return x;  
}
```

(3)

4. (a) Define software testing as per IEEE. Explain objectives of software testing. Explain bug life cycle. (CO4)
- (b) Describe the software testing life cycle. Explain all the phases in detail.
- (c) Consider a simple program to classify a triangle. Its inputs is a triple of positive integers (say x, y, z) and the data type for input parameters ensures that these will be integers greater than 0 and less than or equal to 100. The program output may be one of the following words : [Scalene; Isosceles; Equilateral; Not a triangle, Not Possible]. Identify the equivalence cases for output and input domain.
5. (a) Differentiate between effective testing Vs exhaustive testing through boundary value analysis. Which BVA is effective and which one is exhaustive ? Why ? (CO5)
- (b) Describe verification and validation through V-Shape model. (CO5)
- (c) Explain the following terms : (CO5)
- Software Maintenance, Software Reengineering, Reverse Engineering and CASE Tools.