

Paper Code: CO201
Time: 3:00 Hours

Title of the subject: Data Structures
Max. Marks: 40

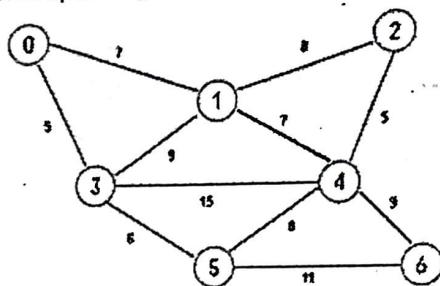
Note: Answer any five questions. Write pseudo code/C code for all algorithms asked. Assume suitable missing data, if any. Write your assumption(s) in answer.

1. (a) Given an array A, which was obtained by swapping two elements (selected randomly) of a sorted array e.g. {5, 45, 17, 20, 32, 12, 67}. Write an algorithm to get back the original sorted array by just swapping one pair.
(b) Write a 3-way merge program/algorithm to merge three sorted arrays into a single sorted array. [4,4]
2. (a) Implement a function [int successor(TreeNodeptr x)] that returns the successor of a node in a binary search tree (the BST stores integer keys). A successor of a node n is defined as the smallest key x in the BST such that x is bigger than the value of n, or null if that does not exist. You may assume that the BST does not contain duplicate keys. Note that getLeft(), getRight(), and getParent() return null if the node does not have a left, a right child, or is the root, respectively.
(b) Develop an efficient algorithm called Partition-Even-Odd(A,n) that partitions an array A[0..n-1] in even and odd numbers. The algorithm must terminate with A containing all its even elements preceding all its odd elements. Partition-Even-Odd may use only a constant memory space in addition to A. In practice, this means that you may not use another temporary array. [4+4]
3. (a) Consider two shorted lists of length m and n respectively. A merge algorithm is applied to merge these lists into a single sorted array of size m+n (assuming all number are unique). Give exact number of comparisons in best case and in worst case.
(b) Write an algorithm (preferably recursive and linear time) to delete all nodes of a linked list and set the pointer (initially pointing to first node) to NULL. Remember we need to physically delete each node and free the memory occupied by each node. [4,4]
4. (a) Write an algorithm to check if given binary tree is a Binary Search Tree or not.

(b) Suppose that we insert a new data x into a Binary Search tree and then immediately delete x from the tree. Will the new tree be identical to the original one? If yes give the reason in no more than 3 sentences. If no give a counterexample. Draw pictures if you necessary.

[4,4]

5. Write Prim's Algorithm for MST. Apply Prim's MST algorithm on following graph and find Minimum Spanning Tree. Show each step of the algorithm.



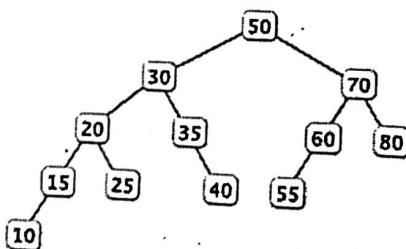
[8]

6. (a) Write algorithm to print all connected components of a given undirected graph.

(b) Write an algorithm to find k th element/node from end in a singly linked list using two pointers and one pass/scan of the linked list). Assume $k \geq 1$ and linked list is having more than k nodes.

[4,4]

7. (a). Consider following height balanced tree (AVL tree)



Draw the tree after insertion of each of the following data in given order: 5, 45, 53.
(b) Explain BFS graph traversal technique. Write an algorithm for BFS traversal such

that along with traversal it also computes single source shortest path for a given unweighted graph. Apply this algorithm on graph given in Question 5 ignoring weights and starting from vertex '0'.

[4,4]

Total No. of Pages 02

Roll No.....

B.Tech.

3rd SEMESTER

END SEMESTER EXAMINATION

Nov./Dec.-2019

PAPER CODE: CO 203 Object Oriented Programming

Time: 3:00 Hours

Max. Marks : 40

Note: Answer five questions. Question No. 1 is compulsory.
Assume suitable missing data, if any.

Q1. Answer all the following questions:

[12]

- [a] Explain array of pointers with suitable example.
- [b] Explain extraction and insertion operator.
- [c] When scope resolution operator is used?
- [d] What precautions should we take while at the time of function overloading?
- [e] What do you mean by abstract class?
- [f] What is type casting and when is it used?

Q2. [a] What is OOP? State advantages of OOP.

[3]

[b] Explain this pointer with suitable example.

[4]

Q3. [a] Explain Class Template with suitable example. How overloading of template functions is resolved?

[3]

[b] Write a C++ program using operator overloading to check whether given number is prime or not.

[4]

Q4. [a] What is Copy Constructor? Describe merits and demerits of it. [3]

[b] Write a C++ program to read a file and count the no. of vowels and consonants. [4]

Q5. [a] Write a program that catches all type of exceptions. [3]

[b] Illustrate with C++ program the execution of constructor and destructor when single inheritance is involved. [4]

Q6. [a] When do we make a function pure virtual Function? [3]

[b] What is virtual function? Why do we need virtual Function? [4]

Q7. [a] What are streams in C++? Explain C++'s predefined streams.

[3]

[b] What are the major features of Java Programming Language?

[4]

Total No. Of Pages 2

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Roll No.....

B.TECH (CO)

Nov-Dec 2019

THIRD SEMESTER

END SEMESTER EXAMINATION

CO207 MODELING AND SIMULATION
(ENGINEERING ANALYSIS AND DESIGN)

Max. Marks: 50

Time 3:00 hours

Note: Attempt any five questions. All Questions Carry Equal Marks.
Assume suitable missing data ,if any:

Q1. Mr. Srinivasan, owner of Citizens restaurant is thinking of introducing separate coffee shop facility in his restaurant. The manager plans for one service counter for the coffee shop customers. A market study has projected the inter-arrival times at the restaurant as given in the table. The counter can service the customers at the following rate:

Inter arrival times		Service times	
Time between two consecutive arrivals (minutes)	Probability	Service time (minutes)	Probability
2	0.15	2	0.10
3	0.25	3	0.25
4	0.20	4	0.30
5	0.25	5	0.2
6	0.15	6	0.15

Mr. Srinivasan will implement the plan if the average waiting time of customers in the system is less than 5 minutes. Before implementing the plan, Mr. Srinivasan would like to know the following:

- i. Mean waiting time of customers, before service.
- ii. Average idle time of server.

Simulate the operation of the facility for customer arriving sample of 20 cars when the restaurant starts at 7.00 pm every day and find whether Mr. Srinivasan will go for the plan. (10)

Q.2 a) Write a short notes on GPSS and SIMSCRIPT simulation languages. (5)

b) With a neat flow chart, explain various steps in a simulation study. (5)

Q.3 Explain chi-square goodness of fit test. Apply it to Poisson assumption with $\lambda = 3.64$. Data size = 100 and observed frequency $O_i = 12, 10, 19, 17, 10, 8, 7, 5, 5, 3, 3, 1$. [Given $\chi^2_{0.05,5} = 11.1$]. (10)

Q.4 a) Explain the flow diagram for the execution of arrival and departure events. (5)

b) Calculate the mean and variance of exponential distribution. (5)

Q.5 How to simulate a single-server queueing system by showing how its simulation model would be represented inside the computer at time $e_0 = 0$ and the times e_1, e_2, \dots, e_9 at which the 8 successive events occur that are needed to observe the desired number, $n = 5$, of delays in queue. Assume the interarrival and service times of customers are

$$\begin{aligned} A_1 &= 0.4, A_2 = 1.2, A_3 = 0.5, A_4 = 1.7, A_5 = 0.2, A_6 = 1.6, A_7 = 0.2, \dots \\ S_1 &= 2.0, S_2 = 0.7, S_3 = 0.2, S_4 = 1.1, S_5 = 3.7, S_6 = 0.6, \dots \end{aligned} \quad (10)$$

Q.6 a) Explain the following:-

i) Normal Distribution. ii) Weibull Distribution.

(2*2.5 = 5)

b) Suggest a step by step procedure to generate random variates using inverse transform technique for triangular distribution. (5)

END

END SEMESTER EXAMINATION
CO-202 Analog Electronics

Max. Marks: 70

Time: 03 Hours

Note: Answer any five questions.
Assume suitable missing data, if any.

Q.1 (a) Derive diode current equation and explain v-i characteristics of pn junction diode using the same equations. (7)

(b) A zener voltage regulator has variable load R_L requiring load current to vary from 10mA to 85mA. Given that $V_Z=10V$, $I_{Z_{\min}} = 15mA$, $I_{Z_{\max}} = 100mA$ and series resistance $R_S = 40 \Omega$. Calculate the range of DC variation permissible and zener power dissipation. (7)

Q.2 (a) A single phase full wave centre tapped rectifier having each secondary rms voltage value of 50V and load resistance is 980 ohm. Find (i) mean load current (ii) rms load current (iii) ripple factor and (iv) output efficiency. (7)

(b) Define ripple factor and explain its significance. Obtain an expression for the ripple factor of full wave bridge rectifier. (7)

Q.3 (a) What do you mean by α , β and γ ? Derive the expressions for the same for each configuration using PNP transistor to provide the relation in between all these and also mention their significance. (7)

(b) A Self bias circuit of NPN transistor is used with $\beta=50$, $V_{BE} = 0.6V$, $V_{CC} = 18V$ and $R_C = 4.3K\Omega$. It is desired to establish a quiescent point at $I_C = 1.5mA$, $V_{CE}=10V$ and stability factor of $S \leq 4$. Find R_E , R_1 and R_2 . (7)

Q.4 (a) Differentiate in between depletion type and enhancement type MOSFET. Explain the working of n-channel JFET and define the parameters for the same and develop its equivalent circuit. (7)

(b) For the common source amplifier given that drain resistance, $R_D = 5K\Omega$, amplification factor, $\mu=50$ and $r_d = 35K\Omega$. Evaluate voltage gain A_v and Output resistance R_o . (7)

Q.5 (a) Explain the concept of Barkhausen criterion of oscillation and RC phase shifter oscillator working with the help of suitable diagram. (7)

(b) Discuss the concept of feedback in amplifiers and various topologies available. Explain the various advantages of negative feedback with suitable proofs and derivations. (7)

Q.6 (a) Explain characteristics and closed loop configurations of an Op-amp with suitable diagrams. (7)

(b) List various applications of an Op-amp. Explain op-amp as a v-i and i-v converter. (7)

Q.7 Write a short note on any two of the following:

- (i) IC555 timer.
- (ii) Biasing and compensation techniques in BJT amplifiers. ($7 \times 2 = 14$)
- (iii) PLL and function generator.

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5. Write algorithm to evaluate a postfix expression using suitable data structure.

Your algorithm should detect and display error messages if given postfix expression is not valid/correct.

[14]

6. (a) Write algorithm which takes input a binary search tree T and value K and returns Kth smallest number in binary search tree. Return 0 if tree contains less than K elements. (assuming BST does not contain key 0).

(b) Insert key 37 in following AVL tree and draw final AVL tree after required rotation(s) if any.

- (b) Describe Overflow(stack full) and Underflow(stack empty) conditions in STACK data structure implemented (i) using array. (ii) using linked list. [8,3+3]

2. Consider a list of numbers: 62, 35, 71, 85, 23, 10, 7, 55, 78, 16

Show the result of inserting the numbers in the list in the same order specified above into an initially empty maxheap. Note that you need to show how the heap looks like after each number is inserted. [14]

3. (a) You are planning the seating arrangement for a wedding given a list of guests, V. Suppose you are also given a lookup table T where T[u] for $u \in V$ is a list of guests that u knows. If u knows v, then v knows u. You are required to arrange the seating such that any guest at a table knows every other guest sitting at the same table either directly or through some other guests sitting at the same table. For example, if x knows y, and y knows z, then x, y, z can sit at the same table. Describe an efficient algorithm that, given V and T, returns the minimum number of tables needed to achieve this requirement. Analyze the running time of your algorithm.

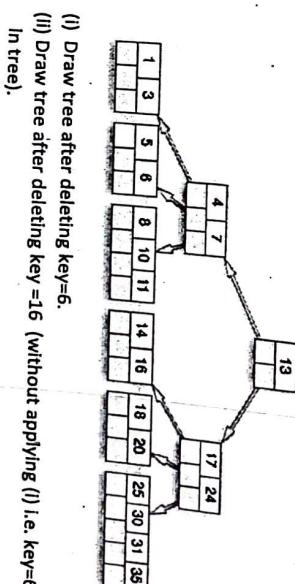
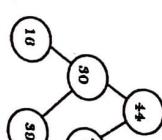
- (b) Describe different methods for handling collision in Hash table. [8,6]

4. (a) Write an algorithm which checks if a given binary tree is a binary search tree (BST) or not. Algorithm should return true/false.

- (b) Write an algorithm that takes two linked lists, sorted in increasing order and merge the two into one linked list which is in decreasing order, and return it. [7,7]

7. (a) Consider following B-Tree of degree 6 (max 6 children)

[7,7]



- (i) Draw tree after deleting key=6.
(ii) Draw tree after deleting key =16 (without applying (i) i.e. key=6 is still present in tree).

- (b) What is sparse matrix representation? Give sparse structure for a 4x5 matrix. [4,4,6]

8. (a) Write an algorithm to count number of leaf nodes in a given binary tree.

- (b) Write an algorithm to concatenate two singly linked lists L1 and L2. L1 and L2 are pointers to first node of linked lists respectively. After concatenation (L1 followed by L2), L1 points to first node of final linked list. [7,7]

[7,7]

III Semester
End Semester Examination
Paper Code: CO-205(OLD SCHEME)
Max Marks: 70

Roll No.:
B.Tech., November-2019
Discrete Mathematics
Time: 3:00 Hours

- NOTE: Answer ALL questions. All questions carry equal marks. Assume suitable missing data, if any.

Q 1. Answer all the following questions: (10x1=10)

For (a) -(e) claim, determine whether it is always true or else false in some cases. Give justification for your answer.

- $|\{\emptyset\}| = 1$ but $|\emptyset| = 0$
- $\overline{\overline{A}} = \overline{(A)}$, i.e. complement of the complement of A equals A .
- $P(\emptyset) = P(\{\emptyset\})$, where $P()$ is power set.
- Suppose that A is any set and $B = \{A, \{A\}\}$. Then $A \subseteq B$.
- If A and B are finite sets with $P(A) = P(B)$. Then $A = B$.
- Let a and b be elements in a Boolean Algebra. Prove that

$$(a + (\bar{a} \cdot (\bar{b} + b))) \cdot b = b$$

(g) Let a and b be elements in a Boolean Algebra. Prove that

$$(a \cdot (\bar{a} + (\bar{b} \cdot b))) + b = b$$

(h) Give degree of following Recurrence Relation:

$$a_n = a_{n-1} + a_{n-2} + a_{n-3} + \dots + e^n$$

(i) Give order of following Recurrence Relation:

$$a_n = a_{n-1} + a_{n-2} + a_{n-3} + \dots + e^n$$

(j) What is a cyclic group. Give example of a cyclic group as well as non cyclic group.

Q 2. Attempt any TWO questions out of the following: (2x7.5=15)

- (a) i. During a month with 30 days a baseball team plays at least 1 game a day, but no more than 45 games. Show that there must be a period of some number of consecutive days during which the team must play exactly 14 games.

- ii. Find the bitwise OR, bitwise AND, and bitwise XOR of the bit string 0110110110 and 1100011101.

- (b) Suppose that the relations R_1 and R_2 on a set A are represented by matrices

$$M_{R_1} = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} \quad M_{R_2} = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

Give graphical representation of $M_{R_1 \cup R_2}$, $M_{R_1 \cap R_2}$ and $M_{R_1 \circ R_2}$.

- (c) Check whether the following statement is a tautology or not

$$([P \rightarrow Q] \leftrightarrow [\sim(P \wedge (\sim Q))]) \rightarrow [(\sim P) \vee Q]$$

Q 5

Q 3. Attempt any TWO questions out of the following: (2x7.5=15)

- (a) Find the conjunctive normal form of the function

$$f = [x \wedge (y' \vee z)] \vee z' \rightarrow x$$

and hence find its disjunctive normal form from it.

- (b) Define Ring. Prove or disprove that $(R, +, *)$ is a commutative ring with identity. R is a set of rational numbers, $+$ and $*$ denote usual addition and multiplication.

- (c) Solve the following Recurrence Relation:

$$a_n - 5a_{n-1} + 6a_{n-2} = 0$$

Q 4. Attempt any TWO questions out of the following: (2x7.5=15)

- (a) Give short note on the following:

- i. Complete Bi partite Graph
- ii. Rule of inference
- iii. Connected Graph

- (b) Write the given argument in words and determine whether the argument is valid or not. Let

p : Ramesh goes to school.

q : Ramesh plays.

r : Ramesh is smart.

$$p \rightarrow (r \vee q)$$

$$r \rightarrow \sim q$$

Therefore

$$p \rightarrow r$$

- (c) Prove that subgroup of a Cyclic Group is Cyclic.

Q 5. Attempt any TWO questions out of the following: (2x7.5=15)

- (a) State and prove Lagrange's Theorem for a Group G .

- (b) Prove that tree has no cycle.

- (c) Prove that cartesian product of two or more Lattices is a Lattice. Give example also.

Total No. of Pages 2
IIIRD SEMESTER
SUPPL. EXAMINATION

Roll No.
B.Tech.(Computer Engg.)
(Feb.- 2019)

Paper Code: COE-201

Title of the subject: Data Structures

Time: 3:00 Hours

Max. Marks: 40

Note: Answer any five questions. Write pseudo code/C code for all algorithms asked. Assume suitable missing data, if any.

1. (a) Write an algorithm to evaluate a postfix expression.

(b) Consider two strings $X = x_1, x_2, \dots, x_m$ and $Y = y_1, y_2, \dots, y_n$ where $x_i, 1 \leq i \leq m$ and $y_j, 1 \leq j \leq n$ are members of finite set symbols. Write an algorithm to generate a string by taking 1 element from each list. When any one string is exhausted, the output string should store rest of the elements of other string.

[4,4]

2. Consider a list of numbers: 62, 31, 70, 91, 25, 11, 9, 61, 73, 6

Write an algorithm to convert this array into a Max-Heap and show the application of the algorithm on given array/list. Show heap construction after every swap operation.

[8]

3. Let the key of a node in a binary search tree be X (let's also call this node, "node X"). Please give a definition of inorder Predecessor(X), and inorder Successor(X). Given that you are at node X write algorithm Predecessor(X), and Successor(X). Assume each node is having a parent pointer and root node address is always available.

[8]

4. (a) Given two linked lists a and b, each containing n distinct numbers, design two different algorithms (possibly with different efficiency) to determine whether the two lists contains precisely the same set of numbers (but possibly in a different order).

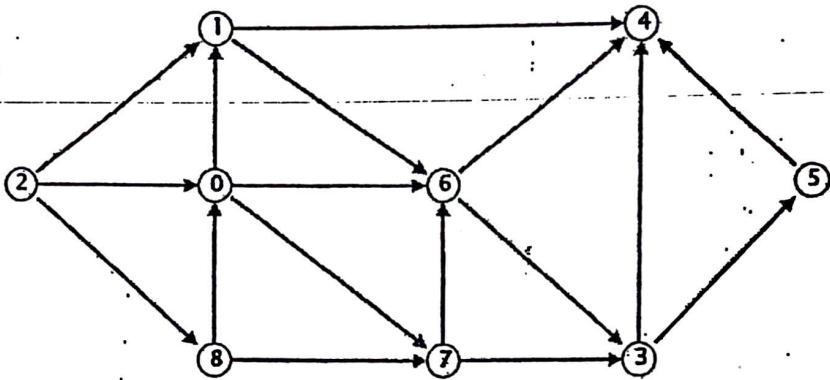
(b) Write an algorithm to reverse a singly linked list.

[6,2]

5. A priority queue is a data structure that supports storing a set of values, each of which has an associated key. Each key-value pair is an entry in the priority queue. The basic operations on a priority queue are: insert(k, v): insert value v with key k into the priority queue, removeMin(): return and remove from the priority queue the entry with the smallest key. Write complete implementation of this priority queue.

[8]

6. Consider the following acyclic digraph. Assume the adjacency lists are in sorted order: for example, when iterating through the edges pointing from 0, consider the edge $0 \rightarrow 1$ before $0 \rightarrow 6$ or $0 \rightarrow 7$.



Give topological sorting order for this graph. Also give DFS and BFS output starting from vertex 2.

[4+2+2]

7. (a) Explain properties and structure of a B-tree. Draw a B-tree of degree 4 or more having atleast three levels.

- (b) Explain BFS graph traversal technique. Write an algorithm for BFS traversal such that along with traversal it also computes single source shortest path for a given unweighted graph.

[4,4]

8. (a) Write an algorithm to count number of non-leaf nodes (internal nodes) in a given binary tree.

- (b) Write an algorithm to add two polynomials using array of structures.

[4,4]

SUPPLEMENTARY EXAMINATION

February 2019

CO-203 OBJECT ORIENTED PROGRAMMING

Time: 3 Hours

Max. Marks : 40

Note : Answer any five questions
Assume suitable missing data, if any.

- Q1. (a) Explain constructors and destructors. Give suitable code to explain. 7
(b) What is type conversion? Write suitable code for conversion from class type basic type. 7
- Q2. (a) What are the additional keywords added in C++ other than C? Explain 5 keywords of C++. 7
(b) What is the difference between inline function and macros? Write a program using inline function, to find sum of two numbers 7
- Q3. (a) Explain the use of friend function. Give suitable example. 7
(b) What is function overloading? Write a program to overload function area using function overloading. 7
- Q4. (a) Create a code for exception handling for exception type int, char and float 6
(b) Write a program to add, show details of employee and student using inheritance where class "person" is inherited by two different classes "employee" and "student" 8
- Q5. (a) Give the meaning of the following terms: 9
i) Abstraction;
ii) Encapsulation;
iii) Data hiding.
(b) Explain different visibility modes available in C++ along with their purpose. 5
- Q6. (a) What are the rules for function overloading? 5

P.T.O.

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- (b) How the virtual functions are declared in C++. 6
(c) List operators which can't be overloaded 3

6

3

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Q7. Write short notes on any two :-

- (a) Virtual class
(b) Templates
(c) Call by value
(d) Features of Java

CO 205: Discrete Structures

Duration: 3 Hours

Maximum Marks: 50

Instructions:

- First question is compulsory. Attempt any two parts from the remaining questions.
- Calculator is allowed.
- Assume missing data suitably (if any).

1. (a) Write the contrapositive, the converse, and the inverse of the following statement.
"A positive integer is a prime only if it has no divisors other than 1 and itself" [2]
(b) Define strong mathematical induction. [2]
(c) How many different messages can be represented by sequence of three dashes and two dots? [2]
(d) Define Boolean algebra with example. [2]
(e) What is chromatic number of a graph? Briefly explain. [2]
2. (a) Suppose that there are 21 cricket players in the Indian team. Out of these 6 players are taking part in a one-day match, 7 players are taking part in T-20 match and five players are taking part in both one-day and T-20 matches. How many players are not taking part either in one-day or in T-20 match? [5]
(b) Suppose that in the Hasse diagram of a partially ordered set, a vertex c is "above" another vertex a , but there is no line from a to c . Can we conclude that $a \leq c$? Explain with example. [5]
(c) In a Boolean algebra show that $ab' + a'b = 0$ if and only if $a = b$. [5]
3. (a) Use mathematical induction to show that $H_{2^n} \geq 1 + \frac{n}{2}$, where

$$H_n = 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}$$

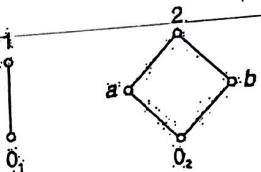
[5]

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(b) Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$, $n \geq 2$, $a_0 = 1, a_1 = 9$. [5]

(c) Let $f(n) = 5f\left(\frac{n}{2}\right) + 3$ and $f(1) = 7$. Find $f(2^k)$ where k is a positive integer. Also, estimate $f(n)$ if f is an increasing function. [5]

4. (a) Let $(L_1, *, +)$ and (L_2, \wedge, \vee) be two lattices. Define the direct product $L_1 \times L_2$ and find the direct product of the lattices given below. [5]



(b) Define a partially ordered set. Check whether $(P(X), \subseteq)$ is a chain

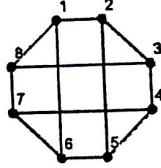
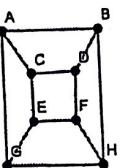
where X is a set and $P(X)$ is the power set of X . [5]

(c) In a distributive lattice, show that

$$(a * b) \oplus (b * c) \oplus (c * a) = (a \oplus b) * (b \oplus c) * (c \oplus a).$$

[5]

5. (a) Define graph isomorphism. Are the following two graphs isomorphic?



[5]

(b) Prove that a Tree with n vertices has $n-1$ edges. [5]

(c) Define spanning tree and prove that a graph is connected if and only if it has a spanning tree. [5]

~All the best~

Total No. Of Pages 2

THIRD SEMESTER

SUPPLEMENTARY EXAMINATION

Roll no.....

B.TECH (CO)

February 2019

**CO207 SIMULATION AND MODELLING
(ENGINEERING ANALYSIS AND DESIGN)**

Time 3:00 hours

Max. Marks: 50

Note: Attempt any five questions. All Questions Carry Equal Marks.

Assume suitable missing data ,if any:

Q1. Records pertaining to the monthly number of jobs related injuries at an underground coalmine were being studied by a federal agency. The values of past 100 months were as follows:

Injuries per month	0	1	2	3	4	5	6
Frequency of Occurrence	35	40	13	6	4	1	1

Apply the chi-square test to these data to test the hypothesis that the underlying distribution is Poisson. Calculate the parameter mean and use in the equation. Use $\chi^2_{0.05,5} = 11.1$ (10)

- Q.2 a)** Explain the flow diagram for the execution of arrival-and-departure events. (5)
b) Calculate the mean and variance of exponential distribution. (5)

Q.3 How to simulate a single-server queueing system by showing how its simulation model would be represented inside the computer at time $e_0 = 0$ and the times e_1, e_2, \dots, e_9 at which the 8 successive events occur that are needed to observe the desired number, $n = 4$, of delays in queue. Assume the interarrival and service times of customers are

$$\begin{aligned} A_1 &= 0.4, A_2 = 1.2, A_3 = 0.5, A_4 = 1.7, A_5 = 0.2, A_6 = 1.6, A_7 = 0.2, \dots \\ S_1 &= 2.0, S_2 = 0.7, S_3 = 0.2, S_4 = 1.1, S_5 = 3.7, S_6 = 0.6, \dots \end{aligned} \quad (10)$$

- Q.4 a)** Customers at a restaurant arrive in groups (one to eight persons). The number of persons (per group) and the relative frequencies appear as below. Draw the empirical CDF and PDF. (5)

Arrivals per party	1	2	3	4	5	6	7	8
Frequency	40	100	40	76	15	10	8	11

R.T.O

- b) Dr X is a dentist who schedules all his patients for 30 minutes appointments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the various categories of work, their probabilities and time actually needed to complete the work.

Category of service	Filling	Crown	Cleaning	Extraction	Checkup
Time Required (in mins)	40	60	15	45	15
Probability of category	0.40	0.15	0.15	0.10	0.20

Simulate the dentist's clinic for four hours and determine the average waiting time for the patients. Assume that all the patients shown up at the clinic at exactly their scheduled arrival time starting at 8:00 A.M. Use the following random numbers for handling the above problem: (5)
40, 82, 11, 34, 25, 66, 17, 79.

Q.5 a) Discuss the Queue Behaviour in a Queueing system. (3)

b) 60% of the assembled ink-jet printers are rejected at the inspection station. Find the probability that the first acceptable inkjet printer is the third one inspected. Also find the probability that the third printer inspected is the second acceptable printer? (3)

c) Given the mean and variance for a binomial distribution are 5 and $5/4$ respectively. Find $P(X \geq 1)$. (4)

Q.6 a) Suggest a step by step procedure to generate random variates using inverse transform technique for triangular distribution. (5)

b) Explain the various components used in Discrete Event Simulation Models. (5)

SUPPLEMENTARY EXAMINATION

Feb-2019

COE/SE/IT -261 ANALOG ELECTRONICS

Time: 3:00 Hours

Max. Marks : 40

Note : Question number 1 is compulsory. Answer any Four questions from the rest. Assume suitable missing data, if any. All abbreviations have their usual meaning.

- Q1. (a) If the emitter current of a transistor is 10 mA and the base current is 1/100 of collector current, determine the values of small-signal model parameters g_m and r_{π} of the transistor. 2
(b) Find the drain voltage for a fixed bias JFET circuit having $V_{GS} = -3V$, assuming $I_{DSS} = 10mA$, $V_P = -5V$, $V_{DD} = 15V$ and $R_D = 5k\Omega$. 2
(c) Explain the Barkhausen criterion of sustained oscillation. 2
(d) Determine the gain desensitivity factor for a feedback amplifier having open loop gain $A = 10^4$ and closed loop gain $A_f = 10^3$. 2

- Q2. (a) For the circuit shown in Fig. 1 determine the value of V_C and I_E if $\beta_F = 100$. 4

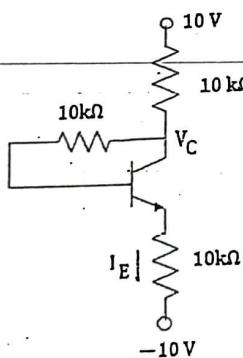


Fig. 1

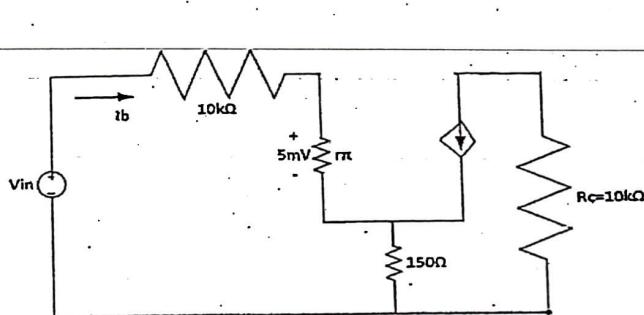


Fig. 2

- (b) Analyze the circuit shown in Fig-2 and determine the input voltage (V_{in}) if the bias current $I_{CQ} = 0.5 \text{ mA}$ and $\beta_F = \beta_0 = 100$. 4

- Q3. (a) An enhancement type NMOSFET with $V_t = 2V$, has its source terminal grounded and a 3V DC source connected to gate. Determine the region of operation of the device for $V_D = 1V$ and the value of drain current if $\mu_n C_{ox} = 20 \mu\text{A/V}^2$ and $W/L = 100\mu\text{m}/10\mu\text{m}$. 3

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(b) Drawing the small signal circuit of CG amplifier determine the voltage gain, and input resistance of the amplifier 5

Q4. (a) Deduce the expression for input resistance for a shunt-shunt feedback amplifier. 3

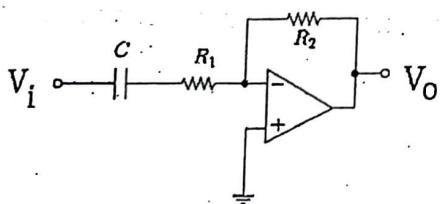


Fig. 3

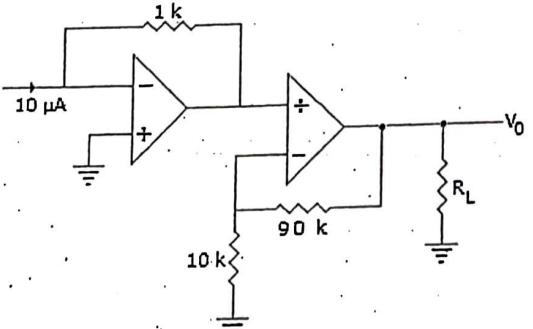


Fig. 4

(b) Derive the transfer function (V_o/V_i) for the circuit shown in Fig. 3. 3

(c) For the circuit shown in Fig. 4 determine the value of output voltage V_o . 2

Q5. (a) An enhancement type NMOSFET with $V_t = 2V$, has its source terminal grounded and a 3V DC source connected to gate. Determine the region of operation of the device for $V_D = 1V$ and the value of drain current if $\mu_n C_{ox} = 20 \mu\text{A}/\text{V}^2$ and $W/L = 100\mu\text{m}/10 \mu\text{m}$. 3

(b) Drawing the small signal circuit of CG amplifier determine the voltage gain, and input resistance of the amplifier 5

Q6. For the transistor amplifier shown in Fig. 5 assume $R_1 = 16 \text{ k}\Omega$, $R_2 = 9 \text{ k}\Omega$, $R_C = 1\text{k}\Omega$, and $R_E = 100 \Omega$, $V_{CC} = 2.5\text{V}$ and $\beta_F = \beta_0 = 100$.

(a) Determine the Q point and identify the region-of-operation of transistor. 4

(b) Determine voltage gain (V_o/V_s) and input resistance (R_i) for the amplifier. 4

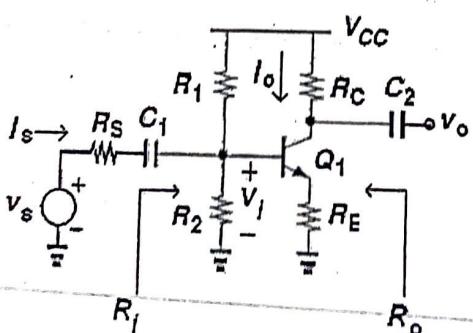


Fig.5