University of Mumbai

Examinations Commencing from 15th June 2021 to 24th June 2021

Program: **Information Technology**
Curriculum Scheme: Rev-2019

Examination: SE — Semester III
Course Code: ITC303 — Course Name: Database Management System
Time: 2 hour — Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	In the architecture of a database system external level is the____level
Option A:	conceptual
Option B:	physical
Option C:	logical
Option D:	view
2.	___is not an Schema.
Option A:	Database Schema
Option B:	Physical Schema
Option C:	Logical Schema
Option D:	Critical Schema
3.	An entity set that does not have sufficient attributes to form a primary key is called ____.
Option A:	strong entity set
Option B:	weak entity set
Option C:	simple entity set
Option D:	primary entity set
4.	Considering the constraints of generalization and specialization the constraints of disjoints and completeness is usually
Option A:	independent
Option B:	dependent
Option C:	not calculated
Option D:	undefined
5.	Cardinality is termed as
Option A:	Number of tuples.
Option B:	Number of tables
Option C:	Number of attributes.
Option D:	Number of constraints.

6.	Which operation of relation X produces Y, such that Y contains only selected attributes of X ?
Option A:	projection
Option B:	intersection
Option C:	difference
Option D:	union
7.	Using Relational Algebra the query that finds customers, who have a balance of over 1000 is
Option A:	Π Customer_name(σ balance >1000(Deposit))
Option B:	σ Customer_name(Π balance >1000(Deposit))
Option C:	Π Customer_name(σ balance >1000(Borrow))
Option D:	σ Customer_name(Π balance >1000(Borrow))
8.	SELECT * FROM employee WHERE salary>10000 AND dept_id=101; Which of the following fields are displayed as output?
Option A:	Salary,dept_id
Option B:	Employee
Option C:	Salary
Option D:	All the field of employee relation
9.	Which of the following statements contains an error ?
Option A:	Select * from emp where empid = 10003;
Option B:	Select empid from emp where empid = 10006;
Option C:	Select empid from emp;
Option D:	Select empid where empid = 1009 and lastname = 'GELLER';
10.	SELECT course_id FROM physics_fall_2009 WHERE building= 'Watson'; Here the tuples are selected from the view. Which one denotes the view.
Option A:	Course_id
Option B:	Watson
Option C:	Building
Option D:	physics_fall_2009
11.	Which of the following creates a virtual relation for storing the query?
Option A:	Function
Option B:	Procedure
Option C:	View
Option D:	Cursor
12.	Which operator test column for the absence of data?
Option A:	EXISTS operator
Option B:	NOT operator
Option C:	IS NULL operator
Option D:	LIKE operator

13.	Which Normal form has the requirement of atomic attribute?
Option A:	2 NF
Option B:	3 NF
Option C:	BCNF
Option D:	1 NF
14.	A functional dependency of the form $A \rightarrow B$ is trivial if -
Option A:	$B \subseteq B$
Option B:	$B \subseteq A$
Option C:	$A \subseteq B$
Option D:	$A \subseteq A$
15.	Which process is performed by the normalization to remove data redundancy from relations?
Option A:	Merge relations into one
Option B:	Add new columns in existing relations
Option C:	Remove columns from existing relations
Option D:	Decompose relations into smaller relations
16.	Which normal form has the requirement: Every non-prime attribute is fully functionally dependent on every key of R.
Option A:	1NF
Option B:	2NF
Option C:	3NF
Option D:	BCNF
17.	What is the requirement of the Atomicity property of Transaction?
Option A:	Execute operations completely
Option B:	Execute all operations or none at all
Option C:	Execute operations partially
Option D:	Execute some operations only
18.	Which component of DBMS handles the database consistency?
Option A:	Transaction Manager
Option B:	Authorization & Integrity manager
Option C:	Concurrency-control manager
Option D:	Buffer Manager
19.	Which component of DBMS handles the grant of locks on data items?
Option A:	Transaction Manager
Option B:	Concurrency-control manager
Option C:	File Manager
Option D:	Buffer Manager
20.	Which of the following systems is responsible for ensuring isolation?
Option A:	Recovery system
Option B:	Atomic system
Option C:	Concurrency control system
Option D:	Compiler system

<table>
<tr><td>Q2 (20 Marks)</td><td>Solve any Four out of Six 5 marks each</td></tr>
<tr><td>A</td><td>Discuss the advantages of DBMS over the File system.</td></tr>
<tr><td>B</td><td>Define derived attribute. State the need with suitable example.</td></tr>
<tr><td>C</td><td>Explain the following Relational algebra operations withsyntax and query. (i)Set Intersection (ii) Union.</td></tr>
<tr><td>D</td><td>Define (i) DDL (ii) DML. Illustrate each with a suitable example.</td></tr>
<tr><td>E</td><td>Consider the following relation.

<table><tr><td>A</td><td>B</td><td>C</td><td>Tuple#</td></tr><tr><td>10</td><td>b1</td><td>C1</td><td>#1</td></tr><tr><td>10</td><td>b2</td><td>C2</td><td>#2</td></tr><tr><td>11</td><td>b4</td><td>C1</td><td>#3</td></tr><tr><td>12</td><td>b3</td><td>C4</td><td>#4</td></tr><tr><td>13</td><td>b1</td><td>C1</td><td>#5</td></tr><tr><td>14</td><td>b3</td><td>C4</td><td>#6</td></tr></table>
Given the previous state, which of the following dependencies may hold in above relation?If dependency cannot hold explain why by specifying the tuples that cause the violation.

1)A->B 2)B->C

.</td></tr>
<tr><td>F</td><td>Draw and explain transaction state diagrams.</td></tr>
</table>

Q3 (20 Marks)	**Solve any Four out of Six** **5 marks each**
A	Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. Convert this E-R diagram into a schema.
B	Differentiate view and conflict serializability.
C	What are different types of Join? Explain any two with examples.
D	What is Functional Dependency?Define different types of it.
E	Consider the following relations for a book club: Members(Member-Id, Name, Designation, Age) Books(Book-Id , Book Title, BookAuthor, Bookpublisher, Book Price) Reserves(Member-Id, Book-Id, Date) Write SQL queries for following statements. (i) Find the names of members who are professors older than 50 years.(ii) List the titles of books reserved by professors.
F	Justify the need of DBMS in Banking and Airlines.

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Examination: SE — Semester III
Course Code: ITC303 — Course Name: Database Management System
Time: 2 hour — Max. Marks: 80

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	D
Q2.	D
Q3.	B
Q4	A
Q5	A
Q6	A
Q7	A
Q8.	D
Q9.	D
Q10.	D
Q11.	C
Q12.	C
Q13.	D
Q14.	B
Q15.	D
Q16.	C
Q17.	B
Q18.	C
Q19.	B
Q20.	C

University of Mumbai
Examination June 2021

Examinations Commencing from 15th June to 24th June 2021

Program: **Information Technology**

Curriculum Scheme: Rev2019

Examination: SE (DSE) Semester III

Course Code:ITC303 Course Name:Database Management System

Time: 2 hour Max. Marks: 80

==========

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Considering the constraints of generalization and specialization the constraints of disjoints and completeness is usually
Option A:	independent
Option B:	dependent
Option C:	not calculated
Option D:	undefined
2.	Every weak entity set can be converted into strong entity set by
Option A:	Using generalization
Option B:	adding appropriate attribute
Option C:	Using aggregation
Option D:	Using Specialization
3.	In an ER diagram simple attributes are represented by ------ and derived attributes are represented by---- --.
Option A:	ellipse, dashed ellipse
Option B:	dashed ellipse, double ellipse
Option C:	ellipse, double ellipse
Option D:	dashed ellipse, ellipse
4.	In relation schema of binary relationship set with one to one mapping cardinality, the primary key is created Using
Option A:	Primary Keys of both participating entity sets
Option B:	Primary key of entity set pointing towards one side
Option C:	Primary key of entity set pointing towards many side
Option D:	Primary key of any one participating entity set
5.	Cardinality represents
Option A:	Number of constraints
Option B:	Number of tuples.
Option C:	Number of tables
Option D:	Number of attributes
6.	Consider R1 and R2 as input relations.The relational algebra operation -------- produces the relation that has the attributes of R1 and R2 in it.
Option A:	Cartesian product
Option B:	Difference

Option C:	Intersection
Option D:	Product
7.	Which operation on relation X produces relation Y, such that Y contains only selected tuples of X
Option A:	projection
Option B:	intersection
Option C:	selection
Option D:	union
8.	If E1 and E2 are relational algebra expressions. Then which of the following is not a relational algebra expression?
Option A:	E1 / E2
Option B:	E1 X E2
Option C:	E1 U E2
Option D:	E1 - E2
9.	Using Relational Algebra the query that finds customers, who have a balance below 1000 is
Option A:	Π Customer_name(σ balance <1000(Deposit))
Option B:	σ Customer_name(Π balance <1000(Deposit))
Option C:	Π Customer_name(σ balance <1000(Borrow))
Option D:	σ Customer_name(Π balance <1000(Borrow))
10.	In relational algebra, intersection is____ operator and rename is _____operator .
Option A:	unary , unary
Option B:	binary , unary
Option C:	binary , binary
Option D:	unary , binary
11.	which of the following displays the unique values of the column? SELECT _____ dept_name FROM instructor;
Option A:	All
Option B:	From
Option C:	Distinct
Option D:	Name
12.	Which operator test column for the absence of data?
Option A:	EXISTS operator
Option B:	NOT operator
Option C:	IS NULL operator
Option D:	LIKE operator
13.	Which of the following statements contains an error ?
Option A:	Select empid where empid = 1009 and lastname = 'GELLER';
Option B:	Select empid from emp;
Option C:	Select empid from emp where empid = 10006;
Option D:	Select * from emp where empid = 10003;

14.	SELECT course_id FROM physics_fall_2009 WHERE building= 'Watson'; Here the tuples are selected from the view. Which one denotes the view.
Option A:	Course_id
Option B:	Watson
Option C:	Building
Option D:	physics_fall_2009
15.	In SQL,------ creates a virtual relation .
Option A:	Function
Option B:	Procedure
Option C:	View
Option D:	Cursor
16.	In SQL, for adding new attribute A with domain D to an existing relation r, which of the following command is used ?
Option A:	alter table r add A
Option B:	alter table r add A D
Option C:	update table r add A
Option D:	update table r add A D
17.	B in BCNF stands for-
Option A:	Bouston
Option B:	Bold
Option C:	Back
Option D:	Boyce
18.	Third Normal Form has the requirement of-
Option A:	Transitive Dependency
Option B:	Multivalued Dependency
Option C:	Trivial Functional Dependency
Option D:	Non-Trivial Functional Dependency
19.	Which normal form has the requirement: Every non-prime attribute is fully functionally dependent on every key of R.
Option A:	1NF
Option B:	2NF
Option C:	3NF
Option D:	BCNF
20.	The notation A-> B is used to denote
Option A:	Non-transitive dependency
Option B:	Transitive dependency
Option C:	Functional dependency
Option D:	Reflexive dependency

Q2 (20 Marks)	**Solve any Four out of Six** **5 marks each**
A	Design an ER diagram for education databases that contains information about an inhouse company education training scheme. The relevant relations are course(course_no, title) offering(course_no, offer_no, off_date, location) teacher(coure_no, offer_no, emp_no) enrolment(course_no, off_no, stud_no, grade) employee(emp_no, emp_name, job) student(stud_no, stud_name, ph_no)
B	Explain with example any two Fundamental Operations in Relational Algebra.
C	What is JOIN? Differentiate between Left and Right outer join with examples.
D	Consider the following relations for a book club: Members(Member-Id, Name, Designation, Age) Books(Book-Id , Booktitle, BookAuthor, Bookpublisher, Bookprice) Reserves(Member-Id, Book-Id, Date) Write SQL queries for following statements. (i) Find the names of members who are professors older than 50 years. (ii) List the titles of books reserved by professors.
E	Explain the following. i) DCL ii) DML
F	Define Boyce-Codd normal form. How does it differ from 3NF?

Q3. (20 Marks)	**Solve any Four out of Six** **5 marks each**
A	Differentiate Strong and weak entities .
B	Explain Generalization & specialization with suitable examples.
C	Explain the following Relational algebra operations with suitable examples. (i)Set Difference (ii) Division
D	What are aggregate functions in SQL? Explain any two with examples.
E	Explain with example any two integrity constraints in SQL .
F	What is Normalization ? Justify its need.

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	A
Q2.	B
Q3.	A
Q4	D
Q5	B
Q6	A
Q7	C
Q8.	A
Q9.	A
Q10.	B
Q11.	C
Q12.	C
Q13.	A
Q14.	D
Q15.	C
Q16.	B
Q17.	D
Q18.	C
Q19.	C
Q20.	C

University of Mumbai

Program: **Information Technology**
Curriculum Scheme: Rev 2019
Examination: SE Semester III
Course Code: ITC302 and Course Name: Data Structure and Analysis
Time: 2 hour Max. Marks: 80

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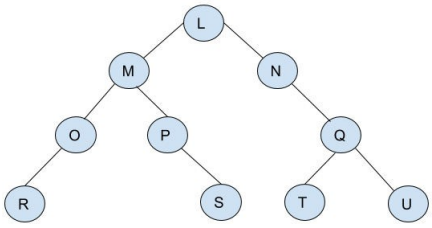
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The time required to insert an element in a stack with linked list implementation is
Option A:	O(1)
Option B:	O(log2 n)
Option C:	O(n)
Option D:	O(n log2 n)
2.	The five items: A, B, C, D and E are pushed in a stack, one after the other starting from A. Then stack is popped four times and each element is inserted in a queue. Then two elements are deleted from the queue and pushed back on the stack. Now one item is popped from the stack. The popped item is
Option A:	A
Option B:	B
Option C:	C
Option D:	D
3.	In which kind of storage structures for strings, one can easily insert, delete, concatenate and rearrange substrings?
Option A:	Fixed length storage structure
Option B:	Variable length storage with fixed maximum
Option C:	Linked list storage
Option D:	Array type storage
4.	In a circular singly linked list organization, insertion of a record involves the modification of?
Option A:	no pointer
Option B:	one pointer
Option C:	two pointers
Option D:	three pointers
5.	What is the Postorder Traversal of a Binary tree if its Inorder traversal is KYIXJ and Preorder traversal is XYKIJ?
Option A:	KYIJX
Option B:	YKIJX
Option C:	KIYJX
Option D:	KIJYX

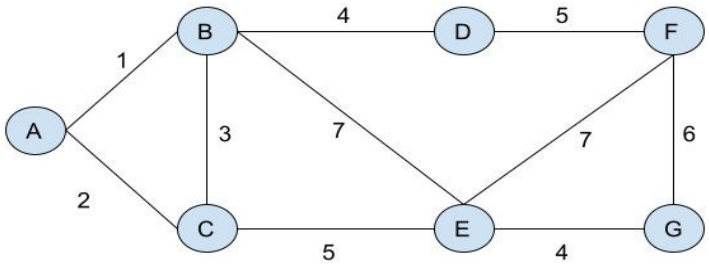
6.	Each non root node of B Tree of order M contains ?
Option A:	At least [M/2]-1 keys and maximum M-1 keys
Option B:	Minimum 2 keys and maximum M-1 keys
Option C:	Minimum M keys and at most 2*M keys
Option D:	Exact [M/2] -1 Keys
7.	What is the height of a constructed Binary Search Tree if elements 36, 2, 15, 22, 55, 43, 88, 29 are inserted in an empty Binary Search tree as per given order?
Option A:	2
Option B:	4
Option C:	6
Option D:	3
8.	Which data structure provides Multilevel Indexing?
Option A:	B-Tree
Option B:	B+-Tree
Option C:	AVL Tree
Option D:	Binary Search Tree
9.	Which of the following data structures is used for traversing in a given graph by breadth first search?
Option A:	Stack
Option B:	Set
Option C:	List
Option D:	Queue
10.	The maximum degree of any vertex in a simple graph with n vertices is?
Option A:	n
Option B:	n-1
Option C:	n+1
Option D:	2n-1
11.	The minimum number of edges in a connected cyclic graph on n vertices is?
Option A:	n-1
Option B:	n
Option C:	n+1
Option D:	2n+1
12.	Consider the case where main() function calls f1(), f1() calls f2(), later f2() calls f1() and this goes on till the terminating condition, such a case is called as?
Option A:	Direct recursion
Option B:	Unwinding phase of the recursion
Option C:	Indirect recursion
Option D:	Tail recursion
13.	Which of the methods traverses the free block list and allocates a memory block, from the free blocks list, that is found at start of the search and equal to or more than in size than required by the process?
Option A:	Free fit

Option B:	First fit
Option C:	Best fit
Option D:	Worst fit
14.	Which of the following methods will suffer from internal fragmentation?
Option A:	Allocating the first free block that is large enough to fulfill the request
Option B:	Traversing the whole free memory list and allocating the block which is closest in size of memory requested
Option C:	Allocating the free block largest in size
Option D:	Allocating the block in the multiple of fixed size
15.	In the best case of the binary search algorithm, how many comparisons will be made, if the data set contains N data elements?
Option A:	0
Option B:	1
Option C:	N-1
Option D:	N
16.	If the data set is {123, 12, 23, 22, 54, 56, 45}, and storage size is 10 where indexing starts from 0 then in hashing by "mid square method", how many collisions will occur? In the case of even counting digits, consider the left digit as middle.
Option A:	0
Option B:	1
Option C:	2
Option D:	3
17.	If the data set is {123, 12, 23, 22, 54, 56, 45}, after the first merge step of the recursive merge sort algorithm, what will be the updated data set?
Option A:	{12, 23, 22, 54, 56, 45, 123}
Option B:	{12, 123, 22, 23, 54, 56, 45}
Option C:	{12, 123, 23, 22, 54, 56, 45}
Option D:	{12, 23, 22, 45, 56, 54, 123}
18.	What is Postfix Expression of given Infix Expression X-Y*(A+B)/C ?
Option A:	XYAB+C/*-
Option B:	XYAB+*C/-
Option C:	XYAB+C-*/
Option D:	XYAB+*C-/
19.	What is the probability of finding the greatest element at the last level from full binary min heap tree with n number of elements and every node with degree 2?
Option A:	1/n
Option B:	n
Option C:	1
Option D:	$1/2^n$
20.	Which data structure is used for the application of implementation of simulation of scheduling of Limited resources?
Option A:	Stack
Option B:	Queue

Option C:	Heap
Option D:	Trees

Q2	**Total 20 marks.**
Q2A	**Solve any Two, 5 marks each, total 10 marks.**
i.	Explain the selection sort algorithm, along with a working example.
ii.	Write Inorder Traversal, Preorder Traversal and Postorder Traversal sequence for given binary tree by giving its algorithm. 
iii.	Solve stepwise, to convert the following Infix expression to Postfix notation. (x*y)+(z+((a+b-c)*d))- i*(j/k)
Q2B	**Solve any One, 10 marks each, total 10 marks.**
i.	Explain what is a Singly linked list along with its operations: traversing, searching, insertion and deletion. Proper diagrammatic representations of operations on the linked list, as mentioned above, are also expected. Also, write two real world applications of the linked list.
ii.	What is an AVL Tree? Construct an AVL tree for the following dataset: 33, 38, 42, 21, 16, 26, 40, 30, 27, 22, 14, 15, 19 Mention the rotations, if any, at each step.

Q3	**Total 20 marks.**
Q3A	**Solve any Two, 5 marks each, total 10 marks.**
i.	Generate a Huffman Tree for the string **CBAAFFACFB**. At the end specify the Huffman code for each character in the given string. Specify how much memory bits are saved from the original, if 8 bits per character are required to store the string in original format.
ii.	What is fragmentation in the storage management? What are the types of fragmentation that may occur while memory allocation/ deallocation? With example, explain how the Boundary Tag method keeps track of free memory blocks.
iii.	Explain Collision in hashing with an example. What are the methods to resolve collision? Explain Double Hashing with an example.
Q3B	**Solve any One, 10 marks each, total 10 marks.**
i.	Explain the working of queue with its operations: insert, delete, display, empty , full. Proper diagrammatic representations of operations as mentioned above, are also expected. Also, write two applications (algorithms) where queue data structure is used.
ii.	Write Prim's algorithm and Kruskal's algorithm to find Minimum Spanning Tree (MST). Also for the given graph below, find the MST using Prim's algorithm and Kruskal's algorithm, both. Specify the cost at each step, and total weight.


A
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University of Mumbai

Program: **Information Technology**
Curriculum Scheme: Rev 2019
Examination: SE Semester III
Course Code: ITC302 and Course Name: Data Structure and Analysis
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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	A
Q2.	D
Q3.	C
Q4	C
Q5	C
Q6	A
Q7	B
Q8.	B
Q9.	D
Q10.	B
Q11.	B
Q12.	C
Q13.	B
Q14.	D
Q15.	B
Q16.	B
Q17.	C
Q18.	B
Q19.	C
Q20.	B

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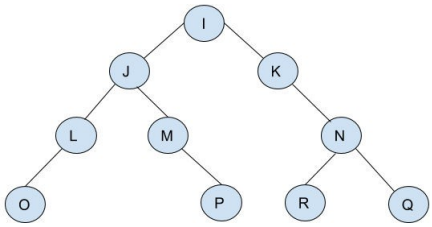
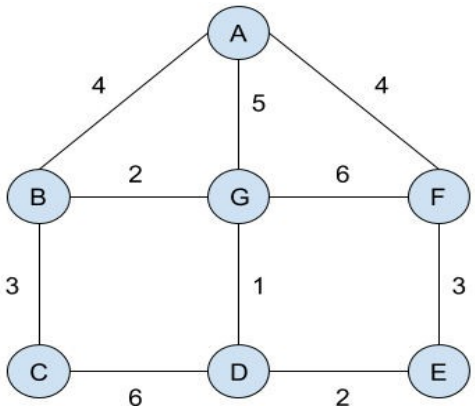
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Given two statements: (i) Insertion of an element should be done at the last node in a circular linked list. (ii) Deletion of an element should be done at the last node in a circular linked list.
Option A:	Both are True
Option B:	Both are False
Option C:	First is True and second is False
Option D:	First is False and second is True
2.	To free which of the following list, traversing through the entire list is not necessary?
Option A:	Priority list
Option B:	Singly linked list
Option C:	Doubly linked list
Option D:	Both Singly linked list and Doubly linked list
3.	Stack cannot be used to?
Option A:	Evaluate an arithmetic expression in postfix form
Option B:	Implement recursion
Option C:	Convert a given arithmetic expression infix form to its equivalent postfix form
Option D:	Allocate resources (like CPU) by the operating system
4.	Which of the following is useful in implementing quick sort?
Option A:	stack
Option B:	graph
Option C:	array
Option D:	queue
5.	AVL Tree takes _____time to perform insertion and deletion operation.
Option A:	O(n)
Option B:	$O(n^2)$
Option C:	$O(\log_2 n)$
Option D:	$O(n\log_2 n)$
6.	What is the Preorder Traversal of a Binary tree if its Inorder traversal is DBEAC and Postorder traversal is DEBCA?
Option A:	ABEDC
Option B:	ABDEC

Option C:	DACBE
Option D:	CABDE
7.	What is the height of a constructed Binary Search Tree if elements 56, 12, 20, 22, 85, 73, 87 are inserted in an empty Binary Search tree as per given order?
Option A:	6
Option B:	2
Option C:	4
Option D:	3
8.	The number of nodes in Full Binary Tree at level L are:
Option A:	2^L-1
Option B:	2^L
Option C:	2^L+1
Option D:	L+1
9.	A connected graph is the one which
Option A:	cannot be partitioned without removing an edge
Option B:	contains at least 3 loops
Option C:	does not contain a cycle
Option D:	is not simple
10.	In breadth first search, if the branching factor of the graph is ‘b’ and the depth of the graph is ‘d’, then the space complexity is
Option A:	O(b^d)
Option B:	O(b+d-1)
Option C:	O(b*d)
Option D:	O(b+d)
11.	If in a directed graph, there exists a path between each pair of its vertices, then it is called
Option A:	strongly connected
Option B:	weakly connected
Option C:	asymmetric graph
Option D:	Hamiltonian graph
12.	int fact(int n) { if(n==0) return 1; else return n*fact(n-1); } in this code if main() calls fact(4) then how many times a recursive call will be made?
Option A:	6
Option B:	5
Option C:	4
Option D:	3
13.	Which of the methods traverses the free block list and allocates a memory block, from the free blocks, that is largest in size?
Option A:	Free fit
Option B:	First fit
Option C:	Best fit

Option D:	Worst fit
14.	Which of the following methods will suffer from external fragmentation?
Option A:	Allocating the first free block that is large enough to fulfill the request
Option B:	Traversing the whole free memory list and allocating the block which is closest in size of memory requested
Option C:	Allocating the free block largest in size
Option D:	Allocating the block in the multiple of fixed size
15.	In the best case of the linear search algorithm, how many comparisons will be made, in case the data set contains N elements?
Option A:	0
Option B:	1
Option C:	N-1
Option D:	N
16.	If the data set is {123, 12, 23, 22, 54, 56, 45}, and storage size is 7, where indexing starts from 1 then in hashing with "truncation by left 1", how many collisions will occur?
Option A:	0
Option B:	1
Option C:	2
Option D:	3
17.	If the data set is {123, 12, 23, 22, 54, 56, 45}, after the first iteration what will be the updated data set in the quick sort algorithm if pivot is considered as the last element?
Option A:	{12, 23, 22, 45, 54, 56, 123}
Option B:	{12, 23, 22, 45, 123, 54, 56}
Option C:	{12, 22, 23, 45, 54, 56, 123}
Option D:	{12, 23, 22, 45, 56, 54, 123}
18.	What is Postfix Expression of given Infix Expression L+(M/(A-B)*C)?
Option A:	LMAB-C/*+
Option B:	LMAB-/C*+
Option C:	LMAB-/C+*
Option D:	LMAB-C+/*
19.	Heap can also be used to implement_____
Option A:	Stack
Option B:	Priority Queue
Option C:	Double Ended Queue
Option D:	An ascending order Array
20.	What is time required to find out the degree of any vertex in Undirected Graph G with n vertices and e edges and G is represented by the Adjacency Matrix?
Option A:	$O(n^2)$
Option B:	O(n+e)
Option C:	O(n)
Option D:	O(e)

Q2	**Total 20 marks.**
Q2A	**Solve any Two, 5 marks each, total 10 marks.**
i.	Explain the Quick sort algorithm along with a working example.
ii.	Write Inorder Traversal, Preorder Traversal and Postorder Traversal sequence for given binary tree by giving its algorithm. 
iii.	Solve stepwise to convert the expression to Prefix notation. (x*y)+(z+((a+b-c)*d))- i*(j/k)
Q2B	**Solve any One, 10 marks each, total 10 marks.**
i.	Explain what is a Circular linked list along with its operations: traversing, searching, insertion and deletion. Proper diagrammatic representations are also expected. Also, write two real world applications of it.
ii.	Define an AVL Tree. Construct an AVL tree for the following dataset: 23, 28, 32, 11, 6, 16, 30, 20, 17, 12, 4, 5, 9 Mention the rotations, if any, at each step.

Q3	**Total 20 marks.**
Q3A	**Solve any Two, 5 marks each, total 10 marks.**
i.	Generate a Huffman Tree for the string **BBAEDAFCBA**. At the end specify the Huffman code for each character in the given string. Specify how much memory bits are saved from the original, if 8 bits per character are required to store the string in original format.
ii.	With example, explain how the Binary Buddy System in the storage management allocates free memory blocks upon request and keeps track of free blocks after the process frees allocated memory block.
iii.	What Collision in hashing with an example? Explain the methods to resolve collision. What is Quadratic Probing with an example?
Q3B	**Solve any One, 10 marks each, total 10 marks.**
i.	Explain the working of priority queue with its operations: insert, delete, display, empty, full. Proper diagrammatic representations of operations as mentioned above, are also expected. Also, write two applications (algorithms) where priority queue data structure is used.
ii.	Write Prim's algorithm and Kruskal's algorithm to find Minimum Spanning Tree (MST). Also for the given graph below, find the MST using Prim's algorithm and Kruskal's algorithm, both. Specify the cost at each step, and total weight.


A
4
5
4
B
2
G
6
F
3
1
3
C
D
E
6
2

University of Mumbai

Program: **Information Technology**
Curriculum Scheme: Rev 2019
Examination: SE Semester III
Course Code: ITC302 and Course Name: Data Structure and Analysis
Time: 2 hour Max. Marks: 80

==========

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	D
Q3.	D
Q4	C
Q5	C
Q6	B
Q7	D
Q8.	B
Q9.	A
Q10.	A
Q11.	A
Q12.	C
Q13.	D
Q14.	C
Q15.	B
Q16.	D
Q17.	A
Q18.	B
Q19.	B
Q20.	A

University of Mumbai

Program: Information Technology
Curriculum Scheme: Rev 2019
Examination: SE Semester III
Course Code: ITC301 and Course Name: Engineering Mathematics III

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The Laplace Transform of $t.e^{at}$
Option A:	$\frac{1}{s}$
Option B:	$\frac{1}{(s-a)^2}$
Option C:	$\frac{1}{(s+a)^2}$
Option D:	$\frac{1}{s^2}$
2	Find $L\left(\frac{e^{-t}\sin t}{t}\right)$
Option A:	$\cot^{-1}(s+1)$
Option B:	$\tan^{-1}(s+1)$
Option C:	$\tan^{-1}(s-1)$
Option D:	$\cot^{-1} s$
3	Given $f(t)=\frac{\sin t}{t}$, find $L\{f'(t)\}$
Option A:	$s\cot^{-1} s$
Option B:	$s\cot^{-1} s+1$
Option C:	$\tan^{-1} s-1$
Option D:	$s\cot^{-1} s-1$
4	Find the Laplace transform of $\int_0^t \frac{\sin u}{u} du$
Option A:	$\frac{1}{s}\tan^{-1} s$
Option B:	$\cot^{-1} s$
Option C:	$\frac{1}{s}\cot^{-1} s$
Option D:	$\tan^{-1} s$

5	Find $L^{-1}\left[\frac{s+2}{s^2+4s+7}\right]$
Option A:	$e^{-2t}.\cos\sqrt{3}t$
Option B:	$e^{-2t}.\cos\sqrt{2t}$
Option C:	$e^{-2t}.\cos^2 t$
Option D:	$e^{-2t}.\sin\sqrt{3t}$
6	Find $L^{-1}\left[\frac{3s+4}{s^2+16}\right]$
Option A:	$4.\sin 4t+\cos 4t$
Option B:	$\cos 4t+\sin 3t$
Option C:	$3.\cos 4t+\sin 4t$
Option D:	$\sin 3t+\cos 4t$
7	Find the Inverse Laplace transform of $\frac{1}{s.(s+a)}$
Option A:	$\frac{1+e^{-at}}{a}$
Option B:	e^{-at}
Option C:	$e^{-at}+1$
Option D:	$\frac{1-e^{-at}}{a}$
8	If $L\{f_1(t)\}=F_1(s)$ and $L\{f_2(t)\}=F_2(s)$ then by Convolution theorem $L^{-1}[F_1(s)*F_2(s)]$
Option A:	$\int_0^\infty f_1(u)\cdot f_2(t-u)du$
Option B:	$\int_0^{\square} f_1(u)\cdot f_2(u)du$
Option C:	$\int_0^{\square} f_1(u)\cdot f_2(t-u)du$
Option D:	$\int_0^\infty f_1(u)\cdot f_2(u)du$
9	In half range □ Fourier series, we assume the function to be
Option A:	Odd function
Option B:	Even function
Option C:	Can't be determined
Option D:	Can be anything

10	The Fourier co-efficient a_n for the function $f(x) = x^2$ in $(0,2\pi)$ is given by
Option A:	$\frac{n}{4\pi}$
Option B:	$\frac{3\pi}{n^2}$
Option C:	$\frac{4\pi}{n}$
Option D:	$\frac{3\pi}{n^3}$
11	If $f(x) = \cos x$ defined in $(-\pi, \pi)$ then the value Fourier coefficient b_n is
Option A:	0
Option B:	□
Option C:	□ / $(n^2 - 1)$
Option D:	2□ / $(n^2 - 1)$ $[(-1)^n - 1]$
12	If $f(z) = e^z$ is an analytic function, then real part is given by
Option A:	$e^x \cos y$
Option B:	$\cos y$
Option C:	$-e^x \sin y$
Option D:	$\sin y$
13	A function $u(x, y)$ is harmonic if and only if,
Option A:	$u_{xx} + u_{yy} = 0$
Option B:	$u_x + u_y = 0$
Option C:	$u_{xy} + u_{yx} = 0$
Option D:	$u_x - u_y = 0$
14	If $f(z)$ is an analytic and $\lvert f(z) \rvert$ is constant, then $f(z)$ is
Option A:	Harmonic
Option B:	constant
Option C:	orthogonal
Option D:	conjugate
15	A random variable X has probability distribution with E(X)=1.5, E(X^2)=3 then then variance is
Option A:	0.75
Option B:	1.5
Option C:	3
Option D:	5.25

16	A continuous random variable X has the probability density function $f(x) = kx^2,\ 0 \le x \le 2$. Determine k
Option A:	$\frac{5}{8}$
Option B:	$\frac{2}{8}$
Option C:	$\frac{8}{3}$
Option D:	$\frac{3}{8}$
17	If X_1 has mean 4 and variance 9 and X_2 has mean -2 variance 4, and the two are independent, find $V(2X_1 + X_2 - 3)$
Option A:	3
Option B:	41
Option C:	14
Option D:	36
18	The limits for coefficient of correlation are
Option A:	$-1 \le r \le 2.$
Option B:	$-1 \le r \le 0.$
Option C:	$-1 \le r \le 1.$
Option D:	$0 \le r \le 1.$
19	If □ = 0.7764 , □ = 1.2321 then coefficient of correlation
Option A:	0.9781
Option B:	0.6291
Option C:	1.2307
Option D:	0.0023
20	If the tangent of the angle made by the line of regression of y on x is 0.6 and $\sigma_y = 2\sigma_x$, find the correlation coefficient between x and y.
Option A:	$r = 0.25$
Option B:	$r = 0.15$
Option C:	$r = 0.2$
Option D:	$r = 0.3$

Subjective / Descriptive questions

Q2 (20 Marks)	**Solve any Four out of Six. 5 marks each**
A	Find the Laplace transform of $\cos t.\cos 2t.\cos 3t$
B	Using convolution theorem find the Inverse Laplace transform of $\frac{s^2}{\left(s^2+a^2\right)^2}$
C	Find the Fourier expansion of $f(x)=x+x^2$; $-\pi \le x \le \pi$ and $f(x+2\pi)=f(x)$
D	Find k & then $E(X)$, if X has the probability density function $f(x)=\begin{cases} kx(2-x), & 0\le x\le 2, k>0 \\ 0, & otherwise \end{cases}$
E	Find an analytic function $f(z)$ whose imaginary part is $e^{-x}(y\sin y + x\cos y)$
F	Obtain the rank correlation coefficient from the following data X : 10, 12, 18, 18, 15, 40 Y : 12, 18, 25, 25, 50, 25

Q3 (20 Marks)	**Solve any Four out of Six. 5 marks each**
A	By using Laplace transform, evaluate $\int_0^\infty e^{-t}\left(\frac{\cos 3t-\cos 2t}{t}\right).dt$
B	Find the inverse Laplace transform of $\tan^{-1}\left(\frac{2}{s^2}\right)$
C	Find the orthogonal trajectory of the family of curves $x^3y-xy^3=c$
D	A random variable X has the following probability function X : 1 2 3 4 5 6 7 $P(X=x)$: k $2k$ $3k$ k^2 k^2+k $2k^2$ $4k^2$ Find i) k and ii) $P(X<5)$
E	Obtain the expansion of $f(x)=x(\pi-x)$; $0<x<\pi$ as a half-range cosine series.
F	Fit a straight line of the form $y=a+bx$ to the following data & estimate the value of y for $x=3.5$ x : 0 1 2 3 4 y : 1 1.8 3.3 4.5 6.3

University of Mumbai

Program: Information Technology
Curriculum Scheme: Rev 2019
Examination: SE Semester III
Course Code: ITC301 and Course Name: Engineering Mathematics III
Time: 2 hour Max. Marks: 80

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Question Number	Correct Option
Q1.	B
Q2.	A
Q3.	D
Q4	C
Q5	A
Q6	C
Q7	D
Q8.	C
Q9.	A
Q10.	C
Q11.	A
Q12.	A
Q13.	A
Q14.	B
Q15.	A
Q16.	D
Q17.	B
Q18.	C
Q19.	A
Q20.	D

University of Mumbai

Program: Information Technology
Curriculum Scheme: Rev 2019 'C' Scheme
Examination: SE Semester III
Course Code: ITC301 and Course Name: Engineering Mathematics III
Time: 2 hour Max. Marks: 80

==========

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
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Option D:	$r = 0.3$

Subjective / Descriptive questions

Q2 (20 Marks)	**Solve any Four out of Six. 5 marks each**
A	Find the Laplace transform of $\cos t.\cos 2t.\cos 3t$
B	Using convolution theorem find the Inverse Laplace transform of $\frac{s^2}{\left(s^2+a^2\right)^2}$
C	Find the Fourier expansion of $f(x)=x+x^2$; $-\pi \le x \le \pi$ and $f(x+2\pi)=f(x)$
D	Find k & then $E(X)$, if X has the probability density function $f(x)=\begin{cases} kx(2-x), & 0\le x\le 2, k>0 \\ 0, & otherwise \end{cases}$
E	Find an analytic function $f(z)$ whose imaginary part is $e^{-x}(y\sin y + x\cos y)$
F	Obtain the rank correlation coefficient from the following data X : 10, 12, 18, 18, 15, 40 Y : 12, 18, 25, 25, 50, 25

Q3 (20 Marks)	**Solve any Four out of Six. 5 marks each**
A	By using Laplace transform, evaluate $\int_0^\infty e^{-t}\left(\frac{\cos 3t-\cos 2t}{t}\right).dt$
B	Find the inverse Laplace transform of $\tan^{-1}\left(\frac{2}{s^2}\right)$
C	Find the orthogonal trajectory of the family of curves $x^3y-xy^3=c$
D	A random variable X has the following probability function X : 1 2 3 4 5 6 7 $P(X=x)$: k $2k$ $3k$ k^2 k^2+k $2k^2$ $4k^2$ Find i) k and ii) $P(X<5)$
E	Obtain the expansion of $f(x)=x(\pi-x)$; $0<x<\pi$ as a half-range cosine series.
F	Fit a straight line of the form $y=a+bx$ to the following data & estimate the value of y for $x=3.5$ x : 0 1 2 3 4 y : 1 1.8 3.3 4.5 6.3

University of Mumbai

Program: Information Technology
Curriculum Scheme: Rev 2019 'C' Scheme
Examination: SE Semester III
Course Code: ITC301 and Course Name: Engineering Mathematics III
Time: 2 hour Max. Marks: 80

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Question Number	Correct Option
Q1.	B
Q2.	A
Q3.	D
Q4	C
Q5	A
Q6	C
Q7	D
Q8.	C
Q9.	A
Q10.	C
Q11.	A
Q12.	A
Q13.	A
Q14.	B
Q15.	A
Q16.	D
Q17.	B
Q18.	C
Q19.	A
Q20.	D

University of Mumbai

Program: **Information Technology**
Curriculum Scheme: Rev2019
Examination: SE Semester-III
Course Code: ITC 304 and Course Name: Principle of Communication

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What is the upper frequency of a signal with a bandwidth of 10MHz, if the lower frequency limit is 54MHz?
Option A:	64MHz
Option B:	48MHz
Option C:	84MHz
Option D:	48Hz
2.	Which one of the following channels has higher data rates as compared to the other wired communication channels?
Option A:	Coaxial cable channel
Option B:	Shielded Twisted pair cable channel
Option C:	Optical fiber channel
Option D:	Unshielded Twisted pair cable channel
3.	Which one of the following is not the Analog modulation system?
Option A:	PAM
Option B:	FM
Option C:	PWM
Option D:	PCM
4.	An amplifier has a noise figure of 3 dB. What is its equivalent temperature?
Option A:	600^0K
Option B:	300^0K
Option C:	400^0K
Option D:	500^0K
5.	The expression for the rms value of the thermal noise voltage is--------
Option A:	kTB
Option B:	Sqrt(4kTBR)
Option C:	4kTB
Option D:	4kTRB
6.	Which one of the following is one of the types of Internal Noise?
Option A:	Atmospheric Noise

Option B:	Industrial Noise
Option C:	Extraterrestrial Noise
Option D:	Thermal Noise
7.	A broadcast radio transmitter radiates 5kW power when the modulation percentage is 60%. What is the carrier power?
Option A:	10.75kW
Option B:	4.237kW
Option C:	1kW
Option D:	8kW
8.	The modulation index of AM is defined as---
Option A:	The ratio of amplitudes of the modulating and carrier wave
Option B:	The ratio of amplitudes of the carrier and modulating wave
Option C:	The ratio of frequencies of the modulating and carrier wave
Option D:	The ratio of frequencies of the carrier and modulating wave
9.	The Intermediate Frequency of the Super Heterodyne receiver is……. [Where f_o is the Local oscillator frequency and f_s is the RF amplifier frequency)
Option A:	f_o-f_s
Option B:	f_sxf_o
Option C:	f_s+f_o
Option D:	f_o/f_s
10.	The artificial boosting of higher modulating frequencies is called as…….
Option A:	De-emphasis
Option B:	Pre-emphasis
Option C:	Diagonal clipping
Option D:	Negative peak clipping
11.	A carrier is frequency modulated with a sinusoidal signal of 2kHz resulting in a maximum frequency deviation of 5 kHz. Find the bandwidth of the modulated signal.
Option A:	10 kHz
Option B:	20 kHz
Option C:	14 kHz
Option D:	28 kHz.
12.	The frequency deviation of FM is……
Option A:	m_f x f_m
Option B:	f_c+f_m
Option C:	m_f / f_m
Option D:	f_c / f_m
13.	Aliasing error occurs when…..
Option A:	f_s=2f_m
Option B:	f_s=4f_m
Option C:	f_s<2f_m
Option D:	f_s>2f_m

14.	The Step size varies in one of the following modulation systems.
Option A:	Pulse Code Modulation
Option B:	Delta Modulation
Option C:	Adaptive Delta Modulation
Option D:	Pulse Amplitude Modulation
15.	Which one of the following is not the essential operation in PCM transmitter?
Option A:	Sampling
Option B:	Quatizing
Option C:	Encoding
Option D:	Decoding
16.	The Inter symbol interference and its effects on various communication systems are studied by using……
Option A:	Modulator
Option B:	Demodulator
Option C:	Comparator
Option D:	Eye Pattern
17.	The cross talk is severe in one of the following techniques
Option A:	Frequency Division Multiplexing
Option B:	Time Division Multiplexing
Option C:	Amplitude Modulation
Option D:	Pulse Amplitude Modulation.
18.	Noise immunity is low in one of the following modulation techniques
Option A:	BASK
Option B:	BPSK
Option C:	BFSK
Option D:	QPSK
19.	The redistribution or modulation of energy within a wave front, when it passes near the edges of an opaque object is defined as……..
Option A:	Reflection
Option B:	Refraction
Option C:	Diffraction
Option D:	Interference
20.	In which of the following propagation, the waves travel along the surface of the earth?
Option A:	Sky Wave Propagation
Option B:	Space Wave Propagation
Option C:	Ground Wave Propagation
Option D:	Tropospheric Scatter Propagation

Q2. **(20 Marks)**	**Solve any Two Questions out of Three 10 marks each**
A	Derive the expression for Friss formula for two stage cascade Amplifier.

	For three cascaded amplifier stages, each with noise figure of 3 dB and power gain of 10dB, determine the overall noise figure.
B	Derive the mathematical expression for Amplitude modulation and also draw the waveforms for m<1, m>1 and m=1.
C	Explain the generation of PPM signal with neat block diagram and also compare PPM with PAM and PWM.

Q3. **(20 Marks)**	**Solve any Two Questions out of Three 10 marks each**
A	Draw and explain the Foster seeley discriminator with neat diagram.
B	Explain BASK Generation and Detection with neat block diagram and waveforms.
C	Explain the principle of Sky wave propagation and its layers and also explain Virtual height.

University of Mumbai

Program: **Information Technology**
Curriculum Scheme: Rev2019
Examination: SE Semester III
Course Code: ITC 304 and Course Name: Principle of Communication
Time: 2 hour Max. Marks: 80

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Question Number	Correct Option
Q1.	A
Q2.	C
Q3.	D
Q4	B
Q5	B
Q6	D
Q7	B
Q8.	A
Q9.	A
Q10.	B
Q11.	C
Q12.	A
Q13.	C
Q14.	C
Q15.	D
Q16.	D
Q17.	A
Q18.	A
Q19.	C
Q20.	C

University of Mumbai

Examination Commencing from 15th June 2021 to 24th June 2021

Program: **Information Technology**

Curriculum Scheme: Rev2019

Examination: SE Semester III (DSE)

Course Code: ITC304 and Course Name: Principle of Communication

Time: 2 hour Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What is the upper frequency of a signal with a bandwidth of 10MHz, if the lower frequency limit is 54MHz?
Option A:	64MHz
Option B:	48MHz
Option C:	84MHz
Option D:	48Hz
2.	Which of the following has a minimum wavelength?
Option A:	Gamma rays
Option B:	Blue light
Option C:	Infrared rays
Option D:	Microwave
3.	Medium which sends information from source to receiver is called ____ _____
Option A:	Transmitter
Option B:	Transducer
Option C:	Loudspeaker
Option D:	Channel
4.	What is the wavelength of a signal with a frequency of 150MHz?
Option A:	10m
Option B:	2m
Option C:	5m
Option D:	20m
5.	Which one of the following channels has higher data rates as compared to the other wired communication channels?
Option A:	Coaxial cable channel
Option B:	Shielded Twisted pair cable channel
Option C:	Optical fiber channel
Option D:	Unshielded Twisted pair cable channel
6.	Thermal noise is also called as
Option A:	Johnson Noise
Option B:	Partition Noise
Option C:	Flicker Noise
Option D:	Solar Noise

7.	Which of the following is one of the types of Internal Noise?
Option A:	Atmospheric Noise
Option B:	Industrial Noise
Option C:	Extraterrestrial Noise
Option D:	Thermal Noise
8.	Periodic signal is……
Option A:	The signals which change with time
Option B:	The signals which change with frequency
Option C:	The signals that repeat itself over a fixed frequency
Option D:	The signal that repeats itself in time
9.	An amplifier has a noise figure of 10 dB. What is the Noise Factor?
Option A:	1
Option B:	10
Option C:	100
Option D:	1000
10.	White noise has_____power spectral density.
Option A:	Constant
Option B:	Variable
Option C:	Flickering
Option D:	Fluctuating
11.	Which one of the following is not the Analog modulation system?
Option A:	PAM
Option B:	FM
Option C:	PWM
Option D:	PCM
12.	A broadcast radio transmitter radiates 5kW power when the modulation percentage is 60%. What is the carrier power?
Option A:	10.75kW
Option B:	4.237kW
Option C:	1kW
Option D:	8kW
13.	The modulation index of AM is defined as---
Option A:	The ratio of amplitudes of the modulating and carrier wave
Option B:	The ratio of amplitudes of the carrier and modulating wave
Option C:	The ratio of frequencies of the modulating and carrier wave
Option D:	The ratio of frequencies of the carrier and modulating wave
14.	The Intermediate Frequency of the Super Heterodyne receiver is……. [Where $f_o$is the Local oscillator frequency and $f_s$is the RF amplifier frequency)
Option A:	f_o-f_s
Option B:	f_sxf_o
Option C:	f_s+f_o
Option D:	f_o/f_s

15.	The artificial boosting of higher modulating frequencies is called as…….
Option A:	De-emphasis
Option B:	Pre-emphasis
Option C:	Diagonal clipping
Option D:	Negative peak clipping
16.	A carrier is frequency modulated with a sinusoidal signal of 2kHz resulting in a maximum frequency deviation of 5 kHz. Find the bandwidth of the modulated signal.
Option A:	10 kHz
Option B:	20 kHz
Option C:	14 kHz
Option D:	28 kHz.
17.	The frequency deviation of FM is……
Option A:	m_f x f_m
Option B:	f_c+f_m
Option C:	m_f / f_m
Option D:	f_c / f_m
18.	The Bandwidth of DSBFC AM is…….
Option A:	$4f_m$
Option B:	$2f_m$
Option C:	$3f_m$
Option D:	f_m
19.	The Intermediate frequency used for AM receiver is…..
Option A:	455 MHz
Option B:	455 KHz
Option C:	455 Hz
Option D:	905 KHz
20.	The ability of a receiver to reject unwanted signal is called……..
Option A:	Fidelity
Option B:	Amplification
Option C:	Selectivity
Option D:	Sensitivity

Q2 **(20 Marks)**	**Solve any Two Questions out of Three 10 marks each**
A	(i) Derive the Friiss formula. (ii) For three cascaded amplifier stages, each with noise figure of 3 dB and power gain of 10 dB, determine the overall noise figure(in dB).
B	(i) Derive the expression of AM. (ii) A sinusoidal carrier has amplitude of 10V and a frequency of 100 kHz. It is amplitude modulated by a sinusoidal voltage of amplitude 3V and

	frequency 500 Hz. Modulated voltage is developed across 75 Ohms resistance. Write the equation for the modulated wave.
C	Explain the working of Ratio detector and compare its performance with Foster Seeley Discriminator.

Q3 **(20 Marks)**	**Solve any Two Questions out of Three 10 marks each**
A	State and prove the time shifting property and frequency shifting property of the Fourier Transform.
B	Explain Super heterodyne receiver with neat block diagram and compare its performance with TRF receiver.
C	A 25 MHz carrier is modulated by a 400 Hz audio sine wave. If the carrier voltage is 4V and maximum deviation is 10 KHz. Write the equation of modulated wave for FM. If the modulating frequency is now changed to 2 KHz, all else remaining constant , derive the new equation for FM.

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Question Number	Correct Option
Q1.	A
Q2.	A
Q3.	D
Q4	B
Q5	C
Q6	A
Q7	D
Q8.	D
Q9.	B
Q10.	A
Q11.	D
Q12.	B
Q13.	A
Q14.	A
Q15.	B
Q16.	C
Q17.	A
Q18.	B
Q19.	B
Q20.	C