University of Mumbai
Examination 2020 under cluster __ (Lead College: _____)
Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021
Program: **Information Technology**
Curriculum Scheme: Rev 2019
Examination: Second Year Semester III
Course Code: ITC301 and Course Name: Engineering Mathematics-3

Time: 2 hour   Max. Marks: 80

==

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Laplace transform of $\cos\left(\sqrt{3}\, t\right)$ is
Option A:	$\dfrac{s}{s^2 + 9}$
Option B:	$\dfrac{s}{s^2 - 9}$
Option C:	$\dfrac{s}{s^2 + 3}$
Option D:	$\dfrac{s}{s^2 - 3}$
2.	The value of $\int_0^\infty e^{-3t}\left(\dfrac{\sinh t}{t}\right)\, dt$ is
Option A:	$\dfrac{1}{3} \ln 3$
Option B:	$\dfrac{1}{3} \ln\left(\dfrac{1}{3}\right)$
Option C:	$\dfrac{1}{2} \ln 2$
Option D:	$\dfrac{1}{2} \ln\left(\dfrac{1}{2}\right)$
3.	Laplace transform of $f(t) = t^2 e^{-t}$ is
Option A:	$\dfrac{2}{(s - 1)^3}$
Option B:	$\dfrac{2}{(s + 1)^3}$

Option C:	$\dfrac{\Gamma(2)}{(s-1)^3}$
Option D:	$\dfrac{\Gamma(2)}{(s+1)^3}$
4.	Laplace transform of $\int_0^t \sin 2t\ cosh2t\ dt$ is
Option A:	$\dfrac{1}{s}\left[\dfrac{1}{(s-2)^2-4} - \dfrac{1}{(s+2)^2-4}\right]$
Option B:	$\dfrac{1}{s}\left[\dfrac{1}{(s-2)^2-4} + \dfrac{1}{(s+2)^2-4}\right]$
Option C:	$\dfrac{1}{s}\left[\dfrac{1}{(s-2)^2+4} - \dfrac{1}{(s+2)^2+4}\right]$
Option D:	$\dfrac{1}{s}\left[\dfrac{1}{(s-2)^2+4} + \dfrac{1}{(s+2)^2+4}\right]$
5.	Inverse Laplace transform of $\dfrac{s-1}{s^2}$ is
Option A:	$-1-t$
Option B:	$-1+t$
Option C:	$1+t$
Option D:	$1-t$
6.	$L^{-1}\left[\dfrac{s+2}{s^2+4s+5}\right]$ is
Option A:	$e^{-2t}\cos t$
Option B:	$e^{-2t}\sin t$
Option C:	$e^{2t}\cos t$
Option D:	$e^{2t}\sin t$
7.	$L^{-1}(tan^{-1}s)$ is
Option A:	$\dfrac{\sin t}{t}$
Option B:	$\dfrac{\cos t}{t}$
Option C:	$-\dfrac{\sin t}{t}$
Option D:	$-\dfrac{\cos t}{t}$

8.	$L^{-1}\left[\frac{s(2s^2-3)}{(s^2+1)(s^2-4)}\right]$ is
Option A:	$cosh\ t + cosh\ 2t$
Option B:	$cos\ t + cosh\ 2t$
Option C:	$cos\ t + cos\ 2t$
Option D:	$cosh\ t + cos\ 2t$
9.	Fourier coefficient a_2 for f(x)=x , x belongs to (-1, 1) is
Option A:	-1
Option B:	1
Option C:	0
Option D:	2
10.	Fourier coefficient b_1 for $f(x) = x.sinx$, where $x \in (0, 2\pi)$ is
Option A:	0
Option B:	π
Option C:	$-\pi$
Option D:	$\frac{\pi}{\sqrt{2}} - \frac{\pi}{\sqrt{3}}$
11.	Fourier coefficient a_0 in half range cosine series for $f(x) = e^x, x \in (0,1)$ is
Option A:	e+1
Option B:	-e-1
Option C:	-e+1
Option D:	e-1
12.	Value of constant real number m such that $f(z) = f(x + iy) = e^{3mx+2iy}$ is analytic function is
Option A:	2/3
Option B:	-2/3
Option C:	3/2
Option D:	-3/2

13.	For real variables x, y function $u(x, y) = 2xy$
Option A:	does not satisfy Laplacian equation.
Option B:	is not continuous.
Option C:	is harmonic.
Option D:	is continuous but not partially differentiable.
14.	For $f(z) = sinx \, cosh(y) + i \, cosx \, sinh(y)$, where $z = x + iy$, $f'(z)$ is
Option A:	$-sin \, z$
Option B:	$sinh \, z$
Option C:	$cos \, z$
Option D:	$cosh \, z$
15.	If coefficients of correlation between variables x, y is 0.5 and coefficient of regression b_{xy} is 0.2 then coefficient of correlation b_{yx} is
Option A:	1.25
Option B:	-1.25
Option C:	2.5
Option D:	-2.5

16.	If a straight line is y=ax+b is fitted to following data					
	x	0	1	2	3	4
	y	1	2	3	4	5
	Then values of a & b are					

Option A:	a=1, b=0
Option B:	a=1, b=1
Option C:	a=0, b=1
Option D:	a=-1, b=1
17.	The coefficient of rank correlation between two variables with unequal ranks is - 0.9 . If the number of pairs is 5 ,then the sum of squares of differences in ranks is
Option A:	37
Option B:	36
Option C:	39
Option D:	38

18.	If random variable X has the probability distribution as
	<table><tr><td>X</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>P(X=x)</td><td>3k</td><td>2k</td><td>2k</td><td>k</td><td>0.2</td></tr></table> Then P(-2<X ≤ 2) is
Option A:	1
Option B:	0.7
Option C:	0.8
Option D:	0.5
19.	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
20.	A continuous random variable X has the probability law $f(x) = k^2x^3$, $0 \le x \le 3$, $k > 0$ then value of k is
Option A:	2/81
Option B:	4/81
Option C:	4/9
Option D:	2/9

Q2 (20 Marks)	Solve any Four out of Six 5 marks each
A	Find Laplace transform of $f(t) = sin^2t\ cos^3t$.
B	Using convolution theorem find the inverse Laplace transform of $$\emptyset(s) = \frac{s}{s^4 - 1}$$
C	Find Fourier series of $f(x) = x\ sinx$ in$(-\pi, \pi)$.
D	Find an analytic function $\omega = f(z) = u + iv, where\ z = x + iy$, whose real part is $u(x, y) = x^2 - y^2 + 2y - sin(x).sinh(y)$
E	Calculate Spearman's coefficient of rank correlation and Pearson's coefficient of correlation from the following data on height and weights of 5 students. <table><tr><td>Height(in inches)</td><td>61</td><td>63</td><td>65</td><td>67</td><td>69</td></tr><tr><td>Weight(In kgs)</td><td>64</td><td>62</td><td>65</td><td>70</td><td>72</td></tr></table>

F	The warranty of electronic device in thousand of days has the density function $f(x) = \begin{cases} 4e^{-4x}, x > 0 \\ 0, \quad otherwise \end{cases}$ Find the expected warranty of the device.

Q3 (20 Marks)	Solve any Four out of Six 5 marks each
A	Given $f(t) = \begin{cases} 4, & 0 \le x < 3 \\ 0, & x > 3 \end{cases}$. Find $L[f(t)]$, $L[f'(t)]$.
B	Find inverse Laplace transform of $\emptyset(s) = \dfrac{3s^2+11s+11}{s^3+6s^2+11s+6}$
C	Find half range sine series for $f(x) = e^{-x}, 0 < x < 1$.
D	In the polar coordinates, let $\omega = u + iv$, $u(r,\theta) = r^2 sin2\theta$. Show that u satisfies Laplace's equation and find $v(r,\theta)$.
E	Fit a second degree parabolic curve to the following data. <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>1</td><td>1</td><td>3</td><td>7</td><td>13</td><td>21</td><td>31</td></tr></table>
F	A random variable X has the probability distribution $P(X = x) = \dfrac{1}{16}\left(4_{C_x}\right)$, $x = 0,1,2,3,4$. Write Probability distribution and find standard deviation.

University of Mumbai
Examination 2020 under cluster 7(Lead College: SSJCOE)
Examinations Commencing from 7th January 2021 to 20th January 2021

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

===

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	In the worst case the time required to search an element in a linked list of length n is?
Option A:	O(n)
Option B:	O(log2 n)
Option C:	O(1)
Option D:	O(n2)
2.	Consider a linked list of n elements which is pointed by an external pointer. What is the time taken to delete the element which is the successor of the element pointed to by a given pointer?
Option A:	O(1)
Option B:	O(log2 n)
Option C:	O(n)
Option D:	O(n log2 n)
3.	Which of the following operations is performed more efficiently by a linear doubly linked list than by a linear singly linked list?
Option A:	Deleting a node whose location is given
Option B:	Searching an unsorted list for a given item
Option C:	Inserting a node after a node with a given location
Option D:	Traversing the list to process each node
4.	A linear list in which the elements can be added or removed at either end but not in the middle is called as?
Option A:	queue
Option B:	dequeue
Option C:	stack
Option D:	tree
5.	A binary tree in which all of the nodes are of degree zero or two but never degree one is called as ?
Option A:	Binary Search Tree
Option B:	Left Skewed Binary Tree
Option C:	Strictly Binary Tree
Option D:	Right Skewed Tree
6.	What is the height of a constructed Binary Search Tree if elements 48, 22, 27, 30,

	96, 74, 88, 35 are inserted in an empty Binary Search tree as per given order?
Option A:	6
Option B:	3
Option C:	2
Option D:	4
7.	What is the Postorder Traversal of a Binary tree if its Inorder traversal is OMPLN and Preorder traversal is LMOPN?
Option A:	OPMNL
Option B:	OMPNL
Option C:	PMONL
Option D:	NPMOL
8.	What is the node structure for Threaded Binary Tree?

Option A:	struct node
	　{
	　　struct node * LeftChild;
	　　bool Left_Tag;
	　　struct node * RightChild;
	　　bool Left_Tag;
	　};

Option B:	struct node
	　{
	　　struct node * RightChild;
	　　bool Left_Tag;
	　};

Option C:	struct node
	　{
	　　struct node * LeftChild;
	　　bool Left_Tag;
	　　};

Option D:	struct node
	　{
	　　struct node * LeftChild;
	　　bool Tag;
	　　struct node * RightChild;
	　　};

9.	Number of vertices in a graph of odd degree is?
Option A:	always even
Option B:	always odd
Option C:	either even or odd
Option D:	always zero
10.	The terminal vertices of a path are of a degree?
Option A:	one
Option B:	two
Option C:	zero
Option D:	more than four
11.	A simple graph with n vertices and k components can have at most
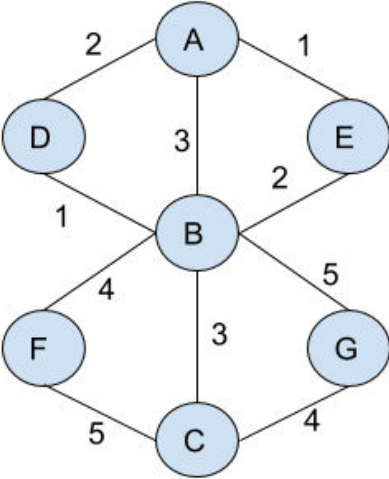
Option A:	n edges
Option B:	n-k edges
Option C:	(n-k)(n-k-1)/2 edges
Option D:	(n-k)(n-k+1)/2 edges
12.	In recursion, the unwinding phase starts when?
Option A:	The first call to the recursive function is made by main()
Option B:	The first call to itself by the recursive function
Option C:	The terminating condition becomes true in the recursive function
Option D:	The control is returned back to the main() from the recursive function
13.	Which of the following methods will not suffer from the 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 equal in size as required by the process
Option D:	Allocating the block in the multiple of fixed size
14.	Which of the methods traverses the whole free block list and allocates a memory block of size equal to or slight more than required by the process?
Option A:	Free fit
Option B:	First fit
Option C:	Best fit
Option D:	Worst fit
15.	In the worst case of the binary search algorithm, how many comparisons will be made, if the data set contains N elements?
Option A:	1
Option B:	$N \ Log_2 N$
Option C:	$Log_2 N$
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 "folding method", how many collisions will occur? Fold the number using the sum of digits till it becomes a singular digit.
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 insertion sort algorithm?
Option A:	{12, 23, 22, 45, 54, 56, 123}
Option B:	{12, 23, 22, 54, 56, 45, 123}
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*(N-O)/P) ?
Option A:	LMNO-*P/+
Option B:	LMNO-P/*+

Option C:	LMNOP-/*+
Option D:	LMNO-/P*+
19.	Element with the largest key in Max-Heap is always present in which node of it?
Option A:	At Left Child of root node
Option B:	At Leaf Node
Option C:	At Right child of root node
Option D:	At Root Node
20.	Let G be a connected undirected graph with 200 vertices and 400 edges. The weight of the Minimum Spanning Tree of G is 800. When the weight of each edge of G is increased by eight, the weight of a Minimum Spanning Tree will be:
Option A:	3200
Option B:	1600
Option C:	2392
Option D:	1392

Q2	**Total 20 marks.**
Q2A	**Solve any Two, 5 marks each, total 10 marks.**
i.	Explain the insertion 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.	Write an algorithm to convert an arithmetic expression 'I' written in infix notation into its equivalent postfix expression 'P'.
Q2B	**Solve any One, 10 marks each, total 10 marks.**
i.	Explain what is a Doubly linked list along with its operations: traversing, searching, insertion and deletion. Proper diagrammatic representations of operations as mentioned above, are also expected. Also, write two computer world applications of the doubly linked list data structure.
ii.	What is an AVL Tree? Construct an AVL tree for the following dataset: 22, 27, 31, 10, 5, 15, 39, 19, 16, 11, 3, 4, 8 Mention the rotation, 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 **EBEABCCEAD**. 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 three sequential fit methods of storage management.
iii.	Explain Collision in hashing with an example. What are the methods to resolve collision? Explain Linear Probing with an example.
Q3B	**Solve any One, 10 marks each, total 10 marks.**
i.	Explain the working of stack with its operations: push, pop, peek, display, empty , full. Proper diagrammatic representations of operations as mentioned above, are also expected. Also, write two applications (algorithms) where stack 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.

University of Mumbai
Examination 2020 under cluster 7 (Lead College: SSJCOE)
Examinations Commencing from 7th January 2021 to 20th January 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

==

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	A relational database consists of a collection of
Option A:	keys
Option B:	table
Option C:	schema
Option D:	record
2.	_____ is not a level of data abstraction.
Option A:	Critical Level
Option B:	Logical Level
Option C:	Physical Level
Option D:	View Level
3.	File code which developer add to the file and limit access to new user is called
Option A:	file code
Option B:	access code
Option C:	code protection
Option D:	physical code
4.	E-R model use_____ to represent weak entity set
Option A:	Doubly outlined rectangle
Option B:	Circle
Option C:	Dotted rectangle
Option D:	Diamond
5.	The constraints of disjoint and completeness in specialization and generalization are usually
Option A:	calculated
Option B:	default value
Option C:	dependent
Option D:	independent

6.	The relational algebra is _____.
Option A:	Data Definition Language
Option B:	Non Procedural Language
Option C:	Meta Language
Option D:	Procedural Language
7.	The natural join is equal to :
Option A:	Cartesian Product
Option B:	Combination of Union and Cartesian product
Option C:	Combination of selection and Cartesian product
Option D:	Combination of projection and Cartesian product
8.	How the data redundancy can be reduced?
Option A:	By adding many constraints
Option B:	Use of appropriate Normal Forms
Option C:	Using keys
Option D:	Using complex database design
9.	The notation X -> Y is used to denote
Option A:	Non-transitive dependency
Option B:	Transitive dependency
Option C:	Functional dependency
Option D:	Reflexive dependency
10.	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
11.	Good relational database design can be obtained by-
Option A:	Normalization
Option B:	Changing functional requirements
Option C:	Complex design of the database
Option D:	Adding keys on a database
12.	Which join refers to join records from the right table that have no matching key in the left table are include in the result set:
Option A:	Left outer join
Option B:	Right outer join
Option C:	Full outer join
Option D:	Half outer join
13.	To include integrity constraint in an existing relation use :
Option A:	Create table
Option B:	Modify table
Option C:	Alter table
Option D:	Drop table

14.	UPDATE instructor_____ salary=salary*1.05; Fill in blank with the correct keyword to update the instructor relation.
Option A:	Where
Option B:	Set
Option C:	In
Option D:	Select
15.	Which of the SQL statements is correct ?
Option A:	SELECT Username AND Password FROM Users
Option B:	SELECT Username, Password FROM Users
Option C:	SELECT Username, Password WHERE Username = 'user1'
Option D:	SELECT Username AND Password FROM Users where Username='user1'
16.	Which operator performs pattern matching ?
Option A:	Between operator
Option B:	Exists operator
Option C:	Like operator
Option D:	Equal operator
17.	Primary Key, Referential Integrity, Check constraint are examples of-
Option A:	Key Constraints
Option B:	Security Constraints
Option C:	Integrity Constraints
Option D:	Transaction Constraints
18.	When a transaction is said to be in a Partially committed state?
Option A:	After all statements in transaction are successfully completed
Option B:	After the half of statements has been executed
Option C:	After the first statement has been executed
Option D:	After the final statement has been executed
19.	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
20.	What is starvation?
Option A:	Selection of a victim based on size
Option B:	Selection of a victim based on priority
Option C:	Selection of a victim based on cost factor
Option D:	Selection of a victim based on time

Q2. (20 Marks)	Solve any Four out of Six 5 marks each
A	Differentiate primary key and secondary key with suitable examples.
B	Write a Note on Functions of Database Administrator (DBA).
C	Explain the following Relational algebra operations. (i)Natural Join (ii) Assignment
D	Discuss functions and procedures in SQL.
E	What undesirable dependencies are avoided when a relation is in 3NF?
F	Define and explain a serial schedule.

Q3. (20 Marks)	Solve any Four out of Six 5 marks each
A	Construct an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents.Convert this E-R diagram into a schema.
B	Discuss steps for transforming ER Diagram to Relation .
C	Explain different types of integrity constraints in SQL .
D	Justify the need for normalization.
E	Draw and explain DBMS structure.
F	Illustrate Two phase locking protocol with suitable case study.

University of Mumbai
Examination 2020 under cluster 7(Lead College: SSJCOE)
Examinations Commencing from 7th January 2021 to 20th January 2021
Program: **Information Technology**
Curriculum Scheme: Rev2019
Examination: SE SemesterIII
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.	The function of the transmitter block in the communication system is _____
Option A:	To convert electrical equivalent of the information in a suitable form
Option B:	To convert the voice signals in electrical signals
Option C:	To demodulate the signals
Option D:	To convert the signal from analog to digital
2.	Which frequency band belongs to the ultra high frequencies (UHF)
Option A:	30Hz – 300 Hz
Option B:	3kHz – 30kHz
Option C:	300MHz – 3GHz
Option D:	30 – 300 GHz
3.	Which of the following communication system is truly bidirectional
Option A:	Full duplex system
Option B:	Half duplex system
Option C:	Simplex system
Option D:	Modern communication system
4.	Which among the following is not external noise
Option A:	Shot noise
Option B:	Atmospheric noise
Option C:	Extraterrestrial noise
Option D:	Man made noise
5.	If an amplifier has a noise figure of 3 dB then the equivalent noise temperature is
Option A:	300° K
Option B:	200^oK
Option C:	100° K
Option D:	50° K
6.	The average thermal noise power is given by _____
Option A:	Pn = kTB watts
Option B:	Pn = P/S
Option C:	Pn = 2(I+2I)

Option D:	Pn = Vn/R
7.	The modulation index of amplitude modulation is given as
Option A:	Ec/Em
Option B:	Ec+Em
Option C:	Em/Ec
Option D:	Ec-Em
8.	In an AM wave useful power is carrier by ………….
Option A:	Carrier
Option B:	Sidebands
Option C:	Both sideband and carrier
Option D:	Noise
9.	Superhertodyne principle refers to
Option A:	Using a large number of amplifier stages
Option B:	Using a push-pull circuit
Option C:	Obtaining lower fixed intermediate frequency
Option D:	Amplifying
10.	How much will be the depth of modulation if the carrier amplitude varies between 4 volts and 1 volt.
Option A:	0.6
Option B:	1
Option C:	0
Option D:	1.6
11.	The amount of frequency deviation in FM signal depends on
Option A:	Amplitude of the modulating signal
Option B:	Carrier frequency
Option C:	Modulating frequency
Option D:	Transmitter amplifier
12.	Sensitivity is defined as
Option A:	Ability of receiver to amplify weak signals
Option B:	Ability to reject unwanted signals
Option C:	Ability to convert incoming signal into Image Frequency
Option D:	Ability to reject noise
13.	The spectrum of the sampled signal may be obtained without overlapping only if
Option A:	$f_s < 2f_m$
Option B:	$f_s > f_m$
Option C:	$f_s < f_m$
Option D:	$f_s \geq 2f_m$
14.	Which of the following is false with respect to pulse modulation?
Option A:	Less power consumption
Option B:	Low noise
Option C:	Degraded signal can be regenerated
Option D:	Can transmit analog as well as digital waves

15.	In PWM signal reception, the Schmitt trigger circuit is used
Option A:	To remove noise
Option B:	To produce ramp signal
Option C:	For synchronization
Option D:	To increase bandwidth
16.	The sampling technique having the minimum noise interference is
Option A:	Instantaneous sampling
Option B:	Natural sampling
Option C:	Flat top sampling
Option D:	Aliasing
17.	In frequency division multiplexing each signal to be transmitted modulates a _____ carrier.
Option A:	Single
Option B:	Different
Option C:	Two carriers
Option D:	Four carriers
18.	Which of the following is not an advantage of time division multiplexing?
Option A:	Signal interference is less
Option B:	More flexible
Option C:	Full channel can be used for every signal
Option D:	Fast data transfer
19.	Electromagnetic waves are represented in which of the following format?
Option A:	Longitudinal waves
Option B:	Transverse waves
Option C:	Sinusoidal waves
Option D:	Surface waves
20.	The broadcast signals received at low frequencies during day-time are due to _____
Option A:	Ground wave
Option B:	Space wave
Option C:	Sky wave
Option D:	Tropospheric wave

Q2	**Solve any Two Questions out of Three 10 marks each**
A	Explain the following terms: 1) Signal to noise ratio. 2)Noise factor 3) Noise figure. Also explain how noise figure is related to signal to noise ratio.
B	What is amplitude modulation and derive the mathematical expression of

	AM signal.
C	Differentiate between PAM, PWM and PPM and explain the generation and detection of Pulse amplitude modulated signal.
Q3.	**Solve any Two Questions out of Three 10 marks each**
A	With a neat block diagram explain the method of FM generation using Varactor diode.
B	Explain ground wave propagation. Compare between sky wave, ground wave and space wave propagation.
C	List the different types of multiplexing and explain FDM transmitter and receiver.

University of Mumbai
Examination 2020 under cluster 7 (Lead College: SSJCOE)
Examinations Commencing from 7ᵗʰ January 2021 to 20ᵗʰ January 2021
Program: **Information Technology**
Curriculum Scheme: Rev2019
Examination: SE Semester III
Course Code: ITC305 and Course Name: Paradigms and Computer Programming Fundamentals
Time: 2 hour   Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Which is **NOT,** one of the standard Haskell type
Option A:	Booleans
Option B:	Lists
Option C:	Tuples
Option D:	Structures
2.	Consider following predicates shown in Image 1 that are defined in two distinct prolog files.Which of the following statements is **TRUE** about the above two KBs
Option A:	Query route(b,b) will evaluate as true in both KBs
Option B:	Query route(b,b) will evaluate as false in both KBs
Option C:	Query route(b,b) will evaluate as true in KB-1 and false in KB-2
Option D:	Query route(b,b) will evaluate as true in KB-1 and will not terminate in KB-2
3.	While declaring a subroutine, names of parameter are known as _____.
Option A:	Formal parameters
Option B:	Actual parameters
Option C:	Normal parameters
Option D:	Additional parameters

4.	Which of the following programming concepts shown by Object Oriented Programming Languages are examples of use of polymorphism?
Option A:	function overriding, extending an interface, abstract base class
Option B:	function overloading, friend function, creation of package/module
Option C:	creation of package/module, multiple constructors for same class, encapsulating members in Class
Option D:	function overriding, function overloading, encapsulating members in Class
5.	Consider the knowledge base shown in Image 2 below. Which option represents **all result/s** in the correct order, when the query "colleagues(amar,X)." is submitted to a prolog interpreter. worksfor(amar, infosys). worksfor(amit, infosys). worksfor(anagha, syntel). worksfor(ajit, syntel). colleagues(X, Y) :- worksfor(X, Z), worksfor(Y, Z). Image 2
Option A:	X=amar; X=amit
Option B:	X=amit; X=amar
Option C:	X=amit
Option D:	X=amar
6.	While implementing synchronization, in which method a thread runs a loop which keeps reevaluating particular conditions until that condition becomes true.
Option A:	chaining
Option B:	blocking
Option C:	clocking
Option D:	busy-wait
7.	Mnemonics to machine language translation is job of a System Program known as _____
Option A:	converter
Option B:	processor

Option C:	assembler
Option D:	debugger
8.	Which of the following is not one of the six principal mechanisms for thread creation in language or library.
Option A:	Co-begin
Option B:	Fork
Option C:	Implicit receipt
Option D:	Finally
9.	Which of the following statements is **TRUE** about scripting languages?
Option A:	Scripting languages requires the declaration of types for variables.
Option B:	Most scripting languages perform extensive compile-time checks to make sure that values are never used in inappropriate ways
Option C:	Some scripting languages even store numbers as strings, so calculations may not always be what you expect, although most auto-converting if needed.
Option D:	Scripting languages do not handle the type errors and require the programmer to check for these errors if they require to.
10.	Image 3 shows the haskell code. Which of the following options represents correct output when main is executed?

```
mySelect :: (a -> Bool) -> [a] -> [a]
mySelect _ [] = []
mySelect f (a : ab) = if f a then a : mySelect f ab else
mySelect f ab
main :: IO ()
main = do
    print $ mySelect (/=25) [20..30]
```

Option A:	[20, 21, 22, 23, 24, 26, 27, 28, 29, 30] [25]
Option B:	[20, 21, 22, 23, 24, 26, 27, 28, 29, 30] 25
Option C:	[21, 22, 23, 24, 26, 27, 28, 29] [25]
Option D:	20, 21, 22, 23, 24, 26, 27, 28, 29, 30 25
11.	JavaScript is _____ and PHP is _____ side scripting language.
Option A:	client, server
Option B:	server, client
Option C:	proxy, client

Option D:	server, proxy
12.	Consider the following expression shown in Image 4 is executed in ghci on prelude prompt, What will be the output? **Prelude>** zipWith (++) ['A','O','C','M'] ["pple", "range",
Option A:	["Apple","Orange","Cherry","Mango"]
Option B:	"Apple","Orange","Cherry","Mango"
Option C:	['Apple','Orange','Cherry','Mango']
Option D:	Error in execution as we cannot concatenate char with [char]
13.	Which of the following is true for Implicit parametric polymorphism
Option A:	Parameter types are not specified at all and not type-safe
Option B:	Parameter types to be specified explicitly, but still type-safe
Option C:	Parameter types are incompletely specified and not type-safe
Option D:	Parameter types are incompletely specified, but still type-safe
14.	Which of the following statements is incorrect about operator overloading
Option A:	Only existing operators can be overloaded
Option B:	The overloaded operator must preserve the original operation
Option C:	Post and pre increment operators can't be overloaded at the same time
Option D:	An operator may be overloaded in multiple way at the same time
15.	Consider declaration of predicate "*natural*" shown in Image 5 below Which is the most appropriate description for this declaration ? natural(1). natural(N) :- natural(M), N is M+1. Image 5
Option A:	It represents a generator for an infinite set of all natural numbers.
Option B:	It is a test for checking whether an input number is natural or not.
Option C:	It represents a generate and validate idiom in prolog programming.
Option D:	It will only be true for natural(1) and will throw an error for any query natural(n) where n is a natural number other than 1.

16.	Subroutine call stack is maintained in response to _____.
Option A:	Called function
Option B:	Calling sequence
Option C:	Calling subroutine
Option D:	Calling parameters
17.	Which statement is false about scripting languages?
Option A:	Scripts can be used for batch processing
Option B:	Scripting languages support high level data types.
Option C:	Scripting languages are statically typed
Option D:	In script variables needn't be declared.
18.	What would be the output of the code shown in Image 6 below?

```
class Parent{
public:
    Parent(){
        cout<<"Parent Con ";
    }
    ~Parent(){
        cout<<"Parent Dest ";
    }
};
class Child: public Parent{
public:
    Child(){
        cout<<"Child Con ";
    }
    ~Child(){
        cout<<"Child Dest ";
    }
};
int main(){
    Child c;
    return 0;
}
                    Image 6
```

Option A:	Parent Con Child Con Parent Dest Child Dest
Option B:	Parent Con Child Con Child Dest Parent Dest
Option C:	Child Con Parent Con Child Dest Parent Dest
Option D:	Runtime Error
19.	Image 7 refers to the definition for user defined Haskell function "**rope**". what will be the output, if we apply the "**rope**" function to input **21**?

```
rope :: (Integral a) => a -> [a]
rope 1 = [1]
rope n
    | even n =  n:rope (n `div` 2)
    | odd n  =  n:rope (n*3 + 1)
```

Option A:	[21,64,32,16,8,4,2,1]
Option B:	21,64,32,16,8,4,2,1
Option C:	[64,32,16,8,4,2,1]
Option D:	64,32,16,8,4,2,1
20.	In case of divide by zero statement execution, which Exception is thrown?
Option A:	NoSuchFieldException
Option B:	IOException
Option C:	ArithmeticException
Option D:	NullPointerException

Q2.	Solve any Four out of Six 5 marks each
A	What are Scripting Languages? List common characteristics of scripting languages.
B	Explain with example the difference between declarative and imperative programming paradigm.
C	Briefly describe the process of resolution and unification in logic programming with example.
D	What is Data Hiding in Object Oriented Programming Paradigm? Describe how data hiding is implemented in C++ or Java.
E	Define Haskell function that inputs one operator +,-,*,^ and two operands which may be Int, Integer, Float or Double. The function will perform the operation and computes the result. Clearly mention the type signature for the function. Note: Students are not expected to write the main function and do user IO.
F	Explain the different communication and synchronization techniques in Concurrent Programming model.
Q3.	Solve any Four out of Six 5 marks each
A	What is type checking and type clash? What do you mean by statically typed and strongly typed programming language? List any two statically typed languages.
B	Explain following terms: Concurrent system, Parallel system, Distributed system, Race condition, Context switching.

C	What mathematical formalism underlies functional programming?
D	Write a note on Naming and Scoping rules for scripting languages.
E	Demonstrate in object oriented programming how to resolve a call to one of the multiple methods with the same name and signature in the superclass and subclass is made.
F	What is the role of an Exception Handler in a programming language ? Briefly explain important tasks it performs.

University of Mumbai
Examination 2021 under cluster __ (Lead College: _)
Examinations Commencing from 10ᵗʰ April to 17ᵗʰ April 2021

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

==

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Laplace Transform of $e^{2t}\cos 2t$ is
Option A:	$\dfrac{s-2}{s^2-2s+8}$
Option B:	$\dfrac{s+2}{s^2-2s+8}$
Option C:	$\dfrac{s-2}{s^2+2s+8}$
Option D:	$\dfrac{s-2}{s^2+2s+4}$
2.	If $f(x)=\frac{1}{2}(\pi-x),\, 0<x<2\pi$ then a_0 is
Option A:	$\dfrac{2}{\pi}$
Option B:	0
Option C:	$\dfrac{\pi}{2}$
Option D:	$\dfrac{\sqrt{2}}{\pi}$
3.	If $f(z)=u+iv$ is analytic then
Option A:	u is harmonic but v may or may not be harmonic.
Option B:	v is harmonic but u may or may not be harmonic.
Option C:	u and v both need not be harmonic.
Option D:	u and v both are harmonic.
4.	If Var(X) = 4 then Var(3x+4) is
Option A:	12
Option B:	20
Option C:	26
Option D:	36
5.	If $f(x)$ is an even function in the interval $(-l,l)$ then the Fourier coefficients are

Option A:	$a_n = 0, b_n = 0.$
Option B:	$a_n = 0, a_0 = 0.$
Option C:	$b_n = 0$
Option D:	$a_0 = 0, b_n = 0$
6.	Find $L^{-1}\left(\frac{s+2}{s^2+4s+13}\right)$
Option A:	$e^{2t}cos3t$
Option B:	$e^{2t}sin3t$
Option C:	$e^{-2t}cos3t$
Option D:	$cos3t$
7.	Find an analytic function whose real part is $u = x^3 - 6x^2y^2 + y^3$
Option A:	$f(z) = z^3 + c$
Option B:	$3z^3 + c$
Option C:	$-z^3 + c$
Option D:	$3z^2 + c$
8.	Find $L^{-1}\left(\frac{1}{3s-7}\right)$
Option A:	$\frac{1}{3}\left(e^{(7/3)t}\right)$
Option B:	$\frac{-1}{3}\left(e^{(5/3)t}\right)$
Option C:	$\frac{1}{3}\left(e^{(-7/3)t}\right)$
Option D:	$\frac{1}{3}\left(e^{(5/3)t}\right)$
9.	A variate x has the following probability distribution x : -3 6 9 P(x) : 1/6 1/2 1/3 Find E(X) .
Option A:	1/2
Option B:	11/2
Option C:	3/2
Option D:	13/2
10.	If $b_{yx} = 0.7764$, $b_{xy} = 1.2321$ then coefficient of correlation
Option A:	0.9781
Option B:	0.6291
Option C:	1.2307
Option D:	0.0023
11.	Find the Laplace Transform of $\frac{cos2t - cos3t}{t}$
Option A:	$\frac{1}{2}log\left(\frac{s^2+9}{s^2+4}\right)$
Option B:	$\frac{1}{2}log\left(\frac{s^2+4}{s^2+9}\right)$

Option C:	$\frac{1}{2} \log \left(\frac{s^2 - 4}{s^2 - 9} \right)$
Option D:	$\frac{1}{2} \log \left(\frac{s^2 - 4}{s^2 + 9} \right)$
12.	If two variables oppose each other then the correlation will be
Option A:	Positive correlation
Option B:	Zero correlation
Option C:	Perfect correlation
Option D:	Negative correlation
13.	Parseval's identity for the function $f(x)$ in the interval $(c, c + 2l)$
Option A:	$\int_c^{c+2l} [f(x)]^2 dx = a_0^2 + \frac{1}{2} \sum_{n=1}^{\infty} (a_n^2 + b_n^2).$
Option B:	$\frac{1}{2l} \int_c^{c+2\pi} [f(x)]^2 dx = a_0^2 + \frac{1}{2} \sum_{n=1}^{\infty} (a_n^2 + b_n^2).$
Option C:	$\frac{1}{2l} \int_c^{c+2l} [f(x)]^2 dx = a_0^2 + \frac{1}{2} \sum_{n=1}^{\infty} (a_n^2 + b_n^2).$
Option D:	$\frac{1}{2\pi} \int_c^{c+2\pi} [f(x)]^2 dx = a_0^2 + \frac{1}{2} \sum_{n=1}^{\infty} (a_n^2 + b_n^2).$
14.	The limits for coefficient of correlation are
Option A:	$-1 \leq r \leq 2.$
Option B:	$-1 \leq r \leq 0.$
Option C:	$-1 \leq r \leq 1.$
Option D:	$0 \leq r \leq 1.$
15.	The value of $\int_0^{\infty} e^{-2t}(1 - t^2)dt$ is
Option A:	$\frac{1}{4}$
Option B:	0
Option C:	$\frac{2}{3}$
Option D:	$\frac{1}{2}$
16.	A continuous random variable X has the following probability mass function $f(x) = kx^2, 0 \leq x \leq 2,$ then the value of k is
Option A:	8/3
Option B:	3/8
Option C:	1
Option D:	5/3
17.	If $x^2 = \frac{\pi^2}{3} + 4 \sum_{n=1}^{\infty} (-1)^n \frac{\cos nx}{n^2}$ then a_n and b_n are
Option A:	$a_n = 4 \sum_{n=1}^{\infty} (-1)^n \frac{\cos nx}{n^2}$, $b_n = 0$

Option B:	$a_n = 0, \quad b_n = 4\sum_{n=1}^{\infty}(-1)^n\dfrac{cosnx}{n^2}$
Option C:	$a_n = 0 b_n = \dfrac{\pi^2}{3}$
Option D:	$a_n = \dfrac{\pi^2}{3}, \quad b_n = 4\sum_{n=1}^{\infty}(-1)^n\dfrac{cosnx}{n^2}$
18.	Find $L^{-1}\left[log\left(\dfrac{s+1}{s+3}\right)\right]$.
Option A:	$\dfrac{-1}{t}(e^{-t} - e^{-3t})$.
Option B:	$\dfrac{-1}{2t}(e^{-t} - e^{-3t})$.
Option C:	$\dfrac{-1}{t}(e^{t} - e^{-3t})$.
Option D:	$\dfrac{1}{t}(e^{-t} - e^{-5t})$.
19.	Find $L^{-1}\left[\dfrac{1}{s(s^2+4)}\right]$
Option A:	$\dfrac{1}{4}(1 - cos2t)$
Option B:	$(1 + cos2t)$
Option C:	$\dfrac{1}{4}(1 - sin2t)$
Option D:	$\dfrac{1}{4}(1 + cost)$
20.	Find the constant 'a' if $f(z) = ax^2y - y^3 + i(3xy^2 - x^3)$ is analytic
Option A:	$a = 0$
Option B:	$a = 3$
Option C:	$a = 6$
Option D:	$a = 2$

Q2. **(20 Marks)**	**Solve any Four out of Six5 marks each**
A	Fit a straight line to the following data (X,Y) = (1,-5),(1,1),(2,4),(3,7),(4,10)
B	Find half range cosine series for $f(x) = x(\pi - x), 0 < x < \pi$
C	Find $L^{-1}\left[\dfrac{1}{(s+3)(s-4)^2}\right]$ using convolution theorem.
D	Find the orthogonal trajectories of the family of curves $3x^2y + 2x^2 - y^3 - 2y^2 = c$

E	A discrete random variable has p.d.f. given below X : -2 -1 0 1 2 3 P(X=x) : 0.2 k 0.1 2k 0.1 2k Find k and $(P(X \geq 1)$
F	Evaluate $\int_0^\infty \frac{e^{-t}-e^{-3t}}{t}\, dt$

Q3 . (20 Marks)	Solve any Four out of Six5 marks each
A	Show that $u = 3x^2y - y^3$ is harmonic.Find the corresponding analytic function.
B	Find $L^{-1}\left[\frac{5s+3}{(s-1)(s^2+2s+5)}\right]$
C	Find the Fourier series for $f(x) = x^3$, in $(-\pi, \pi)$
D	Find the expectation and M.G.F. of the following distribution X : -2 3 1 P(X=x) : 1/3 1/2 1/6
E	Compute Spearman's rank correlation coefficient from the following data X : 16, 18, 25, 30, 12 Y : 38, 21, 38, 16, 50
F	Find Laplace transform of $te^{-t}\cos t$

University of Mumbai
Examination 2020 under cluster 7(Lead College: SSJCOE)
Examinations Commencing from 10ᵗʰ April 2021 to 17ᵗʰ April 2021
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

==

| 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 the 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.	A linear list in which the elements can be added or removed at either end but not in the middle is called as?
Option A:	queue
Option B:	dequeue
Option C:	stack
Option D:	tree
13.	A binary tree in which all of the nodes are of degree zero or two but never degree one is called as ?
Option A:	Binary Search Tree
Option B:	Left Skewed Binary Tree

Option C:	Strictly Binary Tree
Option D:	Right Skewed Tree
14.	The terminal vertices of a path are of a degree?
Option A:	one
Option B:	two
Option C:	zero
Option D:	more than four
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 a 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:	$\frac{1}{2}^n$
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.	Write an algorithm/ pseudo code to add two polynomials using the linked list. Explain with an example.
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 the double ended queue with its operations: insert, delete, display, empty, and full. Proper diagrammatic representations of operations as mentioned above, are also expected.
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.
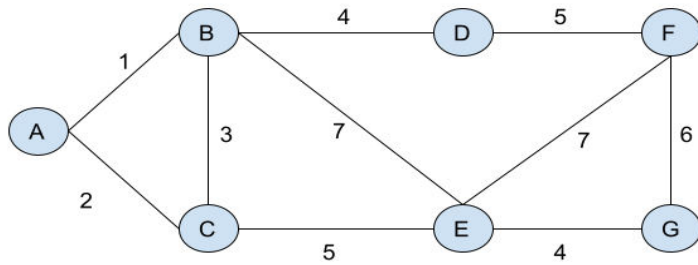
University of Mumbai
Examination 2021 under cluster 7 (Lead College: SSJCOE)
Examinations Commencing from 10th April 2021 to 17th April 2021
Program: **Information Technology**
Curriculum Scheme: Rev2019
Examination: SE Semester III (DSE)
Course Code: ITC303 and Course Name: Database Management System

Time: 2 hour   Max. Marks: 80

===

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The database environment has all of the following components except:
Option A:	User
Option B:	Admin
Option C:	Database
Option D:	Seperate file
2.	The form of data model which focuses on the concepts in the same way as the data stored in computer system is classified as
Option A:	High level data model
Option B:	Medium level data model
Option C:	Dynamic data model
Option D:	Low level data model
3.	Cardinality is termed as
Option A:	Number of tuples
Option B:	Number of tables
Option C:	Number of attributes
Option D:	Number of constraints
4.	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
5.	Generalization and specialization lattices are classified as _____
Option A:	Multiple aggregation
Option B:	Single inheritance
Option C:	Single aggregation
Option D:	Multiple inheritance
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.	If E1 and E2 are relational algebra expressions. Then which of the following is not a relational algebra expression?
Option A:	E1 U E2
Option B:	E1 - E2
Option C:	E1 / E2
Option D:	E1 X E2
8.	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))
9.	In relational algebra rename is_____and difference is _____ .
Option A:	A unary operator, a unary operator
Option B:	A binary operator, a unary operator
Option C:	A binary operator, a binary operator
Option D:	A unary operator, binary operator
10.	If matching tuples are not found, the kind of OUTER JOIN operation which keeps all the tuples of first and second relation is classified as
Option A:	LEFT OUTER JOIN
Option B:	FULL OUTER JOIN
Option C:	HALF OUTER JOIN
Option D:	DOWNWARD JOIN
11.	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
12.	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';
13.	All aggregate functions except _____ ignore null values in their input collection.
Option A:	Count(attribute)
Option B:	Count(*)
Option C:	Avg
Option D:	Sum
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.	Which of the following creates a virtual relation for storing the query?
Option A:	Function
Option B:	Procedure
Option C:	View
Option D:	Cursor
16.	Which Normal form has the requirement of atomic attribute?
Option A:	2 NF
Option B:	3 NF
Option C:	BCNF
Option D:	1 NF
17.	Choose the valid functional dependency for the relation:inst_dept (ID, name, salary, dept name, building, budget)
Option A:	salary→building
Option B:	ID, dept name→ name, salary, building, budget
Option C:	budget→ dept name
Option D:	building→ salary
18.	A functional dependency of the form A→ B is trivial if
Option A:	B⊆B
Option B:	B⊆A
Option C:	A⊆B
Option D:	A⊆A
19.	A→ B and B→C introduces
Option A:	A→ B
Option B:	B→ C
Option C:	A→ C
Option D:	C→ A
20.	BCNF is stricter than_____.
Option A:	1NF
Option B:	2NF
Option C:	3NF
Option D:	4NF

Q2 (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 schema..
B	Define derived attribute. State the need with suitable example
C	What are the types of Join? Explain each with examples.
D	Explain the following Relational algebra operations with proper examples. (i)Set Intersection (ii) Union
E	Explain the following. (i) DDL (ii) DML with example.
F	Write SQL queries for the given database . Sailor(sid,sname,rating,age) Boat(bid,bname,color) Reserves(sid,bid,date) (i) Find the average age of the sailor. (ii) Add a new record into the Boat. Assume any values for required attributes.

Q3 (20 Marks)	Solve any Four out of Six 5 marks each
A	Explain First Normal Form with an example.
B	Explain transitive functional dependency .
C	Consider the following relation: CAR_SALE(Car#, Date_sold, Salesperson#, Commission%, Discount_amt). List all the functional dependencies in the given relation.
D	Explain minimal sets of functional dependencies.
E	List properties of Relational Model
F	What is View ? How is it created and stored ?

University of Mumbai
Examination 2021 under cluster 7 (Lead College: SSJCOE)
Examinations Commencing from 10thApril 2021 to 17thApril 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.	Wired channels are
Option A:	Lossy
Option B:	Lossless
Option C:	Lossy and lossless
Option D:	Constant
2.	The equivalent temperature in a receiver design must be kept
Option A:	Low
Option B:	High
Option C:	Does not affect the receiver
Option D:	Medium
3.	Transmission media used for medium frequency band are
Option A:	Coaxial cable
Option B:	Copper cable
Option C:	Optical fiber
Option D:	Iron cables
4.	Ratio between modulating signal voltage and carrier voltage is called
Option A:	Amplitude modulation
Option B:	Modulation index
Option C:	Ratio of modulation
Option D:	Modulation frequency
5.	Which of the following stage is present in FM receiver but not in AM receiver
Option A:	AM amplifier
Option B:	Demodulator
Option C:	Amplitude limiter
Option D:	Mixer
6.	The Bandwidth of DSBFC AM is…….
Option A:	$2f_m$

Option B:	$4f_m$
Option C:	$3f_m$
Option D:	f_m
7.	What will be the upper and lower sideband frequencies for 5KHz amplitude modulating frequency with a 30KHz carrier frequency
Option A:	35KHz and 25KHz
Option B:	34KHz and 24KHz
Option C:	10 KHz and 35KHz
Option D:	0.35KHz and 0.25KHz
8.	Pre emphasis is done
Option A:	For removing carrier at the receiver
Option B:	For boosting of modulating signal
Option C:	Reduce power consumption
Option D:	Before detection at receiver
9.	10 cm is the wavelength corresponding to the spectrum of
Option A:	Infrared rays
Option B:	Ultraviolet rays
Option C:	Microwaves
Option D:	X-rays
10.	The _____ of an AM signal resembles the shape of baseband signal.
Option A:	Upperband
Option B:	Lowerband
Option C:	Efficiency
Option D:	Envelope
11.	What is the bandwidth of a signal having 928Mhz and 902Mhz as its upper and lower frequencies?
Option A:	26Mhz
Option B:	26Hz
Option C:	1830Hz
Option D:	1830Mhz
12.	Which one of the following noise becomes of great importance at high frequencies?
Option A:	flicker noise
Option B:	shot noise
Option C:	impulse noise
Option D:	transit-time noise
13.	Less Bandwidth is required in
Option A:	Digital Communication
Option B:	Analog Communication
Option C:	Delta Modulation
Option D:	Pulse Code Modulation

14.	In low level Amplitude Modulation
Option A:	Modulation is done at high power of carrier and modulating signal
Option B:	Output power is high
Option C:	Collector Modulation Method in AM is low level
Option D:	Output power is low
15.	Demodulation takes place
Option A:	Transmitter
Option B:	Encoder
Option C:	Channel
Option D:	Receiver
16.	Frequency Modulation is
Option A:	Change in amplitude of carrier according to modulating signal amplitude
Option B:	Change in frequency of carrier according to modulating signal amplitude
Option C:	Change in amplitude of carrier according to modulating signal frequency
Option D:	Change in amplitude of modulating signal according to carrier signal amplitude
17.	For Television and LAN for computer uses cable
Option A:	Microwave
Option B:	Waveguides
Option C:	Coaxial
Option D:	Satellite
18.	What is the advantage of superheterodyneReciever
Option A:	High selectivity and sensitivity
Option B:	Low Bandwidth
Option C:	Low fidelity
Option D:	Low selectivity and sensitivity
19.	The noise due to random behaviour of charge carriers is
Option A:	Shot noise
Option B:	Partition noise
Option C:	Industrial noise
Option D:	Flicker noise
20.	Noise is added to a signal in a communication system
Option A:	At the receiving end
Option B:	At transmitting antenna
Option C:	In the channel
Option D:	During regeneration of the information

Q2. (20 Marks Each)	Solve any Two Questions out of Three 10 marks each
A	What is the disadvantage of Tuned RF Receivers? Draw and explain Superhetrodyne receiver with waveforms.

B	What are the different types of noise? Classify and explain noise that affect communication.
C	Explain Phase Shift Method of SSB generation

Q3. (20 Marks Each)	**Solve any Two Questions out of Three 10 marks each**
A	Give the various methods of FM generation. Draw and explain Armstrong method FM generation
B	Define Noise Figure and Noise Factor. Derive the expression for Friss Transmission Formula
C	A sinusoidal carrier has an amplitude of 20V and frequency 200KHz .It is amplitude modulated of amplitude 6V and frequency 1KHz.Modulated voltage is developed across 80 ohm resistance. 1. Write the equation of modulated wave 2. Determine modulation index 3. Draw the spectrum of modulated wave 4. Calculate total average power

University of Mumbai
Examination 2021 under cluster 7 (Lead College: SSJCOE)
Examinations Commencing from 10th April 2021 to 17th April 2021
Program: **Information Technology**
Curriculum Scheme: Rev2019
Examination: SE Semester III (DSE)
Course Code: ITC305 and Course Name: Paradigms and Computer Programming Fundamentals

Time: 2 hour   Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Which is **NOT** a correct syntax for a type signature for a haskell binary function named "**foo**" ?
Option A:	foo :: a-> a-> a
Option B:	foo :: Num a => a -> a -> a
Option C:	foo :: Num a => (b->a) -> a ->a
Option D:	foo :: Num a => b ->a -> a -> a
2.	Image 1 shows contents of two distinct prolog codes KB-1 and KB-2 Which of the following statements is **true** about the above two KBs KB-1: edge(a,b). edge(b,c). path(X, X). path(X, Y) :- edge(Z, Y), path(X, Z). KB-2: edge(a,b). edge(b,c). path(X, Y) :- edge(Z, Y), path(X, Z). path(X, X). Image 1
Option A:	Query path(a,a) will evaluate as true for both KBs
Option B:	Query path(a,a) will evaluate as false for both KBs

Option C:	Query path(a,a) will evaluate as true for KB-1 and false in KB-2
Option D:	Query path(a,a) will evaluate as true for KB-1 and will not terminate in KB-2
3.	When parameters are passed to a subroutine while calling it , are known as _____
Option A:	Formal parameters
Option B:	Normal parameters
Option C:	Actual parameters
Option D:	Additional parameters
4.	Consider a list a=[1, 2, 3, 4, 5, 6, 7, 8, 9, 10] is available in Haskell's interactive environment. If we execute following statement at prelude prompt what will be the output: let (y,z) = splitAt 1 a in y ++ (tail z)
Option A:	[1,2,3,4,5,6,7,8,9,10]
Option B:	[1,1,3,4,5,6,7,8,9,10]
Option C:	[1,3,4,5,6,7,8,9,10]
Option D:	[1,1,2,3,4,5,6,7,8,9,10]
5.	Image 2 shows a prolog code that performs some arithmetic operations. What will be the output, if we pose queries **calculate(F, 5)** and **calculate(5,5)** separately to the prolog interpreter based on this code? calculate(0,0). calculate(1,1). calculate(F,N) :- N>1, N1 is N-1, N2 is N-2, calculate(F1,N1), calculate(F2,N2), F is F1+F2. Image 2
Option A:	false and 5
Option B:	F=3 and true

Option C:	F=5 and true
Option D:	F=3 and false

6.	Which is the incorrect query in Prolog from the following?
Option A:	?- is(X, 1+2).
Option B:	?- X is 1+2.
Option C:	?- 1+2 is 4-1.
Option D:	?- is(1+2,X).

7.	Compiler translates high level language source code into _____
Option A:	corrected code
Option B:	object code
Option C:	pre code
Option D:	document code

8.	From the following statements, which is **not** true about Coroutines?
Option A:	Coroutines are execution contexts.
Option B:	Coroutines can not share a single stack.
Option C:	Coroutines can not be used to implement iterators.
Option D:	Coroutines can be used to implement threads.

9.	Which of the following is incorrect about Haskell
Option A:	It follows declarative style of programming
Option B:	Adopts principles of lambda calculus
Option C:	Store the state of the function in the form of variables
Option D:	Includes only pure functions

10.	Which of the following is true about polymorphism in Haskell?
Option A:	type variables in haskell is an instance of parametric polymorphism whereas type

	classes in haskell is an instance of ad-hoc polymorphism.
Option B:	type variables in haskell is an instance of ad-hoc polymorphism whereas type classes in haskell is an instance of parametric polymorphism.
Option C:	type variables and type classes in haskell are instances of parametric polymorphism.
Option D:	type variables and type classes in haskell are instances of ad-hoc polymorphism.
11.	Which of the following commands tells the Prolog system to fail a particular goal immediately without trying for alternate solutions.
Option A:	not
Option B:	cut
Option C:	unify
Option D:	disjunction
12.	Which of the following is **NOT** a Type class in Haskell.
Option A:	Bounded
Option B:	Functor
Option C:	Integral
Option D:	String
13.	Which of the following is true for Implicit parametric polymorphism
Option A:	Parameter types are not specified at all and not type-safe
Option B:	Parameter types to be specified explicitly, but still type-safe
Option C:	Parameter types are incompletely specified and not type-safe
Option D:	Parameter types are incompletely specified, but still type-safe
14.	From the following, which can not be considered as variable in Prolog?
Option A:	A

Option B:	_h
Option C:	What
Option D:	x

15.	Which of the following is used in logic programming?
Option A:	classes
Option B:	resolution and unification
Option C:	monad
Option D:	iterative constructs

16.	When binding of the referencing environment of a subroutine that has been passed as a parameter, occurs late then it is known as ___ and which is usually default in languages with _____.
Option A:	Shallow binding, dynamic scoping
Option B:	Shallow binding, static scoping
Option C:	deep binding, dynamic scoping
Option D:	deep binding, static scoping

17.	The period of time between the creation and the destruction of a name-to object binding is referred as
Option A:	binding lifetime
Option B:	object lifetime
Option C:	runtime lifetime
Option D:	referencing

18.	Which of the programming language DOES NOT belongs to declarative programming paradigm
Option A:	XML

Option B:	SQL
Option C:	prolog
Option D:	java
19.	Choose the most appropriate feature of the functional programming used in the Haskell code shown in image 4: ``` relate :: (c -> d) -> [c] -> [d] relate _ [] = [] relate f (x:xs) = f x : relate f xs ``` Image 4
Option A:	Polymorphism
Option B:	Higher order function
Option C:	Aggregates for structured objects
Option D:	Garbage Collection
20.	Maintenance of the stack is done by _____.
Option A:	Subroutine calling sequence / Subroutine frames
Option B:	Prologue2 / Subroutine local variables
Option C:	Epilogue / Subroutine return values
Option D:	Subroutine calling sequence, Prologue and Epilogue

Q2.	Solve any Four out of Six 5 marks each
A	Explain how Prolog differs from imperative languages in its handling of arithmetic.
B	Justify the following statement, "No single factor determines whether a programming language is good."
C	Explain concept of currying in haskell with an example.
D	Explain what are facts, rules, and queries in logic programming with example.

E	The haskell function head defined in prelude, returns the first element of a list and throws an exception when we try to apply it on an empty list. Define two variants of this function (you can use different names) that work exactly like head function except in the case of an empty list input they will show [] as output instead of throwing an exception. You must use the following constructs in Haskell for defining the functions. a. First implementation should make use of pattern matching. b. Second implementation uses guard equations **Note: Students are not expected to write the main function and do uer IO.**	
F	Describe different parameter passing modes.	
Q3.	**Solve any Four out of Six** **5 marks each**	
A	Compare heap based and stack based principle storage allocation mechanisms.	
B	Write a note on Lambda Calculus.	
C	What is the difference between normal-order and applicative-order evaluation? What is lazy evaluation?	
D	Describe the difference between forward chaining and backward chaining. Which is used in Prolog by default?	
E	Define a haskell function named "addUs" that adds 2 input numbers. Using this function as a building block, define a Haskell function "multiplyUs" that multiplies two input numbers. The multiplyUs function should cater to following: 1. Inputs may be signed numbers e.g. "multiplyUs (-2) * (3)" should result in "-6" and "multiplyUs (-2) * (-6)" should result in "12" 2. It should use guard expressions and recursion. 3. No need to write the main function to do user interaction writing definition for "addUs" and "multiplyUs" is sufficient.	
F	Discuss Scope with reference to binding in program. Also compare static and dynamic scoping.	