University of Mumbai

Examination 2021

Examinations Commencing from 10th April 2021 to 17th April 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 2020

Examinations Commencing from 10th April 2021 to 17th April 2021

Program: **Information Technology**

Curriculum Scheme: Rev2019

Examination: SE Semester III (DSE)

Course Code: ITC304 and Course Name: Principles of Communication

Time: 2 hour Max. Marks: 80

==========

==========

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

University of Mumbai
Examination 2021

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.

University of Mumbai
Examination 2021

Examinations Commencing from 10th January 2021 to 17th January 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

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

University of Mumbai

Examination 2021

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:	$\frac{s-2}{s^2-2s+8}$
Option B:	$\frac{s+2}{s^2-2s+8}$
Option C:	$\frac{s-2}{s^2+2s+8}$
Option D:	$\frac{s-2}{s^2+2s+4}$
2.	If $f(x) = \frac{1}{2}(\pi - x), 0 < x < 2\pi$ then a_0 is
Option A:	$\frac{2}{\pi}$
Option B:	0
Option C:	$\frac{\pi}{2}$
Option D:	$\frac{\sqrt{2}}{\pi}$
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 $(-1, 1)$ 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:	$e^{2t}\cos 3t$
Option B:	$e^{2t}\sin 3t$
Option C:	$e^{-2t}\cos 3t$
Option D:	$\cos 3t$
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:	$\frac{1}{3}(e^{(7/3)t})$
Option B:	$\frac{-1}{3}(e^{(5/3)t})$
Option C:	$\frac{1}{3}(e^{(-7/3)t})$
Option D:	$\frac{1}{3}(e^{(5/3)t})$
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 $\frac{\cos 2t-\cos 3t}{t}$

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:	$\int_c^{c+2l}[f(x)]^2dx = a_0^2 + \frac{1}{2}\sum_{n=1}^{\infty}(a_n^2 + b_n^2)$.
Option B:	$\frac{1}{2l}\int_c^{c+2\pi}[f(x)]^2dx = a_0^2 + \frac{1}{2}\sum_{n=1}^{\infty}(a_n^2 + b_n^2)$.
Option C:	$\frac{1}{2l}\int_c^{c+2l}[f(x)]^2dx = a_0^2 + \frac{1}{2}\sum_{n=1}^{\infty}(a_n^2 + b_n^2)$.
Option D:	$\frac{1}{2\pi}\int_c^{c+2\pi}[f(x)]^2dx = a_0^2 + \frac{1}{2}\sum_{n=1}^{\infty}(a_n^2 + b_n^2)$.
14.	The limits for coefficient of correlation are
Option A:	$-1 \le r \le 2$.
Option B:	$-1 \le r \le 0$.
Option C:	$-1 \le r \le 1$.
Option D:	$0 \le r \le 1$.
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 $f(x) = kx^2,\ 0 \le x \le 2$, 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:	$a_n = 0$, $b_n = 4\sum_{n=1}^{\infty}(-1)^n \frac{\cos nx}{n^2}$
Option C:	$a_n = 0 b_n = \frac{\pi^2}{3}$
Option D:	$a_n = \frac{\pi^2}{3}$, $b_n = 4\sum_{n=1}^{\infty}(-1)^n \frac{\cos nx}{n^2}$
18.	Find $L^{-1}\left[\log\left(\frac{s+1}{s+3}\right)\right]$.
Option A:	$\frac{-1}{t}(e^{-t}-e^{-3t})$.
Option B:	$\frac{-1}{2t}(e^{-t}-e^{-3t})$.
Option C:	$\frac{-1}{t}(e^{t}-e^{-3t})$.
Option D:	$\frac{1}{t}(e^{-t}-e^{-5t})$.
19.	Find $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$
Option A:	$\frac{1}{4}(1-\cos 2t)$
Option B:	$(1+\cos 2t)$
Option C:	$\frac{1}{4}(1-\sin 2t)$
Option D:	$\frac{1}{4}(1+\cos t)$
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 $L^{-1}\left[\frac{1}{(s+3)(s-4)^2}\right]$ 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 2021

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

==========

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

University of Mumbai
Examination 2020

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

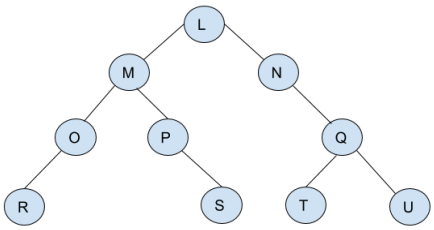
Time: 2 hour Max. Marks: 80

==========

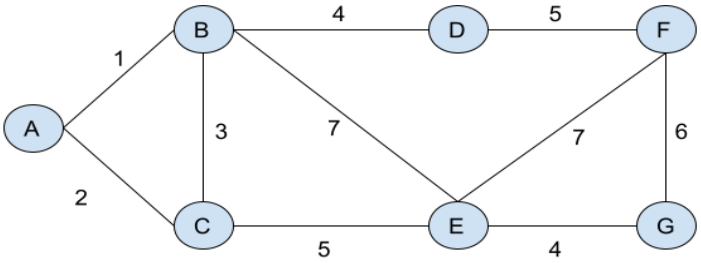
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The time required to insert an element in a stack with linked list implementation is
Option A:	O(1)
Option B:	O(log2 n)
Option C:	O(n)
Option D:	O(n log2 n)
2.	The five items: A, B, C, 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:	$½^n$
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.


A
B
C
D
E
F
G
1
2
3
4
5
7
7
6
5
4

University of Mumbai
Examination 2020

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

==========

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.	B
Q13.	C
Q14.	A
Q15.	B
Q16.	B
Q17.	C
Q18.	B
Q19.	C
Q20.	B

University of Mumbai
Examination 2021
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 2020

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

==========

==========

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