

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSDLO5011 and Course Name: Multimedia System

Time: 1 hour

Max. Marks: 50

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

Q17.	D
Q18.	A
Q19.	D
Q20.	C
Q21.	C
Q22.	A
Q23.	C
Q24.	C
Q25.	B

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSDLO5011 and Course Name: Multimedia System

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Note to the students:- All the Questions are compulsory and carry equal marks .

Q1.	_____ is any combination of text, graphic art, sound, animation, and video delivered to you by computer or other electronic devices.
Option A:	Multimedia
Option B:	Network
Option C:	Hyper media
Option D:	Visual Media
Q2.	Input devices comprises of
Option A:	Scanners
Option B:	Plotters
Option C:	Juke box
Option D:	Database
Q3.	To convert conventional image to digital images, _____ are used.
Option A:	·Cameras
Option B:	Scanners
Option C:	Computers
Option D:	Audio devices
Q4.	GIF means
Option A:	Graphic Information File
Option B:	Graphic Interchange Format
Option C:	Graphic Information Format
Option D:	Graphic Interchange File
Q5.	Rich text is known as _____
Option A:	Un-formatted text
Option B:	Formatted text
Option C:	Hypertext
Option D:	Semi-formatted

Q6.	What does Lossy Compression do to files?
Option A:	Increases the file size and keeps the same quality
Option B:	Eliminates no information at all
Option C:	Decreases the file size and keeps the same quality
Option D:	Eliminates unnecessary information in a file to reduce file size
Q7.	Which image files are a lossy format?
Option A:	GIF
Option B:	MPEG
Option C:	JPEG
Option D:	PNG
Q8.	While enlarging the image, _____ image will blur while _____ image will not blur.
Option A:	bitmap,vector
Option B:	vector,bitmap
Option C:	bitmap,dots
Option D:	Bitmap
Q9.	_____ is the process of converting continuous sample values into discrete values.
Option A:	Quantization.
Option B:	Sampling
Option C:	Prediction Filtering
Option D:	Coding
Q10.	_____ requires more bandwidth
Option A:	PCM
Option B:	DPCM
Option C:	ADPCM
Option D:	DM
Q11.	_____ is the process of converting continuous time into discrete values.
Option A:	Quantization.
Option B:	Sampling
Option C:	Prediction Filtering
Option D:	Coding
Q12.	MP3 is in which of the following MPEG standards?
Option A:	MPEG1
Option B:	MPEG2.
Option C:	MPEG3
Option D:	MPEG21
Q13.	_____ uses I ,P frames.
Option A:	BMP

Option B:	H.261
Option C:	JPEG
Option D:	MPEG
Q14.	_____ uses I ,P and B frames.
Option A:	BMP
Option B:	H.261
Option C:	JPEG
Option D:	MPEG
Q15.	If frames are displayed on screen fast enough, we get an impression of
Option A:	Signals
Option B:	Motions
Option C:	Packets
Option D:	Bits
Q16.	In temporal compression, redundant frames are
Option A:	Channelized
Option B:	Organized
Option C:	Digitized
Option D:	Removed.
Q17.	In real time streaming protocol , what server does in teardown state
Option A:	server resources for the client
Option B:	server delivers the stream to the client
Option C:	server suspends the delivery of the stream
Option D:	server breaks down the connection
Q18.	RTCP stands for
Option A:	real time transport control protocol
Option B:	real time transmission control protocol
Option C:	real time transmission change protocol
Option D:	real time transport change protocol
Q19.	RTP uses a temporary even-numbered _____ port
Option A:	TCP/IP
Option B:	IP
Option C:	TCP
Option D:	UDP
Q20.	The delay that occur during the playback of a stream is called _____
Option A:	Stream Delay
Option B:	Playback Delay
Option C:	Jitter
Option D:	Event Delay

Q21.	Which protocol is used for internet resource reservation?
Option A:	RTP
Option B:	RTCP.
Option C:	RSVP.
Option D:	RTSP.
Q22.	_____ is an attack on integrity
Option A:	modification
Option B:	Fabrication
Option C:	Interruption
Option D:	Interception
Q23.	_____ is hiding of data within data, where we can hide images, text, and other messages within images, videos, music or recording files.
Option A:	Cryptography
Option B:	Tomography
Option C:	Steganography
Option D:	Chorography
Q24.	Message _____ means that the receiver is ensured that the message is coming from the intended sender, not an imposter
Option A:	confidentiality
Option B:	Integrity
Option C:	Authentication
Option D:	Nonrepudiation
Q25.	Message_____ means that the data must arrive at the receiver exactly as sent
Option A:	confidentiality
Option B:	Integrity
Option C:	Authentication
Option D:	Nonrepudiation

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSDL05012 and Course Name: Elective I: Advance Operating System

Time: 1 hour

Max. Marks: 50

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

Q18.	C
Q19.	B
Q20.	B
Q21.	A
Q22.	A
Q23.	A
Q24.	C
Q25.	C

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSDLO5012 and Course Name: Elective I: Advance Operating System

Time: 1 hour

Max. Marks: 50

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Note to the students:- All the Questions are compulsory and carry equal marks .

Q1.	Which type of operating system used for very large and complex system which needs multiple processors?
Option A:	Distributed
Option B:	Real Time
Option C:	Multi-User
Option D:	Network
Q2.	Which operating system follow strict time bound?
Option A:	Hard real time OS
Option B:	Soft real time os
Option C:	Windows OS
Option D:	DOS
Q3.	Which of the following is another name for the system virtual machine?
Option A:	hardware virtual machine
Option B:	real machine
Option C:	software virtual machine
Option D:	hybrid virtual machine
Q4.	Software called a _____ separates the machine's resources from the hardware and provisions them appropriately so they can be used by the Virtual Machine.
Option A:	Real Time Operating System
Option B:	Network Operating System
Option C:	Operating System
Option D:	Hypervisor
Q5.	Which one of the following is not true?
Option A:	kernel is the program that constitutes the central core of the operating system
Option B:	kernel is the first part of operating system to load into memory during booting
Option C:	kernel is made of various modules which can not be loaded in running operating system
Option D:	kernel remains in the memory during the entire computer session

Q6.	Which directory file system in UNIX is used?
Option A:	linear directory
Option B:	diamond directory
Option C:	hierarchical directory
Option D:	graph structured directory
Q7.	Which data structure in unix file system defines the state of file system
Option A:	Boot block
Option B:	Superblock
Option C:	inode list
Option D:	data blocks
Q8.	When the kernel returns a buffer to the buffer pool, it usually attaches to
Option A:	the middle of free list
Option B:	the front of free list
Option C:	the tail of the free list
Option D:	anywhere in the free list
Q9.	What does U-area means ____
Option A:	User area of process which holds the specific information of process
Option B:	Uniform area of process
Option C:	this area contain information of os
Option D:	this area contain information of kernel
Q10.	Page Table is a ____
Option A:	Mapping between logical and physical address
Option B:	hash function
Option C:	store only logical address
Option D:	store only physical address
Q11.	When OS creates a process at the request of the explicit request of another process the action is referred as
Option A:	process creation
Option B:	Process deletion
Option C:	process updation
Option D:	process swapping
Q12.	Which field of PCB keeps information about next instruction
Option A:	CPU registers
Option B:	Program Counter
Option C:	CPU Scheduling Information
Option D:	Memory Control Information
Q13.	When the Processes can assess their own instructions but not the kernel instructions or the instruction of other processes then the mode is called as

Option A:	Kernel mode
Option B:	User Mode
Option C:	user mode and kernel mode
Option D:	no mode
Q14.	A paradigm of multiple autonomous computers having a private memory, communication through network is known as ____
Option A:	Distributed computing
Option B:	cloud computing
Option C:	parallel computing
Option D:	centralized computing
Q15.	Which algorithm is used to allocate new inode?
Option A:	iget
Option B:	ialloc
Option C:	getblk
Option D:	alloc
Q16.	If one site fails in distributed system
Option A:	the remaining sites can continue operating
Option B:	all the sites will stop working
Option C:	directly connected sites will stop working
Option D:	few sites will remain connected
Q17.	In distributed file system, _____ directories are visible from the local machine
Option A:	Private
Option B:	Local
Option C:	Protected
Option D:	Remote
Q18.	A critical section is a program segment
Option A:	which should run in a certain specified amount of time
Option B:	which avoids deadlocks
Option C:	where shared resources are accessed
Option D:	which must be enclosed by a pair of semaphore operations, P and V
Q19.	A multiprocessor operating system must take care of
Option A:	authorized data access and data protection
Option B:	unauthorized data access and data protection
Option C:	authorized data access
Option D:	data protection
Q20.	Communication between processors using a common system bus and common memory takes place in
Option A:	loosely coupled system
Option B:	tightly coupled system

Option C:	tightly and loosely coupled system
Option D:	neither loosely nor tightly couple
Q21.	Define MIMD
Option A:	Multiple instruction multiple data
Option B:	Multiple instruction must data
Option C:	Multiple instruction multiple distribution
Option D:	Multi instrument multiple data
Q22.	_____ serves as a PaaS vendor within Google App Engine system.
Option A:	Google
Option B:	Amazon
Option C:	Microsoft
Option D:	IBM
Q23.	An has a deadline by which it must finish or start, or if may have a constraint on both and finish time.
Option A:	hard real-time task
Option B:	aperiodic task
Option C:	soft real-time task
Option D:	periodic task
Q24.	Which of these mobile operating system is open source?
Option A:	Windows Mobile
Option B:	Linux
Option C:	Android
Option D:	Apple iOS
Q25.	Automated Car Assembly Point is an example of _____
Option A:	Network Operating System
Option B:	Time sharing Operating System
Option C:	Real time Operating System
Option D:	Middleware

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: **CSDLO5013**

and Course Name: **Elective I: Advance Algorithm**

Time: 1 hour

Max. Marks: 50

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

Q15.	C
Q16.	D
Q17.	B
Q18.	C
Q19.	D
Q20.	D
Q21.	B
Q22.	A
Q23.	D
Q24.	B
Q25.	B

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSDL05013 and Course Name: Advance Algorithm

Time: 1 hour

Max. Marks: 50

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Note to the students: - All the Questions are compulsory and carry equal marks .

Q1.	Which method credits the potential energy to pay for future operations
Option A:	accounting method
Option B:	average method
Option C:	potential method
Option D:	aggregate method
Q2.	An amortized analysis guarantees the average performance of each operation
Option A:	in the best case
Option B:	in the average case
Option C:	in the worst case
Option D:	in the best and worst case
Q3.	In master theorem, when the recurrence relation is represented by $T(n) = aT(n/b) + f(n)$ form. Then which of the following condition on 'a' is true?
Option A:	$a < 0$
Option B:	$a \geq 0$
Option C:	$a < 1$
Option D:	$a \geq 1$
Q4.	In accounting method of amortized analysis, what is the amortized cost charged for the 'multipop()' operation of stack?
Option A:	0
Option B:	1
Option C:	2
Option D:	3
Q5.	What will be the complexity for recurrence relation $T(n) = 9T(n/3) + n$ using Master's Method?
Option A:	$T(n) = \theta(n^2)$
Option B:	$T(n) = \theta(n \log n)$
Option C:	$T(n) = \theta(n^3)$
Option D:	$T(n) = \theta(n/3)$

Q6.	The worst case of the hiring problem involves
Option A:	hiring a single candidates
Option B:	hiring few candidates
Option C:	hiring no candidate
Option D:	hiring every candidate
Q7.	Which of the following variables provides a convenient method for converting between probabilities and expectations?
Option A:	Indicator variable
Option B:	Random variable
Option C:	Indicator random variable
Option D:	Temporary variable
Q8.	Why do we need a binary tree which is height balanced?
Option A:	To avoid formation of skew trees
Option B:	To save memory
Option C:	To simplify storing
Option D:	To attain faster memory access
Q9.	When to choose Red-Black tree, AVL tree and B-trees?
Option A:	many inserts, many searches and when managing more items respectively
Option B:	many searches, when managing more items respectively and many inserts respectively
Option C:	sorting, sorting and retrieval respectively
Option D:	retrieval, sorting and retrieval respectively
Q10.	Why do we impose restrictions like: . root property is black . every leaf is black . children of red node are black . all leaves have same black
Option A:	to get linear time complexity
Option B:	to get exponential time complexity
Option C:	to get logarithm time complexity
Option D:	to get constant time complexity
Q11.	In binomial heap, each binomial tree obeys _____ property.
Option A:	max-heap
Option B:	min-heap
Option C:	mean-heap
Option D:	sorted-heap
Q12.	Why Red-black trees are preferred over hash tables though hash tables have constant time complexity?
Option A:	no they are not preferred

Option B:	because of resizing issues of hash table and better ordering in red black trees
Option C:	because they can be implemented using trees
Option D:	because they are balanced
Q13.	Consider a binary max-heap implemented using an array. Which one of the following array represents a binary max-heap?
Option A:	25,12,16,13,10,8,14
Option B:	25,14,16,13,10,8,12
Option C:	25,14,12,13,10,8,16
Option D:	10, 8, 16, 14,12,13,25
Q14.	What best describes Maximum flow problem
Option A:	finding the shortest path between source and sink
Option B:	computing a minimum spanning tree
Option C:	finding a flow between source and sink that is minimum
Option D:	finding a flow between source and sink that is maximum
Q15.	A minimum cut of a flow network is a cut whose
Option A:	Flow is minimum over all cuts of a network.
Option B:	Flow is maximum over all cuts of a network.
Option C:	Capacity is minimum over all cuts of a network.
Option D:	Capacity is maximum over all cuts of a network.
Q16.	The complexity of the relabel to front algorithm is
Option A:	$O(V^2E)$
Option B:	$O(E \log V)$
Option C:	$O(E f^*)$
Option D:	$O(V^3)$
Q17.	Under what condition can a vertex combine and distribute flow in any manner?
Option A:	It may violate edge capacities
Option B:	It should maintain flow conservation
Option C:	The vertex should be a source vertex
Option D:	The vertex should be a sink vertex
Q18.	Let n denotes number of nodes in graph, m denotes edges in graph. and U is the capacity of largest edge. The complexity of Ford Fulkerson Algorithm is
Option A:	$O(mn)$
Option B:	$O(n^2)$
Option C:	$O(nm^2)$
Option D:	$O(\log n)$
Q19.	Consider two vectors $p_1(4,3)$ and $p_2(2,3)$. The cross product $p_1 \times p_2$ is
Option A:	1
Option B:	-1
Option C:	-6

Option D:	6
Q20.	The algorithm which uses a technique of package wrapping to compute the convex hull is known as
Option A:	Incremental method
Option B:	Divide and conquer method
Option C:	Graham scan method
Option D:	Jarvis's March method
Q21.	Graham scan solves the convex hull problem by using which data structures:
Option A:	Queue
Option B:	Stack
Option C:	Array
Option D:	Linked List
Q22.	Which of the following class consists of problems that are solvable in polynomial time?
Option A:	P
Option B:	NP
Option C:	NP Complete
Option D:	NP Hard
Q23.	The halting problem of Turing machine is a
Option A:	P class problem
Option B:	NP class problem
Option C:	NP Complete problem
Option D:	NP Hard problem
Q24.	How many steps are required to prove that a decision problem is NP complete?
Option A:	1
Option B:	2
Option C:	3
Option D:	4
Q25.	In map-coloring problem:
Option A:	Adjacent regions must have the same color
Option B:	Adjacent regions must have different colors
Option C:	Adjacent regions must have the same color but separated by a line of different color
Option D:	There is no restriction on the colors of adjacent regions

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year Semester: V

Course Code: CSC501 and Course Name: Microprocessor

Time: 1 hour

Max. Marks: 50

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	A
Q2.	C
Q3.	C
Q4	A
Q5	B
Q6	D
Q7	A
Q8.	D
Q9.	A
Q10.	A
Q11.	B
Q12.	C
Q13.	A
Q14.	C
Q15.	B
Q16.	C
Q17.	C
Q18.	B
Q19.	C
Q20.	B
Q21.	B
Q22.	C
Q23.	A
Q24.	C
Q25.	C

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year Semester: V

Course Code: CSC501 and Course Name: Microprocessor

Time: 1 hour

Max. Marks: 50

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For the students:- All the Questions are compulsory and carry equal marks .

Q1.	Demultiplexing of address from multiplex pins is done by using
Option A:	8282 address latch
Option B:	8286 data transceiver
Option C:	8284 clk generator
Option D:	8288 bus controller
Q2.	The size of the 8086 instruction byte queue is 6 byte because
Option A:	It supports 16 bit data bus
Option B:	Its all instruction are 6 byte long
Option C:	The maximum size of 8086 instruction is 6 byte
Option D:	Because it supports pipelining
Q3.	Physical address generated by 8086 is of
Option A:	8 bit
Option B:	16 bit
Option C:	20 bit
Option D:	32 bit
Q4.	Direction Flag of 8086 is used to update the content of following register automatically
Option A:	Index Register
Option B:	Pointer register
Option C:	Base Register
Option D:	GPR
Q5.	Maximum mode of 8086 is
Option A:	Uniprocessor system
Option B:	Multiprocessor system
Option C:	Superscalar system
Option D:	Single processor system
Q6.	After execution of Following instruction, the content of flag can not be changed
Option A:	ADD
Option B:	INC
Option C:	CMP
Option D:	JC
Q7.	CMPSB instruction falls under following instruction group

Option A:	String
Option B:	Control transfer
Option C:	I/O
Option D:	Processor control
Q8.	CMC instruction is used to
Option A:	Compare carry flag
Option B:	Set carry flag
Option C:	Reset carry flag
Option D:	Complement carry flag
Q9.	Following directive is used to end the program module
Option A:	END
Option B:	ENDP
Option C:	ENDS
Option D:	ENDL
Q10.	CBW instruction converts
Option A:	Byte to word
Option B:	Word to byte
Option C:	Signed no to unsigned no
Option D:	Unsigned no to signed no
Q11.	Interrupt vector table is used to store
Option A:	Interrupt Nos
Option B:	ISR addresses
Option C:	Offset address of interrupts
Option D:	Base addresses for interrupts
Q12.	Following are the maximum slaves which can be connected to master PIC
Option A:	5 slaves
Option B:	4 slaves
Option C:	8 slaves
Option D:	10 slaves
Q13.	ICW 3 of 8259 is used to set
Option A:	Master and slave mode
Option B:	Mask mode
Option C:	Poll mode
Option D:	Fully nested mode
Q14.	Square wave is generated in mode of 8253 PIT.
Option A:	1
Option B:	2
Option C:	3
Option D:	4
Q15.	When no channel is requesting service 8237 enters into

Option A:	Active cycle
Option B:	Idle cycle
Option C:	DMA cycle
Option D:	Acknowledge cycle
Q16.	What is 8255?
Option A:	PIC
Option B:	PIT
Option C:	PPI
Option D:	PPP
Q17.	Following no of pins of port c are required to operate port A in bidirectional mode
Option A:	3 pins
Option B:	2 pins
Option C:	5 pins
Option D:	6 pins
Q18.	8253 can be operated in _____ no of modes
Option A:	5
Option B:	6
Option C:	3
Option D:	4
Q19.	Following pin is used to generate the output in case of 8253 PIT
Option A:	CLK
Option B:	GATE
Option C:	OUT
Option D:	CS
Q20.	Real address mode of 80386 is same as
Option A:	8085 system
Option B:	8086 system
Option C:	Pentium system
Option D:	8087 system
Q21.	In EFLAG of 80386 IOPL is of Bit flag.
Option A:	1
Option B:	2
Option C:	4
Option D:	8
Q22.	In protection mechanism of 80386 the OS kernel is placed at level
Option A:	PL3
Option B:	PL2
Option C:	PL0
Option D:	PL1
Q23.	Pentium processor support cache memory for

Option A:	Data and Instruction
Option B:	Data and Address
Option C:	Data and control
Option D:	Control and Address
Q24.	The fifth stage of pipeline is also known as
Option A:	read back stage
Option B:	read forward stage
Option C:	write back stage
Option D:	result back stage
Q25.	The unit that is used to implement the branch prediction in Pentium is
Option A:	control unit
Option B:	bus interface unit
Option C:	branch target buffer
Option D:	branch instruction register

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year Semester V

Course Code: CSC502 and Course Name: Database Management System

Time: 1 hour

Max. Marks: 50

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	C
Q2.	A
Q3.	C
Q4	A
Q5	C
Q6	B
Q7	B
Q8.	C
Q9.	D
Q10.	A
Q11.	B
Q12.	D
Q13.	D
Q14.	B
Q15.	A
Q16.	C
Q17.	D
Q18.	B
Q19.	C
Q20.	A
Q21.	C
Q22.	B
Q23.	C
Q24.	B

Q25.	B
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University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year Semester V


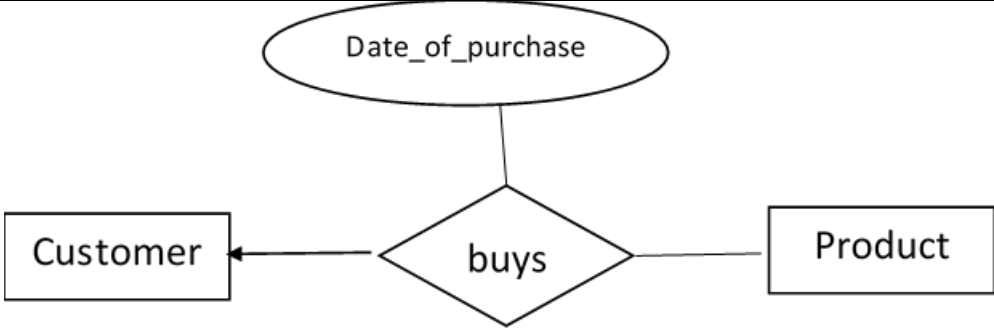
Course Code: CSC502 and Course Name: Database Management System

Time: 1 hour

Max. Marks: 50

For the students:- All the Questions are compulsory and carry equal marks .

Q1.	Which of the following is incorrect regarding levels of abstraction in database ?
Option A:	Physical level describes how to store a record and not the relationship among the data.
Option B:	Logical level describes what data to store in database and the relationship among the data.
Option C:	Physical level describes what data to store in the database.
Option D:	View level hides the details of data types.
Q2.	Bank customer can withdraw money from bank account using ATM machine interfaces. Which type of user is a bank customer
Option A:	Naïve user
Option B:	Application Developer
Option C:	DBA
Option D:	Programmer
Q3.	Which of the following concept allows us to represent relationship as entities.
Option A:	Generalization
Option B:	Specialization
Option C:	Aggregation
Option D:	Participation
Q4.	Consider the employee work-team example, and assume that certain employees participate in more than one work team. A given employee may therefore appear in more than one of the team entity sets that are lower level entity sets of employee. Thus, the generalization is _____
Option A:	Overlapping
Option B:	Disjointness
Option C:	Uniqueness
Option D:	Relational
Q5.	Let E1 and E2 be two entities in an E-R diagram with simple single-valued attributes,R1 and R2 are two relationships between E1 and E2, where R1 is one-to-many and R2 is many-to-many,R1 and R2 do not have any attributes of their own,What is the minimum number of tables required to represent this situation in the relational model.
Option A:	2

Option B:	4
Option C:	3
Option D:	5
Q6.	<p>What is cardinality of relation between loan and customer in the given diagram</p> 
Option A:	A loan can be borrowed by at most 1 customer and a customer can borrow at most 1 loan
Option B:	A loan can be borrowed by N customer and a customer can borrow at most 1 loan
Option C:	A loan can be borrowed by at most 1 customer and a customer can borrow N loans
Option D:	A loan can be borrowed by N customer and a customer can borrow at most N loan
Q7.	 <p>Consider 1-to-many relationship as shown in the diagram. Relationship attribute date_of_purchase will be placed in which of the following tables after converting to relational model.</p>
Option A:	Customer entity table
Option B:	Product entity table
Option C:	Both customer and product relationship table
Option D:	One more table needs to be created
Q8.	Identify the correct type of join which returns all matched and unmatched rows from the table
Option A:	Equi Join
Option B:	Left outer Join
Option C:	Full outer Join
Option D:	Right outer Join
Q9.	Consider the following relations: Parts(pid,pname,color) PartCost(pid,cost) What does the following relational algebra expression represent? $\Pi_{pid}((\sigma_{color='red'} Parts) \bowtie (\sigma_{cost \geq 1000} PartCost))$
Option A:	Find the pid of all parts whose color is red.

Option B:	Find the pid of all parts whose color is red or cost ≥ 1000 .												
Option C:	Find the pid of all parts whose color is red but not cost ≥ 1000 .												
Option D:	Find the pid of all parts whose color is red and cost ≥ 1000 .												
Q10.	<p>Consider the following relations</p> <p>student(id, name, address, gpa, sizeHS)</p> <p>campus(location, enrollment, rank)</p> <p>apply(id, location, date, major, decision)</p> <p>Identify the correct query to find name and address of all students with GPA > 3.7 and sizeHS < 1000</p>												
Option A:	$\Pi_{name, address}(\sigma_{GPA>3.7 \wedge sizeHS<1000}(student))$												
Option B:	$\sigma_{name, address}(\Pi_{GPA>3.7 \wedge sizeHS<1000}(student))$												
Option C:	$\Pi_{name, address}(\sigma_{GPA>3.7 \vee sizeHS<1000}(student))$												
Option D:	$\sigma_{name, address}(\Pi_{GPA>3.7 \vee sizeHS<1000}(student))$												
Q11.	Which command is used to select distinct subject (SUB) from the table (BOOK).												
Option A:	SELECT ALL FROM BOOK												
Option B:	SELECT DISTINCT SUB FROM BOOK												
Option C:	SELECT SUB FROM BOOK												
Option D:	SELECT UNIQUE SUB FROM BOOK												
Q12.	<p>Consider the relation schema, weather(city, temperature, humidity, condition).</p> <p>Find names of the cities whose temperature is not in the range of 71 to 89.</p>												
Option A:	Select city from weather where temperature NOT IN 71 TO 89												
Option B:	Select city from weather where temperature NOT IN 71 AND 89												
Option C:	Select city from weather where temperature NOT BETWEEN 71 TO 89												
Option D:	Select city from weather where temperature NOT BETWEEN 71 AND 89												
Q13.	Write a query to set default amount for fees to 1000 for table student												
Option A:	Update student modify fees default 1000												
Option B:	Update student set fees to default 1000												
Option C:	Alter table student set fees to default 1000												
Option D:	Alter table student modify fees default 1000												
Q14.	'___' matches any string of _____ three characters. '___%' matches any string of _____ three characters.												
Option A:	Atleast, Exactly												
Option B:	Exactly, Atleast												
Option C:	Atleast, All												
Option D:	All, Exactly												
Q15.	<p>Consider the following instance:</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Tname</th> <th>Tvalue</th> <th>Tgroup</th> </tr> </thead> <tbody> <tr> <td>t1</td> <td>12340</td> <td>g1</td> </tr> <tr> <td>t2</td> <td>500</td> <td>g2</td> </tr> <tr> <td>t3</td> <td>3456</td> <td>g2</td> </tr> </tbody> </table>	Tname	Tvalue	Tgroup	t1	12340	g1	t2	500	g2	t3	3456	g2
Tname	Tvalue	Tgroup											
t1	12340	g1											
t2	500	g2											
t3	3456	g2											

	t4	23	g2
	t5	100	g3
	What will be the output of the following query? SELECT MAX(TVALUE)/MIN(TVALUE) FROM TEST GROUP BY TGROUP HAVING TGROUP='g2'		
Option A:	150.260 (approx)		
Option B:	536.52 (approx)		
Option C:	1326.33 (approx)		
Option D:	AN ERROR		
Q16.	A relation is said to be in 1NF if		
Option A:	There is no duplication of data.		
Option B:	There are only a few composite attributes.		
Option C:	There are no multivalued attributes in the relation.		
Option D:	All attributes are of uniform type.		
Q17.	Relation R=(a, b, c, d, e, g) having the functional dependencies F=(a->b, bg->e, c->d,d->g) Find the candidate key		
Option A:	ag		
Option B:	abc		
Option C:	abd		
Option D:	ac		
Q18.	Consider the relation Construction(Company, Material, Type, Cost) along with the Functional Dependencies: FD1: Company -> Material FD2: Material -> Type FD3: Type -> Cost The relation is decomposed into the following: Construction1(Company, Type, Cost) Construction2(Material, Type) Which of the following is true about the decomposition?		
Option A:	Both lossless and decomposition preserving.		
Option B:	Neither lossless nor decomposition preserving		
Option C:	Lossless but not decomposition preserving.		
Option D:	Lossy but decomposition preserving		
Q19.	4NF is designed to cope with		
Option A:	Transitive dependency		
Option B:	Join dependency		
Option C:	Multi valued dependency		
Option D:	Partial dependency		
Q20.	Which of the following has all-or-none property		
Option A:	Atomicity.		
Option B:	Durability.		
Option C:	Isolation.		

Option D:	Consistency																		
Q21.	If the transaction $T_i:read(x);write(x);read(y);write(y);commit;$ completes all the instructions except commit then transaction is in																		
Option A:	Aborted state																		
Option B:	Active state																		
Option C:	Partially committed state																		
Option D:	Failure state																		
Q22.	Consider following 2 schedules $S1: r1(X);r3(Y);r3(X);r2(Y);r2(Z);w3(Y);w2(Z);r1(Z);w1(X);w1(Z)$ $S2: r1(X); r3(Y); r2(Y); r3(X); r1(Z);r2(Z); w3(Y); w1(X); w2(Z);w1(Z)$																		
Option A:	S1 and S2 both are conflict serializable																		
Option B:	only S1 is conflict serializable																		
Option C:	only S2 is conflict serializable																		
Option D:	S1 and S2 both are not conflict serializable																		
Q23.	Suppose in a database, there are three transactions T1, T2 and T3 with timestamp 10, 20 and 30 respectively. T2 is holding a data item which T1 and T3 are requesting to acquire. Which of the following statement is correct in respect of Wound-Wait Deadlock Prevention scheme?																		
Option A:	Transaction T1 will wait for T2 to release the data item.																		
Option B:	Transaction T1 will be aborted.																		
Option C:	Transaction T3 will wait for T2 to release the data item.																		
Option D:	Transaction T3 will be aborted.																		
Q24.	Consider the following example of a log of three transactions, where immediate database modification scheme is used. If a crash occurs just after step 8 and the recovery of the system is successfully completed, which of the following action is true? <table border="1" data-bbox="395 1339 624 1534"> <thead> <tr> <th>#steps</th> <th>Details of log</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>(T0,start)</td> </tr> <tr> <td>2.</td> <td>(T0,X,300,800)</td> </tr> <tr> <td>3.</td> <td>(T1,start)</td> </tr> <tr> <td>4.</td> <td>(T1,Y,500,600)</td> </tr> <tr> <td>5.</td> <td>(T1,Z,800,200)</td> </tr> <tr> <td>6.</td> <td>(T0,Commit)</td> </tr> <tr> <td>7.</td> <td>(T2,start)</td> </tr> <tr> <td>8.</td> <td>(T2,P,500,700)</td> </tr> </tbody> </table>	#steps	Details of log	1.	(T0,start)	2.	(T0,X,300,800)	3.	(T1,start)	4.	(T1,Y,500,600)	5.	(T1,Z,800,200)	6.	(T0,Commit)	7.	(T2,start)	8.	(T2,P,500,700)
#steps	Details of log																		
1.	(T0,start)																		
2.	(T0,X,300,800)																		
3.	(T1,start)																		
4.	(T1,Y,500,600)																		
5.	(T1,Z,800,200)																		
6.	(T0,Commit)																		
7.	(T2,start)																		
8.	(T2,P,500,700)																		
Option A:	T0: redo and T1, T2: No action																		
Option B:	T0: redo and T1, T2: undo																		
Option C:	T1: redo and T0, T2: undo																		
Option D:	T2: redo and T0, T1: undo																		
Q25.	If a transaction has obtained a _____ lock, it can read and write on the item																		
Option A:	Shared mode																		
Option B:	Exclusive mode																		
Option C:	Read only mode																		
Option D:	Write only mode																		

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year Semester V

Course Code: **CSC503** and Course Name: **Computer Network**

Time: 1 hour

Max. Marks: 50

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	D
Q2.	C
Q3.	C
Q4	B
Q5	D
Q6	B
Q7	B
Q8.	D
Q9.	B
Q10.	B
Q11.	A
Q12.	A
Q13.	C
Q14.	B
Q15.	A
Q16.	D
Q17.	C
Q18.	B
Q19.	D
Q20.	C
Q21.	D
Q22.	C
Q23.	A
Q24.	C
Q25.	A

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year Semester V

Course Code: **CSC503** and Course Name: **Computer Network**

Time: 1 hour

Max. Marks: 50

For the students:- All the Questions are compulsory and carry equal marks .

Q1.	The first Network was called _____
Option A:	CNNET
Option B:	NSFNET
Option C:	ASAPNET
Option D:	ARPANET
Q2.	Radio Frequency band as specified in Electromagnetic Spectrum is around _____
Option A:	$3 \times 10^9 - 3 \times 10^{11} \text{Hz}$
Option B:	$3 \times 10^{16} - 3 \times 10^{19} \text{Hz}$
Option C:	$< 3 \times 10^9$
Option D:	$3 \times 10^{11} - 3 \times 10^{14} \text{Hz}$
Q3.	Which Network Medium Carries Multiple Signal Frequencies at a Time
Option A:	STP Cable
Option B:	UTP Cable
Option C:	Coaxial Cable
Option D:	FRC Cable
Q4.	The Communication Mode of Sending Signal from KeyBoard to Processor is
Option A:	Duplex
Option B:	Simplex
Option C:	Half Duplex
Option D:	Full Duplex
Q5.	Count to infinity Problem is in _____
Option A:	Broadcasting
Option B:	Strict Source Routing
Option C:	Link State Routing
Option D:	Distance vector Routing
Q6.	The main reason to apply some Twists for Twisted Pair Cable is just to _____
Option A:	Eliminate Electric Loss
Option B:	To Overcome the Noise and EMI
Option C:	To eliminate Radiation
Option D:	To Enhance the Speed of Communication

Q7.	Which Topology needs a central Authority or Central Control Unit for Feasible Communication?
Option A:	Distributed Bus
Option B:	Star
Option C:	Ring
Option D:	Mesh
Q8.	Sending a response along with an Acknowledgement is termed as
Option A:	Handshake
Option B:	Response Headers
Option C:	Sequence Forwarding
Option D:	Piggybacking
Q9.	Ethernet IEEE 802.3 uses _____ MAC protocol
Option A:	S-Aloha
Option B:	CSMA/CD
Option C:	PRMA
Option D:	MACA
Q10.	Sliding Window protocol is used for?
Option A:	Error Correction
Option B:	Flow Control
Option C:	Routing
Option D:	Encapsulation
Q11.	Layer 3 device is a _____
Option A:	Router
Option B:	Bridge
Option C:	Access Point
Option D:	Connector
Q12.	IGMP messages are
Option A:	Join and Leave
Option B:	Echo and Ping
Option C:	Sync and Ack
Option D:	Fin and Close
Q13.	A _____ byte IPv4 address consists of _____
Option A:	4, only network address
Option B:	6, only host address
Option C:	4, network address & host address
Option D:	6, network address & MAC address
Q14.	Address Resolution protocol is
Option A:	MAC layer protocol
Option B:	Network Layer Protocol
Option C:	Physical Layer Protocol
Option D:	Transport Layer Protocol

Q15.	ICMP is primarily used for _____
Option A:	Error and diagnostic functions
Option B:	Addressing
Option C:	Forwarding
Option D:	Routing
Q16.	Which of the following routing algorithms can be used for network layer design?
Option A:	Shortest path algorithm
Option B:	Distance vector routing
Option C:	Link state routing
Option D:	All of the above
Q17.	In an IPv4 datagram, the M bit is 0, the value of HLEN is 10, the value of total length is 400 and the fragment offset value is 300. The position of the datagram, the sequence numbers of the first and the last bytes of the payload, respectively are
Option A:	Last fragment, 2400 and 2789
Option B:	First fragment, 2400 and 2759
Option C:	Last fragment, 2400 and 2759
Option D:	Middle fragment, 300 and 689
Q18.	Which statement is false in case of User Datagram Protocol
Option A:	Its Connection less protocol
Option B:	It's a protocol used to establish Network Layer connection
Option C:	It does not use handshake process
Option D:	It's used to send small messages across to its peer.
Q19.	Transmission control protocol _____
Option A:	Is a connection-oriented protocol
Option B:	Uses a three way handshake to establish a connection
Option C:	Receives data from application as a single stream
Option D:	All of the above
Q20.	Which of the following are transport layer protocols used in Computer Networks?
Option A:	TCP and FTP
Option B:	UDP and HTTP
Option C:	TCP and UDP
Option D:	HTTP and FTP
Q21.	Which of the following system calls results in the sending of SYN packets?
Option A:	Socket
Option B:	Bind
Option C:	Listen
Option D:	Connect
Q22.	TCP Congestion Control Method

Option A:	Checksum
Option B:	Cyclic Redundancy Check
Option C:	Slow Start
Option D:	Network Address Translation
Q23.	What is MIME
Option A:	Multipurpose Internet Mail Extension
Option B:	Multimedia Internet Mail Extension
Option C:	Multimedia Interactive Mail Extension
Option D:	Mail Internet Multimedia Engine
Q24.	_____ Used for FTP Control and _____ is used for FTP Data Part
Option A:	Port 20 , Port 21
Option B:	Port 16 , Port 17
Option C:	Port 21, Port 20
Option D:	Port 80, Port 81
Q25.	What are the different Sections of Email
Option A:	Envelope, Body, Header
Option B:	To, From, Text, Report
Option C:	Source, Destination, Text
Option D:	Message, Sender and Receiver

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year

Semester: V

Course Code: CSC504 and Course Name: Theory of Computer Science

Time: 1 hour

Max. Marks: 50

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	A
Q2.	B
Q3.	B
Q4	B
Q5	C
Q6	C
Q7	C
Q8.	A
Q9.	C
Q10.	A
Q11.	A
Q12.	B
Q13.	C
Q14.	D
Q15.	A
Q16.	C
Q17.	A
Q18.	B
Q19.	A
Q20.	C
Q21.	D
Q22.	A
Q23.	C
Q24.	A
Q25.	B

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year Semester: V

Course Code: CSC504 and Course Name: Theory of Computer Science

Time: 1 hour

Max. Marks: 50

=====

For the students:- All the Questions are compulsory and carry equal marks .

Q1.	Which of the following statement is correct?
Option A:	Positive Closure is the set of all possible strings except ϵ over alphabet Σ .
Option B:	Positive closure and Kleene closure both are same.
Option C:	Positive closure is the set of all possible strings including ϵ over alphabet Σ .
Option D:	Kleene closure is the set of all possible strings excluding ϵ over alphabet Σ .
Q2.	The functions used to represent working of Finite State Machine are _____.
Option A:	Output Function and State Function
Option B:	Machine Function and State transition Function
Option C:	Transition Function and Machine Function
Option D:	Output Function and Machine Function
Q3.	How many states will be there in FSM to check any binary number is divisible by 4 or not?
Option A:	3
Option B:	4
Option C:	6
Option D:	5
Q4.	The transition function of NFA is represented as _____
Option A:	$\delta : Q \times \Sigma \rightarrow Q$
Option B:	$\delta : Q \times \Sigma \rightarrow 2^Q$
Option C:	$\delta : Q \times \Sigma \rightarrow \Sigma$
Option D:	$\delta : Q \times \Sigma \rightarrow Q^2$
Q5.	Q. Which of the following statements are correct? Statement 1 : ϵ -closure of state 'q' is set of states 'p' such that there is a path "from q to p" labelled ' ϵ ' directly or indirectly. Statement 2 : It is a set of states with distance zero from state 'q'. Statement 3 : The state itself is included in its ϵ -closure.
Option A:	1 and 2
Option B:	1 only
Option C:	1, 2 and 3
Option D:	2 only
Q6.	For minimizing DFA which of the following statements are true? Statement 1 : We can replace initial state. Statement 2 : Any final state can be replaced by other final state only.

	Statement 3 : Any non-final state can be replaced by other non-final state only. Statement 4 : We cannot replace initial state.
Option A:	1 and 2
Option B:	1, 2 and 3
Option C:	2, 3 and 4
Option D:	1 and 3
Q7.	Which of the following identity is not correct in case of regular languages?
Option A:	$R+R=R$
Option B:	$\epsilon.R = R. E = R$
Option C:	$R^*R=R$
Option D:	$(R^*)^* = R^*$
Q8.	Which of the following pair of Regular Expression is equivalent?
Option A:	$(a+b)^* = (a+b)^*+(a+b)^*$
Option B:	$(x+y) =x.y$
Option C:	$0^*1=1$
Option D:	$(a.b)^* = a^*b^*$
Q9.	Find out regular expression for the given finite automata.
Option A:	$(b+a)^*$
Option B:	$(a+b)^*$
Option C:	$(b+aa)^*a$
Option D:	$(b+a)^*a$
Q10.	Which of the following language is not regular language?
Option A:	$a^n b^{(n+1)}$
Option B:	$(a+b)(a+b)$
Option C:	$(a+b)^*$
Option D:	ab^*
Q11.	A context free language is called ambiguous if _____
Option A:	It has two or more leftmost or rightmost derivations for some terminal string $w \in L(G)$.
Option B:	It has two or more only leftmost derivations for some terminal string $w \in L(G)$.
Option C:	It has two or more only rightmost derivations for some terminal string $w \in L(G)$.
Option D:	It has only one leftmost and rightmost derivation for some terminal string $w \in L(G)$.
Q12.	Consider CFG G , which is defined as: $S \rightarrow aB \mid bA$ $A \rightarrow a \mid aS \mid bAA$ $B \rightarrow b \mid bS \mid aBB$ where S is the starting symbol.

	How many steps are required in LMD to generate “bbaaba”?
Option A:	5
Option B:	6
Option C:	7
Option D:	4
Q13.	In context to the process of removing useless symbols, which of the following is correct?
Option A:	We remove the Nullable variables
Option B:	We eliminate the unit productions
Option C:	We eliminate products which yield no terminals
Option D:	We eliminate start symbol
Q14.	Given Grammar: $S \rightarrow A$ $A \rightarrow aA$ $A \rightarrow \epsilon$ $B \rightarrow bA$ Which among the following productions are Useless productions?
Option A:	$S \rightarrow A$
Option B:	$A \rightarrow Aa$
Option C:	$A \rightarrow \epsilon$
Option D:	$B \rightarrow bA$
Q15.	Which of the production rule cannot be accepted by Chomsky normal form?
Option A:	$A \rightarrow BCD$
Option B:	$A \rightarrow a$
Option C:	$S \rightarrow \epsilon$
Option D:	$A \rightarrow BC$
Q16.	Which of the statement is true in case of Deterministic PDA?
Option A:	There can be multiple moves under a situation.
Option B:	No-operation is not valid.
Option C:	There is only one move in every situation.
Option D:	There can be Epsilon transition.
Q17.	Which of the following is valid action while designing PDA for $L = \{a^n b^{n+1}, n \geq 1\}$
Option A:	For first ‘b’ perform no-operation
Option B:	For first ‘b’ perform push
Option C:	For first ‘b’ perform pop
Option D:	For first ‘b’ pop ‘a’
Q18.	What are the stack symbols in case of PDA for $L = \{a^n b^m c^n, n \geq 1\}$.
Option A:	$\Gamma = \{a, b, Z_0\}$
Option B:	$\Gamma = \{a, Z_0\}$
Option C:	$\Gamma = \{a, b, c, Z_0\}$
Option D:	$\Gamma = \{a, b, c\}$

Q19.	What does the following transition of Turing Machine represent? $(q_2, 0) \rightarrow (q_3, *, S)$
Option A:	Replace 0 by *, change state to q_3 and Halt
Option B:	No change on input tape
Option C:	Replace 0 by *
Option D:	Replace 0 by * , no change in state and Halt
Q20.	Which of the operations can be performed by the head of Turing Machine?
Option A:	Read
Option B:	Write
Option C:	Read and Write
Option D:	No-operation
Q21.	Which of the following statement is true for Turing machine, Finite Automata and Pushdown Automata with respect to their capability?
Option A:	All are equally capable.
Option B:	Turing Machine is more capable than Finite Automata but equally capable with Pushdown Automata.
Option C:	Turing Machine is more capable than Pushdown Automata but equally capable with Finite Automata.
Option D:	Turing Machine is more capable than Pushdown Automata and Finite Automata both.
Q22.	If there are multiple transitions from any particular state on any particular input symbol then such Turing Machine is considered as_____.
Option A:	Non-Deterministic
Option B:	Multi-tape
Option C:	Multi-head
Option D:	Multi-tape and Multi-head
Q23.	The Turing Machine that simulates behavior of other Turing Machine is called as_____.
Option A:	Two-way Infinite Tape TM
Option B:	Multi-tape TM
Option C:	Universal TM
Option D:	Multi-head TM
Q24.	Which of the following are undecidable problem?
Option A:	Post Correspondence Problem
Option B:	Decide Language is regular or not
Option C:	Check Ambiguity
Option D:	Derive Parse Tree
Q25.	_____ language is accepted by Turing Machine.
Option A:	Regular Language
Option B:	Recursively Enumerable Language
Option C:	Context Free Language
Option D:	Context Sensitive Language

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Semester V

Course Code: CSDLO5011 and Course Name: Multimedia System

Time: 1 hour

Max. Marks: 50

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	A
Q3.	B
Q4	B
Q5	A
Q6	C
Q7	C
Q8.	A
Q9.	B
Q10.	D
Q11.	B
Q12.	A
Q13.	B
Q14.	C
Q15.	C
Q16.	B
Q17.	A
Q18.	A
Q19.	A
Q20.	A
Q21.	D
Q22.	D
Q23.	C
Q24.	C
Q25.	D

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year Semester V

Course Code: CSDLO5011 and Course Name: Multimedia System

Time: 1 hour

Max. Marks: 50

For the students:- All the Questions are compulsory and carry equal marks .

Q1.	Multimedia is a system which is combination of
Option A:	Environment & Application
Option B:	Make use of audio, video, text and graphics to deliver capabilities of system to user
Option C:	Hardware and software systems for handling multiple digital media.
Option D:	Make use of software to deal with digital content
Q2.	Video is and animation is display of.....to convey information
Option A:	sequence of images , moving images
Option B:	Moving Images , sequence of images
Option C:	sequence of images, images
Option D:	Moving images, images
Q3.	Facsimile transmissions uses pixel densities in the range of-----to-----
Option A:	200 to 400 dpi
Option B:	100 to 200 dpi
Option C:	100 to 250 dpi
Option D:	100 to 300 dpi
Q4.	Which of the following is NOT an advantage of Multimedia?
Option A:	User friendly and entertaining.
Option B:	Specific education, practices and learning to use multimedia.
Option C:	To support the development of Internet Technology and Network.
Option D:	Information delivery and retrieval will be more efficient and interactive.
Q5.	A video signal for transmission requires ----- and -----
Option A:	one Luminance signal and two Chrominance signal

Option B:	one Luminance signal and one Chrominance signal
Option C:	Two Luminance signal and one Chrominance signal
Option D:	Two Luminance signal and two Chrominance signal
Q6.	<p>The characters a to h have the set of frequencies based on the first 8 Fibonacci numbers as follows: a : 1, b : 1, c : 2, d : 3, e : 5, f : 8, g : 13, h : 21</p> <p>A Huffman code is used to represent the characters. What is the sequence of characters corresponding to the following code. 11110 111110011010</p>
Option A:	Fdheg
Option B:	Ecgdf
Option C:	Dchfg
Option D:	Fehdg
Q7.	Which image file is a lossy format?
Option A:	GIF
Option B:	MPEG
Option C:	JPEG
Option D:	PNG
Q8.	The amplitude measurement of each sample is rounded to the nearest bit. This process is known as
Option A:	Quantisation
Option B:	Sample and hold
Option C:	Clocking
Option D:	Compression
Q9.	The effect of quantization with lower bit depth causes
Option A:	Digital distortion
Option B:	Quantisation noise
Option C:	Alias noise
Option D:	Improved quality of sound

Q10.	Which of the following pathways represents the Digital audio process?
Option A:	Anti aliasing filter, Sample and hold, (processing and editing in the digital domain) data recovery filter, DAC
Option B:	Data recovery filter, Sample and hold, (processing and editing in the digital domain) anti aliasing filter, DAC
Option C:	Sample and hold, Anti aliasing filter, (processing and editing in the digital domain) data recovery filter, DAC
Option D:	Anti aliasing filter, Sample and hold, (processing and editing in the digital domain) DAC, data recovery filter
Q11.	The advantages of digital representation of audio signal does not include
Option A:	Regeneration of coded signal along transmission path
Option B:	Increased transmission bandwidth
Option C:	Secured Communication
Option D:	Transmission of data using a uniform digital format
Q12.	DPCM as compared to PCM provides
Option A:	moderate signal to noise ratio.
Option B:	Good signal to noise ratio
Option C:	Poor signal to noise ratio
Option D:	Less signal to noise ratio
Q13.	In PCM encoding, quantization level varies as a function of _____
Option A:	Frequency
Option B:	Amplitude
Option C:	Square of frequency
Option D:	Square of amplitude
Q14.	The third phase of JPEG is _____
Option A:	DCT transformation
Option B:	quantization
Option C:	Data compression
Option D:	Decompression of data
Q15.	The sampling rate has a direct effect on:
Option A:	The dynamic range of the audio
Option B:	Amplitude of audio

Option C:	Bandwidth of audio
Option D:	Resolution of the audio
Q16.	Quantization noise can be reduced by _____ the number of levels.
Option A:	Decreasing
Option B:	Increasing
Option C:	Doubling
Option D:	Squaring
Q17.	The video signal clarity can be improved by separating the different components of video signal thus reducing interference between them . The signal separated in this way is called
Option A:	Component video
Option B:	Composite video
Option C:	S-video
Option D:	N-video
Q18.	The coding technique used in video conferencing application is
Option A:	CCITT H.261
Option B:	CCITT group4
Option C:	Shannon Fano
Option D:	Moving Pictures Experts Group
Q19.	In video compression the frame that is not related to any other frame is
Option A:	I Frame
Option B:	B Frame
Option C:	P Frame
Option D:	D Frame
Q20.	The variance of frame or packet delay is known as
Option A:	Jitter
Option B:	Latency
Option C:	Bandwidth
Option D:	Amplitude
Q21.	RTP uses a temporary even numbered
Option A:	RTCP
Option B:	SMTP
Option C:	HTTP
Option D:	UDP

Q22.	What are the factors that are not included in QoS parameters for multimedia data transmission
Option A:	Throughput
Option B:	Jitter
Option C:	Bandwidth
Option D:	Amplitude
Q23.	Multimedia authoring tool used for universal document exchange
Option A:	Page Maker
Option B:	Corel Draw
Option C:	Adobe Acrobat
Option D:	Hand tool
Q24.	The security aspect that ensures that the message is real, accurate and safeguards from unauthorized user modification during the transmission is
Option A:	Authentication
Option B:	Non-repudiation
Option C:	Integrity
Option D:	Confidentiality
Q25.	The components of Distributed Multimedia System does not include
Option A:	Application Program
Option B:	Data Storage Unit
Option C:	Service Agents
Option D:	Display Devices

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev 2016

Examination: Third Year Semester V

Course Code:CSDL05012 and Course Name: Advanced Operating Systems

Time: 1 hour

Max. Marks: 50

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	A
Q3.	C
Q4	A
Q5	B
Q6	D
Q7	C
Q8.	C
Q9.	A
Q10.	A
Q11.	D
Q12.	D
Q13.	C
Q14.	A
Q15.	C
Q16.	B
Q17.	D
Q18.	A
Q19.	B
Q20.	C
Q21.	D
Q22.	D
Q23.	C
Q24.	B
Q25.	A

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev 2016

Examination: Third Year Semester V

Course Code: CSDLO5012 and Course Name: Advanced Operating Systems

Time: 1 hour

Max. Marks: 50

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For the students:-All the Questions are compulsory and carry equal marks .

Q1.	Following are some of important functions of an operating System. Except:
Option A:	Security
Option B:	Virus protection
Option C:	Device management
Option D:	Job accounting
Q2.	_____ is one of the main advantages of using Virtual machine approach
Option A:	A Virtual Machine can share the same hardware on several different execution environments concurrently
Option B:	The host system is not protected from the virtual machines
Option C:	As many heavily used systems can be combined to create one more lightly used system.
Option D:	It requires multiple links in a chain that must work together cohesively.
Q3.	The file subsystem has following structure. Except:
Option A:	The boot block
Option B:	The super block
Option C:	The process table
Option D:	The inode list
Q4.	Which of the following is the data structure used for a process?
Option A:	The region table
Option B:	Page table
Option C:	Segment table
Option D:	Inode table
Q5.	The kernel caches the data in the buffer pool according to
Option A:	First in First Out Algorithm
Option B:	Least Recently Used Algorithm
Option C:	Optimal Used Algorithm
Option D:	Least Frequently Used Algorithm
Q6.	The kernel accesses a disk block by searching a buffer with appropriate combination of
Option A:	Device number and inode number
Option B:	Block number and inode number
Option C:	Device number and status

Option D:	Device number and block number
Q7.	Which of the following algorithm is used to allocate a buffer?
Option A:	Brelse
Option B:	Breada
Option C:	Getblk
Option D:	Bwrite
Q8.	The disk inode consists of the following fields. Except:
Option A:	File owner identifier
Option B:	File access permission
Option C:	A reference count
Option D:	Number of links to the file
Q9.	Which algorithm does the kernel use to allocate a known inode?
Option A:	Iget
Option B:	Ialloc
Option C:	Namei
Option D:	Getblk
Q10.	A directory is a file whose data is a sequence of entries, each consisting of
Option A:	Inode number and file name
Option B:	File type, file name and file size
Option C:	File type, file name and i-node
Option D:	File type and i-node
Q11.	What is Zombie?
Option A:	File
Option B:	Device
Option C:	User
Option D:	Process
Q12.	_____ is not the kernel data structure
Option A:	Process table
Option B:	Region Table
Option C:	Per Process Region Table
Option D:	Segment Table
Q13.	What is the ready to run in memory state of a process?
Option A:	The process is executing in user mode
Option B:	The process is running in kernel mode
Option C:	The process is not executing but is ready to run as soon as the kernel schedules it
Option D:	When process exit
Q14.	The _____ consists of the process text, data, (user) stack, and shared memory regions
Option A:	User-level context
Option B:	Register context

Option C:	System-level context
Option D:	Memory level context
Q15. is a process state recognized by the UNIX operating system in which the process no longer exists, but it leaves a record for its parent process to collect.
Option A:	Sleeping, swapped
Option B:	Preempted
Option C:	Zombie
Option D:	Ready to run, Swapped
Q16.	What are the characteristics of Distributed Operating system?
Option A:	Users are aware of multiplicity of machines
Option B:	Access is done like local resources
Option C:	They have multiple zones to access files
Option D:	They have single zones to access files
Q17.	Which is not a design issue in distributed system structure?
Option A:	Scalability
Option B:	Naming
Option C:	Global knowledge
Option D:	Processor scheduling
Q18.	Following are the distributed computing models except
Option A:	Client server model
Option B:	Minicomputer model
Option C:	Workstation Model
Option D:	Processor Pool Model
Q19.	Based on the vicinity and accessibility of the main memory to the processors, following are the basic multiprocessor system architecture except
Option A:	UMA
Option B:	Tightly Coupled
Option C:	NORMA
Option D:	NUMA
Q20.	Which of the following is not a design issue in multiprocessor operating system?
Option A:	Threads
Option B:	Process Synchronization
Option C:	Compatibility
Option D:	Memory Management
Q21.	All runnable tasks of an application are scheduled on the processors simultaneously by
Option A:	Smart scheduling
Option B:	Affinity based scheduling
Option C:	Gang Scheduling
Option D:	Co-scheduling algorithm

Q22.	Which of the following is not a major cause of performance degradation in multiprocessor systems?
Option A:	Preemption inside spinlock controlled critical section
Option B:	Cache corruption
Option C:	Context switching overhead
Option D:	Fault tolerance
Q23.	iOS stands for
Option A:	Internetwork operating system
Option B:	Internet operating system
Option C:	iphone operating System
Option D:	Intra operating system
Q24.	The real time operating system
Option A:	Gives same priority to all processes
Option B:	Serves a task by its deadline period
Option C:	Does process scheduling only once
Option D:	Does not require a Kernel
Q25.	The ____ schedulers are those in which the scheduling points are determined by the interrupts received from a clock.
Option A:	Clock driven
Option B:	Event driven
Option C:	Rate monotonic analysis (RMA)
Option D:	Hybrid

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016/Rev2012 (Keep the required)

Examination: First/Second/Third/Final Year Semester I/II/III/IV/V/VI (Keep the required)

Course Code: _____ and Course Name: _____

Time: 1 hour

Max. Marks: 50

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NOTE to the Question Paper Setter: (Following information has to be deleted before submitting the paper to Semester Coordinator)

Please save this file with file name as per the sample format given below:

File Name: Date of Examination_Scheme_Program_Semester_Subject Code_Answer Key Set Number

For example:

Answer Keys for QP set number 1 of first core course of Mechanical Engineering Semester V for Rev2016 scheme and scheduled on 2/12/2020 has to have the file name as

0212_R16_Mech_V_MEC501_AK1

Answer Keys for QP set number 3 of Department Level Optional Course of Computer Engineering Semester VI for Rev2012 scheme and scheduled on 12/12/2020 has to have the file name as

1212_R12_Comp_VI_CSDLO6021_AK3

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

Q18.	A
Q19.	A
Q20.	B
Q21.	A
Q22.	B
Q23.	C
Q24.	D
Q25.	D

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: Third Year Semester V

Course Code: CSDLO5013 and Course Name: Advanced Algorithms

Time: 1 hour Max. Marks: 50

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For the students:- All the Questions are compulsory and carry equal marks .

Q1.	What is A if $A = \{ f(n) : \text{there exist positive constants } c_1, c_2, \text{ and } n_0 \text{ such that } 0 \leq c_1(n) \leq f(n) \leq c_2g(n) \text{ for all } n \geq n_0 \}$
Option A:	$\Omega(g(n))$
Option B:	$\Theta(g(n))$
Option C:	$\log(n)$
Option D:	$O(n)$
Q2.	If the recurrence relation is $T(n) = 3T(n/4) + n \log(n)$, then the solution to the recurrence is
Option A:	$T(n) = O(\log n)$
Option B:	$T(n) = O(n)$
Option C:	$T(n) = O(n \log n)$
Option D:	$T(n) = O(n^2)$
Q3.	Which of the following are the types of amortized analysis?
Option A:	Potential, Accounting, Integration
Option B:	Aggregate , Potential, Integration
Option C:	Aggregate , Accounting, Integration
Option D:	Potential, Accounting, Aggregate
Q4.	In dynamic tables the load factor $\alpha(T)$ of a nonempty table T is given by which of the following statements.
Option A:	$\alpha(T) = (\text{Number of items stored in the table}) / (\text{size of the table})$
Option B:	$\alpha(T) = \text{Number of items stored in the table}$
Option C:	$\alpha(T) = (\text{size of the table}) / (\text{Number of items stored in the table})$
Option D:	$\alpha(T) = \text{size of the table}$
Q5.	The time complexity of convex hull is :
Option A:	$O(n)$
Option B:	$O(\log n)$
Option C:	$O(n \log n)$
Option D:	$O(n^2)$
Q6.	Package wrapping (or gift wrapping) technique to compute the convex hull of a set of points is used in :
Option A:	Jarvis's march
Option B:	Graham's scan

Option C:	Incremental method
Option D:	Divide –and-conquer method
Q7.	If the cross products between vector p1 and vector p2 ($p1 \times p2$) is positive, then:
Option A:	vector p1 is counterclockwise from vector p2 with respect to the origin (0,0).
Option B:	vector p1 is clockwise from vector p2 with respect to the origin (0,0).
Option C:	the boundary condition arises.
Option D:	it can be concluded that cross products is wrong.
Q8.	Which of the following statements about red-black tree is false?
Option A:	It is a binary tree.
Option B:	The root is black.
Option C:	Every leaf (NIL) is black.
Option D:	The root is red.
Q9.	What is the maximum height of a red-black tree with n internal nodes?
Option A:	$2 \log (n+1)$
Option B:	n^2
Option C:	$(n (n+1))/2$
Option D:	$\log(n)$
Q10.	Which of the following is a properties specific to the red-black tree?
Option A:	The root is red.
Option B:	If a node is red, then both its children nodes are black.
Option C:	Every leaf (NIL) is red.
Option D:	The root node can hold any number of child nodes.
Q11.	Which of the following is irrelevant to the Ford-Fulkerson method for solving the maximum-flow problem?
Option A:	Residual networks
Option B:	Augmenting paths
Option C:	Minimum cuts
Option D:	Minimum joints
Q12.	Select the complexity of SEARCH operation in Red Black Tree.
Option A:	$O(n^2 \log n)$
Option B:	$O(n)$
Option C:	$O(n \log n)$
Option D:	$O(\log n)$
Q13.	The maximum flow problem involves:
Option A:	finding a flow between source and sink that is maximum
Option B:	finding a flow between source and sink that is minimum
Option C:	finding the shortest path between source and sink
Option D:	computing a minimum spanning tree
Q14.	An augmenting path is a:

Option A:	simple cyclic path between source and sink which pass through only positive weighted edges.
Option B:	simple acyclic path between source and sink which pass through only positive weighted edges.
Option C:	simple cyclic path between source and sink which pass through only negative weighted edges.
Option D:	simple acyclic path between source and sink which pass through only negative weighted edges.
Q15.	How many conditions have to be met if an NP- complete problem is reducible?
Option A:	1
Option B:	2
Option C:	3
Option D:	4
Q16.	A CNF-satisfiability problem belongs to which class.
Option A:	NP class
Option B:	P class
Option C:	NP complete
Option D:	NP hard
Q17.	What is the total cost of hiring an assistant in worst case situation if C_i is the interviewing cost and C_h is the hiring cost?
Option A:	$O(n C_i + n C_h)$
Option B:	$O(n^2)$
Option C:	$O(n C_i * n C_h)$
Option D:	$O(n C_h)$
Q18.	Indicator random variables provide a convenient method for ____ .
Option A:	converting between probabilities and expectations.
Option B:	converting between probabilities and randomness.
Option C:	converting between randomness and expectations.
Option D:	converting between worst case and average case.
Q19.	A binomial tree of order k has
Option A:	2^k nodes, and height k .
Option B:	2^{k+1} nodes, and height $\log(k)$.
Option C:	2^k nodes, and height $\log(k)$.
Option D:	k nodes, and height $\log(k)$.
Q20.	A binomial heap with 13 nodes will consist of
Option A:	three binomial trees of orders 8, 3, and 2.
Option B:	three binomial trees of orders 3, 2, and 0.
Option C:	three binomial trees of orders 6, 5, and 2.
Option D:	three binomial trees of orders 5, 5, and 2.
Q21.	A vertex cover of a graph is a set of vertices that includes
Option A:	at least one endpoint of every edge of the graph.

Option B:	all vertices of the graph.
Option C:	all edges of the graph.
Option D:	number of vertices more than edges
Q22.	The traveling-salesman problem is
Option A:	P type
Option B:	NP-complete type
Option C:	NP type
Option D:	NP hard type
Q23.	Which of the following statements is true about Push-relabel algorithm?
Option A:	It examines the entire residual network to find an augmenting path.
Option B:	It examines only a part of the residual network to find an augmenting path.
Option C:	It works on one vertex at a time.
Option D:	It works on all vertices at a time.
Q24.	Extra bit in red black tree is for:
Option A:	Address
Option B:	Height
Option C:	Index
Option D:	Color
Q25.	What is probabilistic analysis?
Option A:	It is linear analysis.
Option B:	Probability is used in input.
Option C:	Probability is used in output.
Option D:	Use of probability in analyzing randomized algorithms.

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE)
Examinations Commencing from 7th January 2021 to 20th January 2021
Program: **Computer Engineering**
Curriculum Scheme: Rev2016
Examination: TE Semester :V
Course Code: CSDLO5011 and Course Name: Multimedia Systems

Time: 2 hour

Max. Marks: 80

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	A
Q2.	C
Q3.	B
Q4	A
Q5	C
Q6	C
Q7	A
Q8.	B
Q9.	D
Q10.	B

Q11.	A
Q12.	C
Q13.	D
Q14.	C
Q15.	D
Q16.	A
Q17.	A
Q18.	D
Q19.	B
Q20.	D

•

A. Describe different mediums in multimedia.

Ans-

classify media according to perception, representation, presentation, storage, transmission and information exchange

B. Compare CCITT group 3 two D and CCITT group 4 two D

Ans Each difference carries one mark.

C. What are the different types of redundancies in image?

Ans -

- (i) Redundancy can be broadly classified into Statistical redundancy and Psycho visual redundancy.
- (ii) Statistical redundancy can be classified into inter-pixel redundancy and coding redundancy.
- (iii) Inter-pixel can be further classified into spatial redundancy and temporal redundancy.
- (iv) Spatial redundancy or correlation between neighboring pixel values.
- (v) Spectral redundancy or correlation between different color planes or spectral bands.
- (vi) Temporal redundancy or correlation between adjacent frames in a sequence of images in video applications.
- (vii) Image compression research aims at reducing the number of bits needed to represent an image by removing the spatial and spectral redundancies as much as possible.
- (viii) In digital image compression, three basic data redundancies can be identified and exploited: Coding redundancy, Inter-pixel redundancy and Psychovisual redundancy.

D. Compare WAV and MPEG Audio.

Ans-

Basis for comparison	WAV	MP3
Expands to	Waveform Audio File Format	MPEG layer 3
Basic	Implement minimal changes in the original file.	Removes the redundant portions of information from the file.
Compression level	Low	High
Size	Larger	Smaller
Quality	Good	Moderate
Developed by	Microsoft and IBM	MPEG

E. Explain different types of video signals.

Ans -

There are three types of video signals as follows:

- Composite Video
- Component Video
- S-Video

F. What are design issues face to design the authoring system.

Design issues of Authoring Systems:

- Display resolution
- File format and compression issues: Authoring systems should be capable of handling different file formats.
- The first – and hardest – part is to choose the technology for your presentation. The choice comes down to two main contenders,

Adobe Flash

- Flash allows you to create presentations where you can build in powerful animation. It also has very good video compression technology.
- Perhaps the best part of Flash is that it also allows you to put presentations directly onto your web site.
- The biggest problem though is that Flash is a difficult system to get to use.

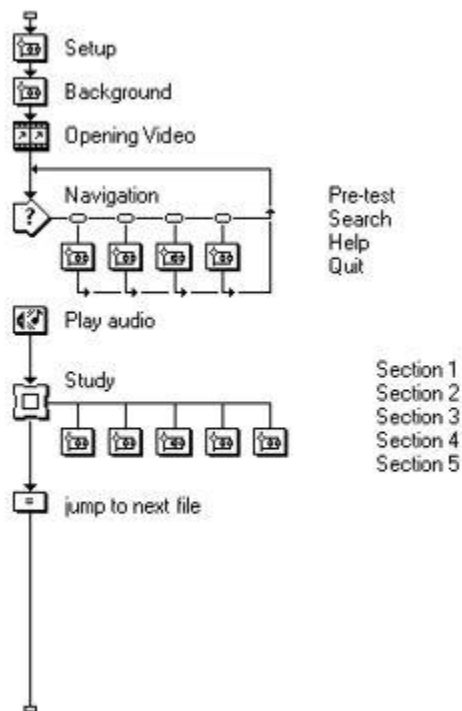
Microsoft PowerPoint.

- The easiest way to create a multimedia presentation is in Microsoft PowerPoint. You can add in video, a soundtrack and also a reasonable degree of animation.
- By far the biggest advantage of making multimedia presentations in PowerPoint is that it is easy for anyone to be able to edit the presentation.
- Types of Authoring Systems

Icon based authoring system

- Each part is represented an icon (symbolic picture)
- Each icon does a specific task, e.g. plays a sound
- Icons are then linked together to form complete applications

- Can easily visualize the structure and navigation of the final application



Dedicated authoring system

- Dedicated authoring systems are designed for a single user consisting of single track for playback.
- In the case of dedicated authoring system, users need not to be experts in multimedia or a professional artist.
- Dedicated authoring systems are extremely simple since they provide drag and drop concept.
- Authoring is done on objects captured by video camera, image scanner or objects stored in multimedia library.
- It does not provide effective presentation due to single stream.
- Examples of Dedicated authoring systems are Paint, MS PowerPoint etc.

Telephone Authoring Systems

- There is an application where the phone is linking into multimedia electronic mail application.
- Telephone can be used as a reading device by providing full text to-speech synthesis capability.
- The phone can be used for voice command input for setting up and managing voice mail messages.
- Digitized voice clips are captured via the phone and embedded in electronic mail messages.
- As the capability to recognize continuous speech is deployed, phones can be used to create electronic

mail.

Programmable authoring system

- Structured authoring tools were not able to allow the authors to express automatic function for handling certain routine tasks.
- But, programmable authoring system has improved in providing powerful functions based on image processing and analysis and embedding program interpreters to use image processing functions. E.g. Visual Basic, Net beans, Visual Studio

Timeline Based Authoring

- It has an ability to develop an application like movie.
- It can create complex animations and transitions.
- All the tracks can be played simultaneously carrying different data.
- Best to use when you have a message with a beginning and an end.
- Played back at a speed that you can set.
- Other elements (such as audio events) are triggered at a given time or location in the sequence of events.
- Jumps to any location in a sequence

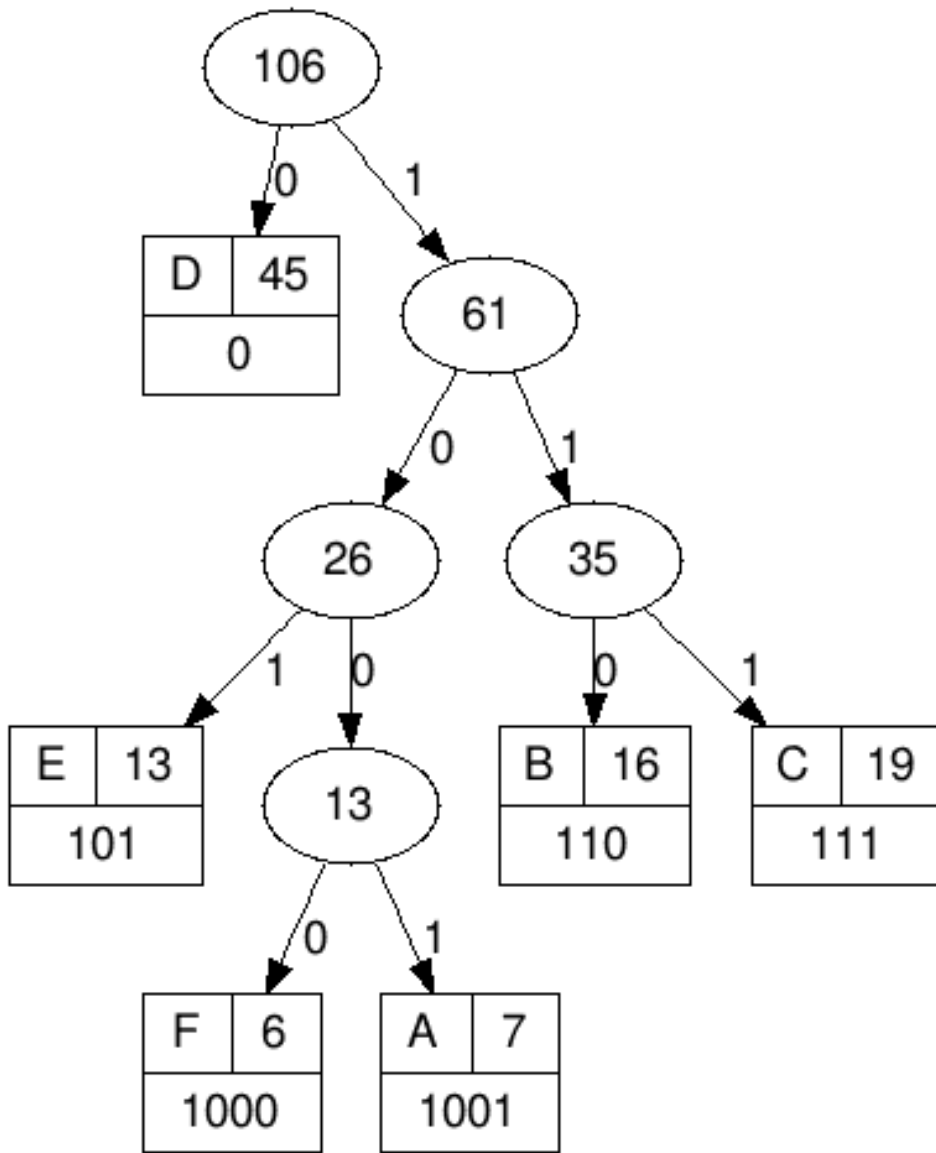
Example of Timeline Based Authoring system is Flash software.

Q3.

A. A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency:

a:7 b:16 c:19 d:45 e:13 f:6 Note that each character in input message takes 1 byte. If the compression technique used is Huffman Coding, how many bits will be saved in the message?

Huffman coding



1 byte = 8 bits

Symbol	Freq. of Symbols	Length of Symbols (no. of bits)	Encoding	Length of Symbols (no. of bits) after encoding
D	45	$45 \times 8 = 360$	0	$45 \times 1 = 45$
C	19	$19 \times 8 = 152$	111	$19 \times 3 = 57$
B	16	$16 \times 8 = 128$	110	$16 \times 3 = 48$

Symbol	Freq. of Symbols	Length of Symbols (no. of bits)	Encoding	Length of Symbols (no. of bits) after encoding
E	13	13*8=104	101	13*3=39
A	7	7*8=56	1001	7*4=28
F	6	6*8=48	1000	6*4=24
Total	106	848	18	241

Saved bits are : $848-241=607$

B. Explain the step by step Shannon-Fano compression algorithm and Solve by the Shannon-Fano frequency code for following frequencies of symbols.

Ans-

The steps of the algorithm are as follows:

1. Create a list of probabilities or frequency counts for the given set of symbols so that the relative frequency of occurrence of each symbol is known.
2. Sort the list of symbols in decreasing order of probability, the most probable ones to the left and least probable to the right.
3. Split the list into two parts, with the total probability of both the parts being as close to each other as possible.
4. Assign the value 0 to the left part and 1 to the right part.
5. Repeat the steps 3 and 4 for each part, until all the symbols are split into individual subgroups.

The Shannon codes are considered accurate if the code of each symbol is unique.

First division

Symbol	A	B	C	D	E
--------	---	---	---	---	---

Frequency	12	8	7	6	5
Sum	(20)		(18)		
Assign bit	0		1		

Second division

Symbol	A	B	C	D	E
Frequency	12	8	7	6	5
Sum	12	8	7	11	
Code	00	01	10	11	

Third division

Symbol	A	B	C	D	E
Frequency				6	5
Sum				6	5
Code				110	111

Final Codes

Symbol	A	B	C	D	E
Code	00	01	10	110	111

C.

TYPES OF STEGANOGRAPHY

There are different ways to hide the message in another, well known are Least Significant bytes and Injection.

When a file or an image is created there are few bytes in the file or image which are not necessary or least important. These type of bytes can be replaced with a message without damaging or replacing the original message, by which the secret message is hidden in the file or image.

Another way is a message can be directly injected into a file or image. But in this way the size of the file would be increasing accordingly depending on the secret message

STEGANOGRAPHY IN IMAGE

Digital images are the most widely used cover objects for steganography. Due to the availability of various file formats for various applications the algorithm used for these formats differs accordingly.

An image is collection of bytes (known as pixels for images) containing different light intensities in different areas of the image. When dealing with digital images for use with Steganography, 8-bit and 24-bit per pixel image files are typical. Both have advantages and disadvantages 8-bit images are a great format to use because of their relatively small size. The drawback is that only 256 possible colors can be used which can be a potential problem during encoding. Usually a gray scale color palette is used when dealing with 8-bit images such as (.GIF) because its gradual change in color would be harder to detect after the image has been encoded with the secret message. 24-bit images offer much more flexibility when used for Steganography. The large numbers of colors (over 16 million) that can be used go well beyond the human visual system (HVS), which makes it very hard to detect once a secret message, has been encoded.

Large amount of data can be encoded in to 24-bit images as it is compared to 8-bit images. The drawback of 24-bit digital images is their size which is very high and this makes them suspicious our internet due to their heavy size when compared to 8-bit images. Depending on the type of message and type of the image different algorithms are used.

Few types in Steganography in Images:

Least significant bit insertion

Masking and filtering

Redundant Pattern Encoding

Encrypt and Scatter

Algorithms and transformations

Least significant bit insertion

Least Significant Bit (LSB) insertion is most widely known algorithm for image steganography ,it involves the modification of LSB layer of image. In this technique,the message is stored in the LSB of the pixels which could be considered as random noise.Thus, altering them does not have any obvious effect to the image.

Masking and filtering

Masking and filtering techniques work better with 24 bit and grey scale images. They hide info in a way similar to watermarks on actual paper and are sometimes used as digital watermarks. Masking the images changes the images. To ensure that changes cannot be detected make the changes in multiple small proportions. Compared to LSB masking is more robust and masked images passes cropping, compression and some image processing. Masking techniques embed information in significant areas so that the hidden message is more integral to the cover image than just hiding it in the “noise” level. This makes it more suitable than LSB with, for instance, lossy JPEG images.

Redundant Pattern Encoding

Redundant pattern encoding is to some extent similar to spread spectrum technique. In this technique, the message is scattered through out the image based on algorithm. This technique makes the image ineffective for cropping and rotation. Multiple smaller images with redundancy increase the chance of recovering even when the stegano-image is manipulated.

Encrypt and Scatter

Encrypt and Scatter techniques hides the message as white noise and White Noise Storm is an example which uses employs spread spectrum and frequency hopping. Previous window size and data channel are used to generate a random number. And with in this random number ,on all the eight channels message is scattered through out the message. Each channel rotates, swaps and interlaces with every other channel. Single channel represents one bit and as a result there are many unaffected bits in each channel. In this technique it is very complex to draw out the actual message from stegano-image. This technique is more secure compared to LSB as it needs both algorithm and key to decode the bit message from stegano-image. Some users prefer this method for its security as it needs both algorithm and key despite the stegano image. This method like LSB lets image degradation in terms of image processing, and compression.

Algorithms and transformations

LSB modification technique for images does hold good if any kind of compression is done on the resultant stego-image e.g. JPEG, GIF. JPEG images use the discrete cosine transform to achieve compression. DCT is a lossy compression transform because the cosine values cannot be calculated exactly, and repeated calculations using limited precision numbers introduce rounding errors into the final result. Variances between original data values and restored data values depend on the method used to calculate DCT

STEGANOGRAPHY IN AUDIO

Implanting secret message into an audio is the most challenging technique in Steganography. This is because the human auditory system (HAS) has such a vibrant range that it can listen over. To put this in perspective, the (HAS) recognize over a range of power greater than one million to one and a range of frequencies greater than one thousand to one making it extremely hard to add or remove data from the original data structure. The only weakness in the (HAS) comes at trying to differentiate sounds (loud sounds drown out quiet sounds) and this is what must be exploited to encode secret messages in audio without being detected.

Below are the lists of methods which are commonly used for audio Steganography.

LSB coding

Parity coding

Phase coding

Spread spectrum

Echo hiding

LSB coding

Using the least-significant bit is possible for audio, as modifications usually would not create recognizable changes to the sounds. Another method takes advantage of human limitations. It is possible to encode messages using frequencies that are indistinct to the human ear. Using frequencies above 20.000Hz, messages can be hidden inside sound files and can not be detected by human checks.

Parity coding

Instead of breaking a signal down into individual samples, the parity coding method breaks a signal down into separate regions of samples and encodes each bit from the secret message in a sample region's parity bit. If the parity bit of a selected region does not match the secret bit to be encoded, the process flips the LSB of one of the samples in the region. Thus, the sender has more of a choice in encoding the secret bit, and the signal can be changed in a more unobtrusive fashion.

Phase coding

Phase coding attends to the disadvantages of the noise inducing methods of audio Steganography. Phase coding uses the fact that the phase components of sound are not as audible to the human ear as noise is. Rather than introducing perturbations, this technique encodes the message bits as phase shifts in the phase spectrum of a digital signal, attaining an indistinct encoding in terms of signal-to-perceived noise ratio.

Spread spectrum

In the context of audio Steganography, the basic spread spectrum (SS) method attempts to spread secret information across the audio signal's frequency spectrum as much as possible. This is comparable to a system using an implementation of the LSB coding that randomly spreads the message bits over the entire audio file. However, unlike LSB coding, the SS method spreads the secret message over the sound file's frequency spectrum, using a code that is independent of the actual signal. As a result, the final signal occupies a bandwidth in excess of what is actually required for broadcast.

Echo hiding

In echo hiding, information is implanted in a sound file by introducing an echo into the separate signal. Like the spread spectrum method, it too provides advantages in that it allows for a high data transmission rate and provides superior strength when compared to the noise inducing

methods. If only one echo was produced from the original signal, only one bit of information could be encoded. Therefore, the original signal is broken down into blocks before the encoding process begins. Once the encoding process is completed, the blocks are concatenated back together to create the final signal.

STEGANOGRAPHY IN VIDEO

In video steganography, a video file would be embedded with supplementary data to hide secret messages. In the process, an intermediate signal which is a function of hidden message data and data of content signal would be generated. Content data (video file) is then combined with this intermediate signal to result encoding. The supplementary data can include copy control data which can be brains by consumer electronic device and used to disable copying.

The intermediate signal may also contain a pseudo arbitrary key data so as to hide encoding and decode needs corresponding key to extract hidden information from encoded content. In some implementations regulation data is embedded in the content signal with auxiliary data. This regulation data consists of known properties enabling its identification in the embedded content signal. This encoding is robust against scaling, resampling and other forms of content degradation, so that the supplementary data can be detected from the content which might have been degraded.

There are different approaches for video steganography apart from the above mentioned. Most widely known are listed and discussed below.

Least Significant Bit Insertion

This is the most simple and popular approach for all types of steganography. In this method the digital video file is considered as separate frames and changes the displayed image of each video frame. LSB of 1 byte in the image is used to store the secret information. Effecting changes are too small to be recognized by human eye. This method enhances the capacity of the hidden message but compromises the security requirements such as data integrity.

Real time video steganography

This kind of steganography involves hiding information on the output image on the device. This method considers each frame shown at any moment irrespective of whether it is image; text .The image is then divided into blocks. If pixel colors of the blocks are similar then changes color characteristics of number of these pixels to some extent. By labeling each frame with a sequence number it would even be easy to identify missing parts of information. To extract the information, the displayed image should be recorded first and relevant program is used then.

STEGANOGRAPHY IN DOCUMENT

Steganography in documents just focuses on altering some of its characteristics. They can either be characteristics of text or even text formatting. Below are few ways listed and discussed to implement the same.

Since everyone can read, encoding text in neutral sentences is doubtfully effective. But taking the first letter of each word of the previous sentence, one can see that it is possible and not very difficult. Hiding information in plain text can be done in many different ways. One way is by

simple adding white space and tabs to the ends of the lines of the document .The last technique was successfully used in practice and even after a text has been printed and copied on paper for ten times, the secret message could still be retrieved.

Another possible way of storing a secret inside a text is using a publicly available cover source, a book or a newspaper, and using a code which consists for example of a combination of a page number, a line number and a character number. This way, no information stored inside the cover source leads to the hidden message. Discovering it depends exclusively on gaining knowledge of the secret key.

Setting background color and font color is one of the mainly used steganographic approach. This method is focused for Microsoft word documents. Choose predefined colors and set font and background colors of invisible characters such as space, tab or the carriage return characters. R,G,B values are 8 bits means we have allowed range of 0 to 255. Most of the viewers would not feel interested about color values of these invisible characters hence 3 bytes of information is easily hidden in each occurrence of space,tab or carriage return.This approach needs no extra information to hide required bits.

University of Mumbai

Examination 2020 under cluster 4 (Lead College: PCE)

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: Computer Engineering

Curriculum Scheme: Rev2016

Examination: TE Semester :V

Course Code: CSDLO5011 and Course Name: Multimedia Systems

Time: 2 hour

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	CCITT Group 3 compression utilizes Huffman coding to generate a set of _____ code and set of _____ codes for given bit stream.
Option A:	makeup code, terminating code
Option B:	Vertical Code, Pass Code
Option C:	Pas code, Terminating code
Option D:	Vertical Code, Terminating code
2.	While enlarging the image, _____ image will blur while _____ image will not blur.
Option A:	vector, bitmap
Option B:	bitmap, gif
Option C:	bitmap, vector
Option D:	bitmap, jpeg
3.	What is the extension at the image file used by digital cameras and supports upto 24-bit colors?
Option A:	.bmp
Option B:	.jpeg
Option C:	.gif
Option D:	.tif
4.	If I want to use Google meet as a tool for my online class. Which of the following will be best supported Multimedia System Architecture for the same?
Option A:	Workstation Architecture
Option B:	IMA Architecture
Option C:	Network Architecture
Option D:	Internet Architecture
5.	_____ correlation between adjacent frames in a sequence of images in video applications.
Option A:	Spatial redundancy
Option B:	Spectral redundancy
Option C:	Temporal redundancy
Option D:	Coding redundancy
6.	_____ in JPEG aims at reducing the total number of bits in the

	compressed image.
Option A:	Zig-zag ordering
Option B:	run-length encoding
Option C:	Quantization
Option D:	Entropy coding
7.	WAVE sound file format bit stream encoding is the _____
Option A:	PCM
Option B:	DM
Option C:	PWM
Option D:	DPCM
8.	Component video is an analog format that carries _____ only
Option A:	Audio data
Option B:	visual data
Option C:	Text Data
Option D:	Image Data
9.	The higher the bit rate, the less compression, which results in overall _____ of audio file.
Option A:	less quality
Option B:	zero quality
Option C:	Poor quality
Option D:	higher quality
10.	_____ a digital compression of video data that compresses the size of the video file by compressing the image data of each frame
Option A:	Temporal compression
Option B:	Spatial compression
Option C:	redundant compression
Option D:	visual compression
11.	In video compression, _____ saves even more space by using differences between the current frame and both the preceding and following frames to specify its content.
Option A:	B - frames
Option B:	Multi- frame
Option C:	I - frame
Option D:	P - frames
12.	In H.261, each CIF frame is composed of _____ Groups of Blocks (GOBs)
Option A:	8
Option B:	10
Option C:	12
Option D:	16
13.	Multicast packets are encapsulated inside regular IP packets for "tunneling", so that they can be sent to the destination through the islands. Is the a feature of _____ packets.
Option A:	RTP

Option B:	RTCP
Option C:	IGMP
Option D:	MBONE
14.	_____ is a measure of smoothness of the audio/video playback, related to the variance of frame/packet delays.
Option A:	Packet loss
Option B:	Latency
Option C:	Jitter
Option D:	Data rate
15.	In IP-Multicast, message is sent to _____
Option A:	only receiver
Option B:	only one node
Option C:	all nodes in the domain
Option D:	a set of specified nodes
16.	_____ monitors QoS in providing feedback to the server (sender) on quality of data transmission and conveys information about the participants of a multiparty conference.
Option A:	RTCP
Option B:	RTP
Option C:	IGMP
Option D:	RTSP
17.	Digital signatures offer a way of verifying both the authenticity and _____ of a message.
Option A:	integrity
Option B:	Confidentiality
Option C:	Copyrights
Option D:	Privacy and Anonymity
18.	Which of the following is not type of Steganography?
Option A:	Image
Option B:	Audio
Option C:	Video
Option D:	Text
19.	if I want to edit my childhood photograph, first I have to convert it into the digital format. What would be the best suitable device for the same?
Option A:	Camera
Option B:	scanner
Option C:	printer
Option D:	Electric pen
20.	What will be more suitable from below to describe a digital signature?
Option A:	Signature which is used to authenticate the person on digital documents
Option B:	Signature image which is used in online platform to fill the form whenever its needed.
Option C:	Signature which provides the authentication of the user through self produced methods

Option D:	Signature which provides the authentication of the user through security mechanisms
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Q2	Solve any Four out of Six	5 marks each
A	Describe different mediums in multimedia.	
B	Compare CCITT group 3 one D and CCITT group 3 two D.	
C	What are the different types of redundancies in image?	
D	Compare WAV and MPEG Audio.	
E	Explain different types of video signals.	
F	What are design issues face to design the authoring system.	

Q3	Solve any Two Questions out of Three	10 marks each												
A	<p>A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency: a:7 b:16 c:19 d:45 e:13 f:6 Note that each character in input message takes 1 byte. If the compression technique used is Huffman Coding, how many bits will be saved in the message?</p>													
B	<p>Explain the step by step Shannon-Fano compression algorithm and Solve by the Shannon-Fano frequency code for following frequencies of symbols.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Symbol</th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> </tr> </thead> <tbody> <tr> <td>Frequency</td> <td>12</td> <td>8</td> <td>7</td> <td>6</td> <td>5</td> </tr> </tbody> </table>		Symbol	A	B	C	D	E	Frequency	12	8	7	6	5
Symbol	A	B	C	D	E									
Frequency	12	8	7	6	5									
C	Write a short note on Steganographic methods.													

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: TE Semester: V

Course Code: CSDLO5012 and Course Name: Advanced Operating System

Time: 2 hours

Max. Marks: 80

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

Q. 2 A. Explain the U-area

Solution: only Definition----2 marks

Explain all the filed with diagram---5 marks

Q. 2 B. Explain the context of a process.

Solution: The context of a process consists of:

- Contents of its (user) address space, called as user level context
- Contents of hardware registers, called as register context
- Kernel data structures that relate to the process, called as system context

if explain only 2 points-----3marks

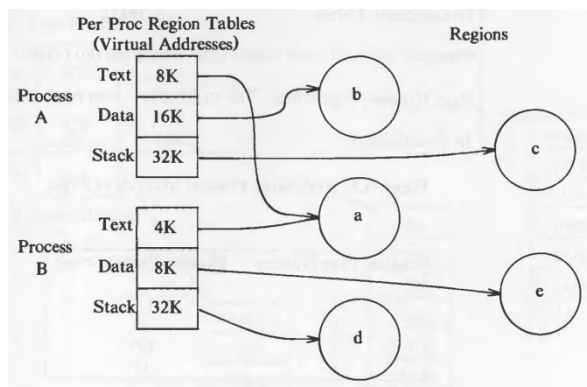
if explain all points-----5 Marks

Q.2 C Explain different types of kernel.

Solution: If explain Monolithic and micro kernel with diagram-----5 marks

Q. 2 D Explain the region table.

Solution: If explain with diagram-----5 marks



Q.2 E When attaching the a region to a process how can the kernel check the region does not overlap virtual address in regions already to the process?

Solution.

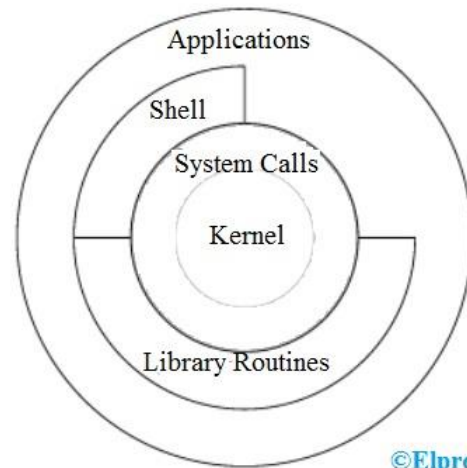
Explain the load region algorithm -----5 marks

Q. 2 F Compare NOS with DOS

Solution: If students write 5 to 6 valid points ----5 marks

Q. 3 A Explain the architecture of Unix OS

Solution:

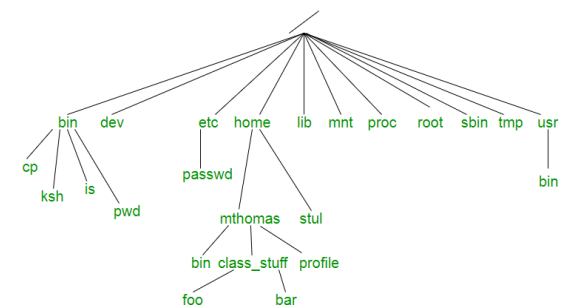


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Explain with the above diagram with details-----10 marks.

Q.3 B Explain the structure of file directories.

Solution:



Explanation for above diagram is expected

Q. 3 C Write and explain the ialloc algorithm

Solution:

```

algorithm ialloc      /* allocate inode */
input:  file system
output: locked inode
{
    while (not done)
    {
        if (super block locked)
        {
            sleep (event super block becomes free);
            continue; /* while loop */
        }
        if (inode list in super block is empty)
        {
            lock super block;
            get remembered inode for free inode search;
            search disk for free inodes until super block full,
            or no more free inodes (algorithms bread and brelse);
            unlock super block;
            wake up (event super block becomes free);
            if (no free inodes found on disk)
                return (no inode);
            set remembered inode for next free inode search;
        }
        /* there are inodes in super block inode list */
        get inode number from super block inode list;
        get inode (algorithm iget); /* !!! */
        if (inode not free after all) /* !!! */
        {
            write inode to disk;
            release inode (algorithm iput);
            continue; /* while loop */
        }
        /* inode is free */
        initialize inode;
        write inode to disk;
        decrement file system free inode count;
        return (inode);
    }
}

```

Algorithm with explanation is expected

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Curriculum Scheme: Rev 2016

Examination: TE Semester V

Course Code: CSDLO5012 and Course Name: Advanced Operating Systems

Time: 2 hour

Max. Marks: 80

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Various Models are used for building distributed computing system. From the following statement which is true i) Mini Computer Model ii) Workstation Model iii) Process Pool Model iv) Hybrid Model
Option A:	i, ii, iii, iv
Option B:	i and ii
Option C:	iii and iv
Option D:	i and iv
2.	What are the advantages of Batch Operating Systems? Choose the correct option i) It is very difficult to guess or know the time required by any job to complete. Processors of the batch systems know how long the job would be when it is in queue ii) Multiple users can share the batch systems iii) The idle time for batch system is very less iv) It is easy to manage large work repeatedly in batch systems
Option A:	i and ii
Option B:	ii and iii
Option C:	i, iii, iv
Option D:	i, ii, iii, iv
3.	Various autonomous interconnected computers communicate with each other using a shared communication network. Independent systems possess their own memory unit and CPU. These are referred as
Option A:	loosely coupled systems

Option B:	Tightly coupled system
Option C:	Network Operating system
Option D:	Batch Operating System
4.	----- types of systems, each processor contains a similar copy of the operating system and they all communicate with each other.
Option A:	Multiprocessors operating System
Option B:	Symmetric Multiprocessors
Option C:	Asymmetric Multiprocessors
Option D:	Symmetric Multiprocessors and Asymmetric Multiprocessors
5.	How many fields are there in Process Table
Option A:	1
Option B:	4
Option C:	5
Option D:	7
6.	Which field in U-area restrict the size of the process and size of the file
Option A:	Error Field
Option B:	UID
Option C:	Limit
Option D:	An array
7.	The UNIX system divides its virtual address space in logically separated -----
Option A:	Page
Option B:	Process
Option C:	Segment
Option D:	Region
8.	If the kernel executes in the context of a process, its virtual address space is
Option A:	dependent of Process
Option B:	Independent of Processes.
Option C:	Dependent of operating system
Option D:	Independent of operating system
9.	The register context consists components: i)Program counter ii)The processor status register (PS) iii)The stack pointer iv)The general purpose registers Choose the correct options
Option A:	i,iv
Option B:	i,ii,iii,iv
Option C:	i,ii,iii
Option D:	iii iv
10.	The algorithm “allocreg” used for

Option A:	Allocation of Process
Option B:	Allocating a Region
Option C:	Allocation of Memory
Option D:	Allocation of pages
11.	What happens, if the sleep priority is above a threshold value,
Option A:	A process will not wake up on receiving a signal,
Option B:	A process will wake up on receiving a signal,
Option C:	A process become zombie
Option D:	A process will be terminated
12.	The open and create system calls return an integer called a -----
Option A:	file Table
Option B:	file descriptor
Option C:	file id
Option D:	file UID
13.	Data structure used in kernel of unix operating system
Option A:	File table and the user file descriptor table
Option B:	Inode Table and file table
Option C:	Process Control Block and File descriptor Table
Option D:	Super Block and Boot Block
14.	The kernel caches data in the buffer pool according to a
Option A:	First in First out algorithm
Option B:	Least recently used algorithm
Option C:	Round Robin algorithm
Option D:	Priority Algorithm
15.	Which statement is not correct about “init” process in Unix?
Option A:	It is generally the parent of the login shell
Option B:	It has PID 1.
Option C:	It is the first process in the system
Option D:	Init forks and execs a ‘getty’ process at every port connected to a terminal.
16.	What is a shell script?
Option A:	group of commands
Option B:	a file containing special symbols
Option C:	a file containing a series of commands
Option D:	group of functions
17.	A process is an instance of _____ program.
Option A:	Waiting
Option B:	Executing
Option C:	Terminated
Option D:	Halted
18.	What is cron?
Option A:	a simple process
Option B:	an orphan process

Option C:	a daemon
Option D:	a zombie process
19.	Which of the following is not an OS for mobile?
Option A:	Palm
Option B:	Windows
Option C:	Mango
Option D:	Android
20.	For real time operating systems, interrupt latency should be _____
Option A:	Minimal
Option B:	Maximum
Option C:	Zero
Option D:	Dependent on the scheduling

Q2 (20 Marks)	Solve any Four out of Six	5 marks each
A	Explain the U-area	
B	Explain the context of a process.	
C	Explain different types of kernel.	
D	Explain the region table.	
E	When attaching a region to a process how can the kernel check the region does not overlap virtual address in regions already to the process?	
F	Compare NOS with DOS	

Q3. (20 Marks)	Solve any Two Questions out of Three	10 marks each
A	Explain the architecture of Unix OS	
B	Explain the structure of file directories.	
C	Write and explain the ialloc algorithm	

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE New Panvel)

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: Computer Engineering

Curriculum Scheme: Rev2016

Examination: TE Semester V

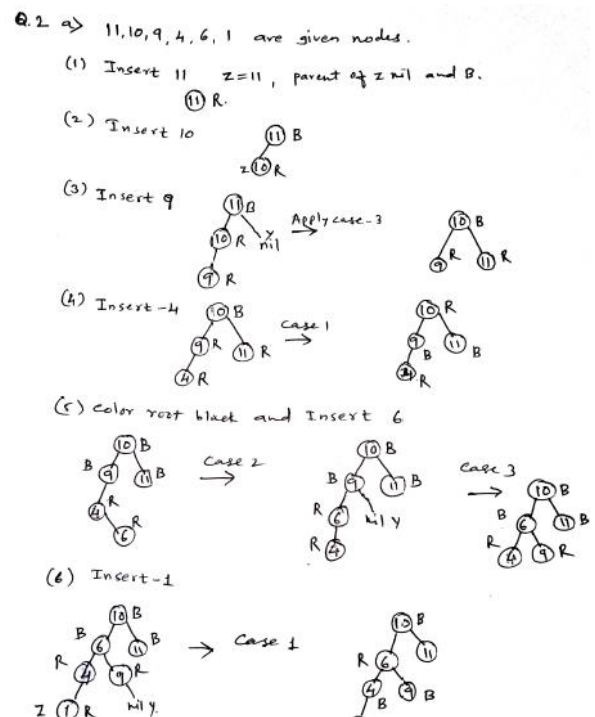
Course Code: CSDLO5013 and Course Name: Advanced Algorithm

Time: 2 hour

Max. Marks: 80

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

Q. 2 A. (For correct tree after each element insertion 1 Mark.)



B. (Explanation of cost considered for operation – 2 Marks. Explanation of amortized analysis with example- 3 Marks)

The running time of this operation is proportional to the number of bits flipped. Use this as cost. For the amortized analysis, let us charge an amortized cost of 2 dollars to set a bit to 1. When a bit is set, we use 1 dollar (out of the 2 dollars charged) to pay for the actual setting of the bit, and we place the other dollar on the bit as credit

to be used later when we flip the bit back to 0. At any point in time, every 1 in the counter has a dollar of credit on it, and thus we needn't charge anything to reset a bit to 0; we just pay for the reset with the dollar bill on the bit.

The amortized cost of INCREMENT can now be determined. At most one bit is set, therefore the amortized cost of an INCREMENT operation is at most 2 dollars. The number of 1's in the counter is never negative, and thus the amount of credit is always nonnegative. Thus, for n INCREMENT operations, the total amortized cost is $O(n)$, which bounds the total actual cost.

C. (For correct answer-5 marks)

q. 2 c.

$$T(n) = 6T(n/3) + n^2 \log n$$

solⁿ :- $a=6, b=3 \quad f(n) = n^2 \log n$
 now $n^{\log_3 6} = n^{1.63} \Rightarrow f(n) > n^{1.63}$
 by case 3 $T(n) = \Theta(n^2 \log n)$.

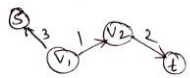
D.

(For proving VERTEX-COVER \in NP. (1 M).
 For proving vertex-cover problem is NP-hard by showing that CLIQUE \leq_P VERTEX-COVER based on the notion of the "complement" of the graph (4 M))

2. E. (Initialization of height and excess flow – 1 marks, For discharge operation and showing linked list and neighbor list- 4 marks)

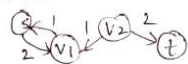
2 E) Initially height of all vertices initialized to zero, excess flow = 0

After initialization of preflow, Let vertex v_1 goes for discharge operation it has excess flow of 3



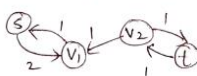
L:	B	C
N:	S	B
	C	t

vertex B has excess flow of 2. Relabel it, $h=5$ as source height = 4, push flow 2 to S. discharge vertex C.



L:	C	B
N:	S	B
	C	t

vertex C performs relabel op? $h(c) = 1$
 push flow 1 from C to sink t.



L:	C	B
N:	B	S
	t	S

Relabel-to-front terminates. No overflowing vertices. preflow is maximum flow which is 1.

2 F. (Defining random variable – 1 Mark, Defining indicator random variable for candidate

i- 2 marks, $E[X]$ calculation for n variables-2 marks)

Let X be the random variable whose value equals the number of times we hire a new office assistant.

$$E[X] = \sum_{x=1}^n x \Pr\{X = x\}$$

Define n variables related to whether or not each particular candidate is hired. Suppose X_i be the indicator random variable associated with the event in which the i^{th} candidate is hired.

$$X_i = I\{\text{candidate } i \text{ is hired}\} = \begin{cases} 1 & \text{if candidate } i \text{ is hired,} \\ 0 & \text{if candidate } i \text{ is not hired,} \end{cases}$$

and

$$X = X_1 + X_2 + \dots + X_n.$$

$$E[X_i] = \Pr\{\text{candidate } i \text{ is hired}\}$$

$$E[X_i] = 1/i.$$

Now we can compute $E[X]$:

$$\begin{aligned} E[X] &= E\left[\sum_{i=1}^n X_i\right] \\ &= \sum_{i=1}^n E[X_i] \\ &= \sum_{i=1}^n 1/i \\ &= \ln n + O(1) \end{aligned}$$

Q. 3 A. (For each step – 1 mark. 4 marks for writing steps. In example, for removal of minimum key element and making binomial heap H' - 2 Mark, Showing heap after reversing order of the linked list of removed minimum keys children. For final Heap- 2 marks)

1 find the root x with the minimum key in the root list of H , and remove x from the root list of H

2 Make Binomial Heap H'

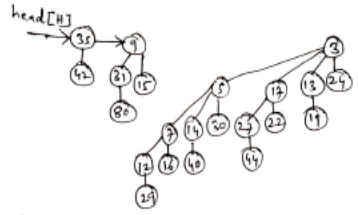
3 Reverse the order of the linked list of x 's children, and set head[H'] to point to the head of the resulting list

4 $H \leftarrow \text{BINOMIAL-HEAP-UNION}(H, H')$

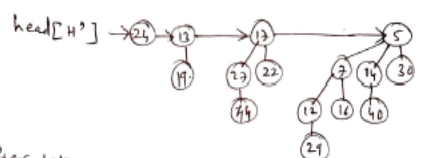
5 return x

Q.3A

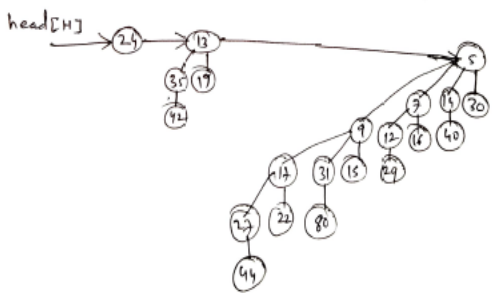
Root with minimum key is removed from root list of H.



Reverse the linked list of roots children forming binomial Heap H'



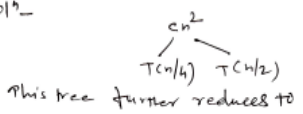
After taking union of H and H', following is final binomial heap.



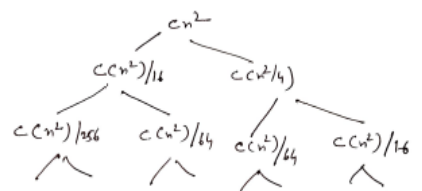
Q.3 B. Recursion-Tree-Method

$$T(n) = T(n/4) + T(n/2) + cn^2$$

solⁿ-



This tree further reduces to



Following series is obtained after summing the all levels.

$$T(n) = c(n^2 + 5(n^2)/16 + 25(n^2)/256) + \dots$$

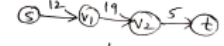
The ratio of progression of above series is $(5/16)$

for upper bound, this infinite series sum is $c(n^2)/(1-5/16) \Rightarrow O(n^2)$

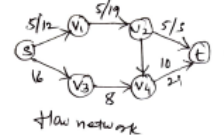
Q.3.C.

(For selecting each augmenting path and showing flow network and residual network - 3 marks. For three augmenting path total 9 marks. For maximum flow answer 1 mark.

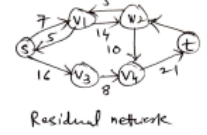
(i) Consider augmenting path



max flow = 5



Flow network

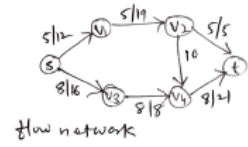


Residual network

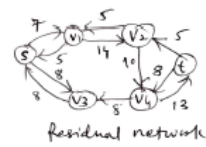
(2) consider the augmenting path in Residual network



max flow = 8



Flow network

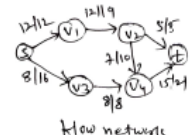


Residual network

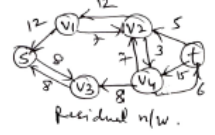
(3) consider augmenting path in Residual network



Max flow = 20



Flow network



Residual n/w.

Maximum flow = 5 + 8 + 7 = 20

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE New Panvel)

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: Computer Engineering

Curriculum Scheme: Rev2016

Examination: TE Semester V

Course Code: CSDLO5013 and Course Name: Advanced Algorithm

Time: 2 hour

Max. Marks: 80

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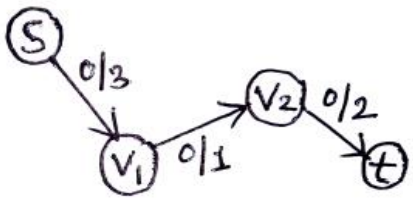
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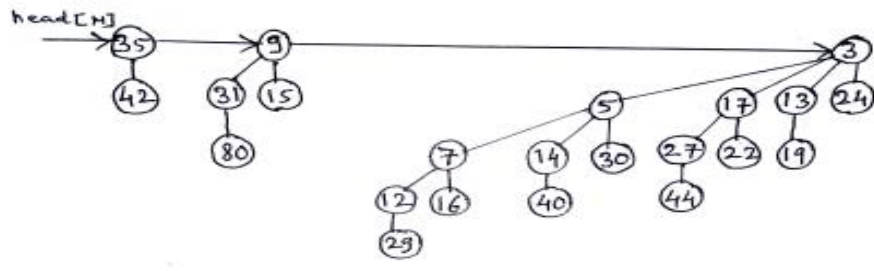
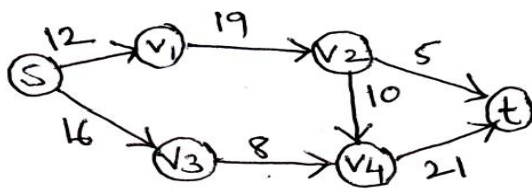
Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	In dynamic table, the amortized cost of the single operation is at the most -----
Option A:	2
Option B:	1
Option C:	3
Option D:	4
2.	In Hiring Problem, how many times a new office assistant will be hired if the input is considered in the order of rank of candidates where the order is <4, 5, 2, 6, 3, 7, 8, 9, 10, 1>
Option A:	5
Option B:	6
Option C:	8
Option D:	7
3.	A binomial tree B_k has ---
Option A:	K^2 nodes and the height of the tree is $2k$
Option B:	$(k+2)$ nodes and the height of the tree is $(\lg k)$
Option C:	K nodes and the height of the tree is $(k + 2)$
Option D:	2^k nodes and the height of the tree is k
4.	Let the capacity of the edge from vertex u to vertex v is 30 and flow from vertex u to vertex v is -10 (minus 10). The residual capacity C_f is -----
Option A:	20
Option B:	30
Option C:	40
Option D:	50
5.	In bipartite graph $G = (V E)$, vertex set can be partitioned into $V = P \cup Q$ where - ----- and all edges in E go between P and Q .

Option A:	P is subset of Q
Option B:	Q is subset of P
Option C:	$P \cap Q = \Phi$
Option D:	$P \cap Q \neq \Phi$
6.	The sweeping algorithm which takes n line segments as input and considers endpoints in sorted order have runtime complexity of ----- to determine any pair of line segments intersects.
Option A:	$O(n)$
Option B:	$O(n \lg n)$
Option C:	$O(n^2)$
Option D:	$O(\lg n)$
7.	Let $A \leq_p B$. Which of the following statement is true?
Option A:	problems A and B are polynomial time equivalent
Option B:	problem B is polynomial time reducible to problem A
Option C:	problem A is polynomial time reducible to problem B.
Option D:	problem A cannot be reducible to Bin polynomial-time.
8.	In Aggregate analysis for sequence of n operations worst case time is $T(n)$. In the worst case the amortized cost per operation is given by -----
Option A:	$n / T(n)$
Option B:	$T(n)/n$
Option C:	$T(n) * T(n)$
Option D:	$n * n$
9.	In Red-Black tree, RB-DELTE_FIXUP procedure takes time ----- and performs at the most -----rotations.
Option A:	$O(n)$ and 2 rotations
Option B:	$O(n)$ and 4 rotations
Option C:	$O(\lg n)$ and 3 rotations
Option D:	$O(n \lg n)$ and 1 rotations
10.	In relabel-to-front algorithm let f is preflow. The edge from vertex u to vertex v is admissible if and only if -----
Option A:	Residual capacity of edge u to v is greater than zero and height of vertex u is

	larger than vertex v.
Option B:	Residual capacity of edge v to vertex u is greater than zero and height of vertex u is less than vertex v.
Option C:	Residual capacity of edge u to v and height of vertex u and vertex v is equal.
Option D:	Residual capacity and height both conditions need not be fulfilled.
11.	Those problems that can be solved in polynomial time known as ----- problems.
Option A:	Decision
Option B:	Intractable
Option C:	Tractable
Option D:	Complete
12.	The convex hull of a set Q of points, denoted by CH(Q). If $ Q \geq 3$ then at termination of Graham scan algorithm bottom to top content of stack is -----
Option A:	Exactly the vertices of CH(Q) in counterclockwise order
Option B:	Exactly the vertices of CH(Q) in clockwise order
Option C:	All the vertices in CH(Q)
Option D:	All the vertices having same polar angle.
13.	The time complexity of the recurrence $T(n) = 3T(n/3) + n/2$ by using master theorem is -----
Option A:	$\Theta(n^2)$
Option B:	$\Theta(n \log n)$
Option C:	$\Theta(\log n)$
Option D:	$\Theta(n)$
14.	Let Red-Black has n number of internal nodes. Then this tree has height at most -- -----
Option A:	$\lg(n+1)$
Option B:	n
Option C:	$2 \lg(n^2)$
Option D:	$2 \lg(n+1)$
15.	Which of the following statement is correct in case of hiring problem?
Option A:	Interviewing has higher cost than hiring.
Option B:	Interviewing and hiring both have equal cost.

Option C:	Interviewing has lower cost whereas hiring is expensive
Option D:	hiring has lower cost than Interviewing
16.	In Push-relabel algorithm the basic operation PUSH(u, v) that pushes flow from vertex u to vertex v applies if -----
Option A:	u is an overflowing vertex, $C_f(u, v) > 0$ and vertex u height = vertex v height + 1.
Option B:	v is an overflowing vertex, $C_f(v, u) > 0$ and vertex v height = vertex u height + 1.
Option C:	u is an underflowing vertex, $C_f(u, v) > 0$ and vertex u height = vertex v height + 1.
Option D:	v is an underflowing vertex, $C_f(v, u) > 0$ and vertex v height = vertex u height + 1.
17.	Let M and N are the two vectors. If the cross product $M \times N = 0$ then -----
Option A:	M and N are said to be colinear
Option B:	M is clockwise from N with respect to the origin (0,0)
Option C:	M is counterclockwise from N with respect to the origin (0,0)
Option D:	M and N are not related to each other.
18.	Suppose two problems A and B not known to be in NP. Let problem C be an NP-Complete problem. Problem A is polynomial-time reducible to C and problem C is polynomial-time reducible to problem B. Which one of the following statements is true?
Option A:	Problem A is NP-hard
Option B:	Problem A is NP-Complete
Option C:	Problem B is NP-hard
Option D:	Problem B is NP-Complete
19.	In the union of two binomial heaps H1 and H2, the root list of H1 and H2 is merged into a single linked list which is sorted by -----
Option A:	Increasing order of the key value of the root nodes.
Option B:	Decreasing order of the key value of the root nodes.
Option C:	Decreasing order of the degree of the root nodes.
Option D:	Increasing order of the degree of the root nodes
20.	Deletion of a node in Red-Black tree takes ----- time
Option A:	$O(\lg n)$
Option B:	$O(n)$
Option C:	$O(\lg n)$
Option D:	$O(\lg(\lg n))$

Q2 (20 Marks)	Solve any Four out of Six (5 marks each)
A	Show the red-black tree that result after successively inserting the keys 11, 10, 9, 4, 6, 1 into an initially empty red-black tree.
B	Explain how accounting method of amortized analysis is used to analyze the increment operation on a binary counter that starts at zero.
C	Use master method to find run time complexity of the following recurrence. $T(n) = 6T(n/3) + n^2 \log n$
D	Prove that vertex-cover problem is NP-complete
E	Consider the initial flow network as shown below. Find maximum flow from source vertex s to sink t using Relabel-to-front Algorithm. Consider initial vertex V_1 for discharge operation. 
F	Explain analysis of hiring problem using indicator random variable.

Q3. (20 Marks)	Solve any Two Questions out of Three (10 marks each)
A	Write steps to extract the node with minimum key from binomial heap. Extract the node with minimum key from following binomial heap. Show each step clearly. 
B	Use recursion tree method to find time complexity of the following recurrence. $T(n) = T(n/4) + T(n/2) + cn^2$
C	What is maximum flow in the given network from source s to sink t by Ford Fulkerson algorithm? Show all the flow networks, residual networks and augmented paths. 

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSC502 and Course Name: Database Management System

Time: 1 hour

Max. Marks: 50

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

Q17.	A
Q18.	C
Q19.	A
Q20.	A
Q21.	C
Q22.	B
Q23.	C
Q24.	A
Q25.	B

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSC502 and Course Name: Database Management System

Time: 1 hour

Max. Marks: 50

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Note to the students:- All the Questions are compulsory and carry equal marks .

Q1.	In ER Diagram, _____ is represented by Rectangle
Option A:	Data
Option B:	attributes
Option C:	entity
Option D:	constraints
Q2.	The collection of all concepts that must be used to describe the database structure is called
Option A:	structural model
Option B:	server model
Option C:	data model
Option D:	client model
Q3.	The attribute AGE is calculated from DATE_OF_BIRTH. The attribute AGE is
Option A:	Single valued
Option B:	Multi valued
Option C:	Composite
Option D:	Derived
Q4.	It has entities and relationships.
Option A:	ER
Option B:	Network
Option C:	Semantic
Option D:	Functional
Q5.	Consider a relation Employee(employee_id, emp_first_name, emp_last_name, salary, department_id) Identify the composite attribute.
Option A:	Employee_id, emp_first_name
Option B:	emp_first_name, emp_last_name
Option C:	employee_id, department_id
Option D:	department_id, emp_first_name, emp_last_name

Q6.	Which of the following can be a multivalued attribute?
Option A:	Phone_number
Option B:	Name
Option C:	Date_of_birth
Option D:	City
Q7.	Identify Domain Integrity Constraint with respect to Data type of SQL?
Option A:	Primary Key
Option B:	Integer
Option C:	Foreign Key
Option D:	Check
Q8.	For select operation the _____ appear in the subscript and the _____ argument appears in the paranthesis after the sigma.
Option A:	Predicates, relation
Option B:	Relation, Predicates
Option C:	Operation, Predicates
Option D:	Relation, Operation
Q9.	The _____ operation, denoted by $-$, allows us to find tuples that are in one relation but are not in another.
Option A:	Union
Option B:	Set-difference
Option C:	Difference
Option D:	Intersection
Q10.	A foreign key is:
Option A:	a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table.
Option B:	used to define data types.
Option C:	used to define null status.
Option D:	used in place of a super key.
Q11.	Which of the following are TCL commands?
Option A:	UPDATE and TRUNCATE
Option B:	SELECT and INSERT
Option C:	GRANT and REVOKE
Option D:	ROLLBACK and SAVEPOINT
Q12.	To undo the changes made in database can be done using the SQL command
Option A:	Commit
Option B:	Grant
Option C:	Revoke
Option D:	Rollback
Q13.	What are the five built-in aggregate functions provided by SQL?

Option A:	COUNT, SUM, AVG, MAX, MIN
Option B:	SUM, AVG, MIN, MAX, MULT
Option C:	SUM, AVG, MULT, DIV, MIN
Option D:	SUM, AVG, MIN, MAX, NAME
Q14.	Consider the relation schema . weather (city , temperature , humidity , condition) . Find the names of cities whose humidity is not in range of 50 to 61.
Option A:	Select cities from weather where humidity IN (50 to 61)
Option B:	Select cities from weather where humidity having (50 and 61)
Option C:	Select cities from weather where humidity BETWEEN (50 to 61)
Option D:	Select cities from weather where humidity NOT BETWEEN (50 and 61)
Q15.	To remove a relation from an SQL database, _____ command is used.
Option A:	Delete
Option B:	Purge
Option C:	Remove
Option D:	Drop table
Q16.	'Union All' operation on two relations will give the values
Option A:	From two relations by removing duplicates
Option B:	From two relations by removing duplicates from first relation
Option C:	From two relations by removing duplicates from second relation
Option D:	From two relations without removing duplicates
Q17.	A relation will be in 3NF if it is in 2NF and not contain any _____
Option A:	transitive partial dependency.
Option B:	transparent partial dependency.
Option C:	transitive dependency.
Option D:	transitive partial declaration
Q18.	When the values in one or more attributes being used as a foreign key must exist in another set of one or more attributes in another table, we have created a(n):
Option A:	transitive dependency.
Option B:	insertion anomaly.
Option C:	referential integrity constraint.
Option D:	normal form.
Q19.	If FD A->B is true it means
Option A:	Whenever t1[A]=t2[A] then t1[B]=t2[B]
Option B:	Whenever t1[A]=t2[A] then t1[B] not equal to t2[B]
Option C:	Whenever t1[A] not equal to t2[A] then t1[B]=t2[B]
Option D:	It is not related to values of relation in columnsA and B
Q20.	Normalization is used to _____ data duplication.
Option A:	eliminate
Option B:	reduce

Option C:	increase
Option D:	maximize
Q21.	Checkpoint defines a point
Option A:	Where failure occurred
Option B:	Where database is modified last time
Option C:	where Database was in consistent state
Option D:	where commit takes place
Q22.	A _____ checkpoint is a checkpoint in which when buffer blocks are being written out at the same time updates are allowed to be performed in transactions.
Option A:	Temporary
Option B:	Fuzzy
Option C:	Permanent
Option D:	Recovery
Q23.	A protocol to ensure deadlock free state is called as
Option A:	Deadlock detection
Option B:	Deadlock elimination
Option C:	Deadlock prevention
Option D:	Deadlock recovery
Q24.	The schedule in which t1: R(A), W(A) and t2: R(B) and W(B) then $\langle t1, t2 \rangle$ is
Option A:	Serializable schedule
Option B:	non serializable schedule
Option C:	Equivalent schedule
Option D:	concurrent schedule
Q25.	_____ ensures Atomicity and durability properties.
Option A:	Query Management
Option B:	transaction management
Option C:	Cost management
Option D:	Payroll Management

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSC503 and Course Name: Computer Network

Time: 1 hour

Max Marks: 50

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

Q18.	C
Q19.	D
Q20.	A
Q21.	B
Q22.	C
Q23.	A
Q24.	A
Q25.	A

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSC503 and Course Name: Computer Network

Time: 1 hour

Max. Marks: 50

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Q1.	OSI stands for _____
Option A:	open system interconnection
Option B:	operating system interface
Option C:	optical service implementation
Option D:	open service Internet
Q2.	Which network topology requires a central controller or hub?
Option A:	Star
Option B:	Mesh
Option C:	Ring
Option D:	Bus
Q3.	Repeater and Hub operates at which layer?
Option A:	DLL
Option B:	Physical
Option C:	Network
Option D:	Transport
Q4.	Several computers are linked to a server to share programs and storage space in a
Option A:	Integrated system
Option B:	Grouping
Option C:	Network
Option D:	Library
Q5.	A _____ is the physical path over which a message travels.
Option A:	Path
Option B:	Medium
Option C:	Protocol
Option D:	Route
Q6.	Which multiplexing technique involves signals composed of light beams?
Option A:	FDM
Option B:	TDM
Option C:	WDM
Option D:	CDM

Q7.	A periodic signal completes one cycle in 0.001 s. What is the frequency?
Option A:	1 THZ
Option B:	1 GHZ
Option C:	1 HZ
Option D:	1 KHZ
Q8.	Before data can be transmitted, they must be transformed to _____
Option A:	aperiodic signal
Option B:	electromagnetic signals
Option C:	periodic signal
Option D:	low frequency waves
Q9.	Start and stop bits used in serial communication for
Option A:	Error Detection
Option B:	error correction
Option C:	synchronization
Option D:	Listening for sender and receiver
Q10.	In Pure ALOHA, the vulnerable time is _____ frame transmission time.
Option A:	the same as
Option B:	two times
Option C:	three times
Option D:	four times
Q11.	In the _____ protocol we avoid unnecessary transmission by sending only frames that are corrupted.
Option A:	Stop-and-Wait ARQ
Option B:	Go-Back-N ARQ
Option C:	Selective-Repeat ARQ
Option D:	Wait and Stop ARQ
Q12.	A bit-stuffing based framing protocol uses an 8-bit delimiter pattern of 01111110. If the output bit-string after stuffing is 01111100101, then the input bit-string is
Option A:	111110100
Option B:	111110101
Option C:	111111101
Option D:	111111111
Q13.	During error reporting, ICMP always reports error messages to _____
Option A:	Destination
Option B:	Source
Option C:	Previous Router
Option D:	Next Router

Q14.	Which of these is not a type of error-reporting message?
Option A:	Source Quench
Option B:	Time Exceeded
Option C:	Router Error
Option D:	Destination Unreachable
Q15.	First address in a block is used as network address that represents the _____
Option A:	Class
Option B:	Entity
Option C:	Organization
Option D:	Code
Q16.	Which field helps to check rearrangement of the fragments?
Option A:	Offset
Option B:	DF
Option C:	MF
Option D:	Identifier
Q17.	If you wanted to have 12 subnets with a Class C network ID, which subnet mask would you use?
Option A:	255.255.255.252
Option B:	255.255.255.255
Option C:	255.255.255.240
Option D:	255.255.255.248
Q18.	Transport Layer performs
Option A:	Host to host communication
Option B:	Node to node communication
Option C:	Process to Process communication
Option D:	Host to process communication
Q19.	UDP is _____
Option A:	Connection oriented, reliable
Option B:	Connection oriented, unreliable
Option C:	Connection less, reliable
Option D:	Connection less, unreliable
Q20.	What is goal of congestion control?
Option A:	making sure the subnet is not able to carry forward the traffic
Option B:	making sure the subnet will allow more than subnet packet
Option C:	making sure the subnet is able to carry the offered traffic
Option D:	making sure the subnet is not allow any traffic

Q21.	An endpoint of an inter-process communication flow across a computer network is called _____
Option A:	port
Option B:	socket
Option C:	link
Option D:	system
Q22.	Which one of the following protocols is NOT used to resolve one form of address to another one?
Option A:	DNS
Option B:	ARP
Option C:	DHCP
Option D:	RARP
Q23.	E-mail is an example of mode of communication where one party can send a note to another person and the recipient need not be online to receive the e-mail.
Option A:	asynchronous
Option B:	synchronous
Option C:	full duplex
Option D:	Half Duplex
Q24.	Sequence of protocols for sending and receiving mails
Option A:	SMTP, POP
Option B:	POP, SMTP
Option C:	SMTP, DNS
Option D:	DNS, SMTP
Q25.	_____ handles heterogeneity in Telnet
Option A:	NVT
Option B:	FTP
Option C:	IMAP
Option D:	SMTP

Program: BE Computer- Engineering

Curriculum Scheme: Revised 2016

Examination: Third Year Semester V

Course Code: CSC504 and Course Name: Theory of computer science

Time: 1 hour

Max. Marks: 50

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

Q17.	A
Q18.	C
Q19.	B
Q20.	B
Q21.	D
Q22.	D
Q23.	D
Q24.	B
Q25.	D