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

Program: Computer Engineering
Curriculum Scheme: Rev2016
Examination: SE Semester: IV
Course Code: CSC405 and Course Name: Operating system

Time: 2 hour   Max. Marks: 80

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

Q2A.What is an effect of page size on performance of operating system

- Increase the number of page faults because of the lower freedom in replacement choice.
- Internal Fragmentation.

- Number of TLB misses.
- number of fault may decrease if there is limited contention

B. Calculate hit ratio for LRU page replacement policy for the following string. Page frame size is 4. Calculate the hit ratio for the same.1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2

String:

1	2	3	4	5	3	4	1	6	7	8	7	8	9	7	8	9	5	4	5	4	2
1	1	1	1	5	5	5	5	6	6	6	6	6	6	6	6	6	5	5	5	5	5
	2	2	2	2	2	2	1	1	1	1	1	1	9	9	9	9	9	9	9	9	9
		3	3	3	3	3	3	3	7	7	7	7	7	7	7	7	7	4	4	4	4
			4	4	4	4	4	4	4	8	8	8	8	8	8	8	8	8	8	8	2
					H	H					H	H		H	H	H			H	H	

No of Hits=9

C. Explain Shell. Explain use of chmod command in Linux

Ans:

- Diagram of shell and Explanation
  - A shell is software that provides an interface for an operating system's users to provide access to the kernel's services shown.

  On Unix-based or Linux-based operating systems, a shell can be invoked through the shell command in the command line interface (CLI)

UNIX Architecture
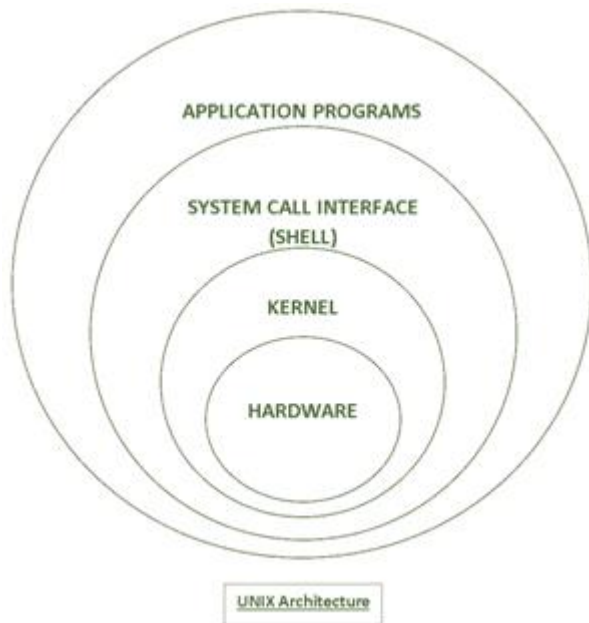
- Command Description: The chmod command is used to change the access mode of a file.
- Syntax & explanation:
  - chmod [reference][operator][mode] file...
- example: chmod u=r assgn1_client.c

D. Data structures used in Banker's Algorithm

Ans:

Available:
- It is a 1-d array of size **'m'** indicating the number of available resources of each type.
- Available[j] = k means there are **'k'** instances of resource type R_j

Max:
- It is a 2-d array of size **'n*m'** that defines the maximum demand of each process in a system.
- Max [i, j] = k means process P_i may request at most **'k'** instances of resource type R_j.

Allocation:
- It is a 2-d array of size **'n*m'** that defines the number of resources of each type currently allocated to each process.
- Allocation[i, j] = k means process P_i is currently allocated **'k'** instances of resource type R_j

Need:
- It is a 2-d array of size **'n*m'** that indicates the remaining resource need of each process.
- Need [i, j] = k means process P_i currently need **'k'** instances of resource type R_j
- Need [i, j] = Max [i, j] – Allocation [i, j]

E. Discuss Operating System as a Resource Manager.

Ans: Explanation with diagram

Operating system can be viewed as a resource allocator also. A computer system consists of many resources like - hardware and software - that must be managed efficiently. The operating system acts as the manager of the resources, decides between conflicting requests, controls execution of programs etc.

Four Components of a Computer System
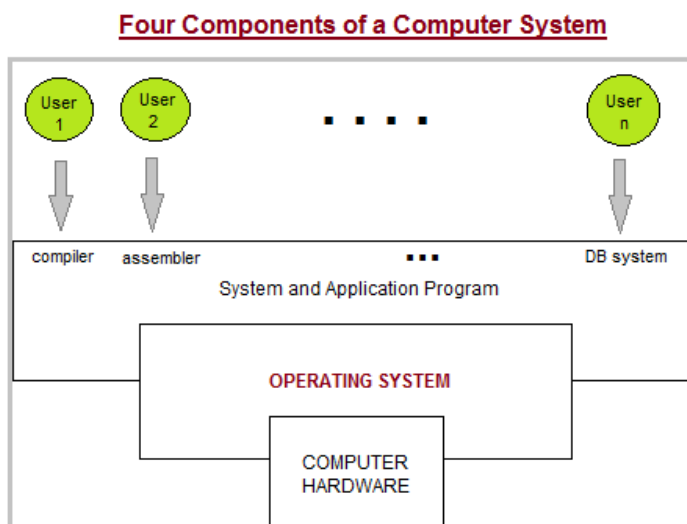
Operating System Management Tasks

1.   Processor management which involves putting the tasks into order and pairing them into manageable size before they go to the CPU.

2.   Memory management which coordinates data to and from RAM (random-access memory) and determines the necessity for virtual memory.

3.   Device management which provides interface between connected devices.

4.   Storage management which directs permanent data storage.

5.   Application which allows standard communication between software and your computer.

6.   User interface which allows you to communicate with your computer.

F. Describe Microkernel with a diagram.

Ans: Explanation with diagram

Microkernel is the only software executing at the privileged level. The other important functionalities of the OS such as device drivers, application, file servers, interprocess communication, etc. are removed from the kernel-mode and run in the user mode.
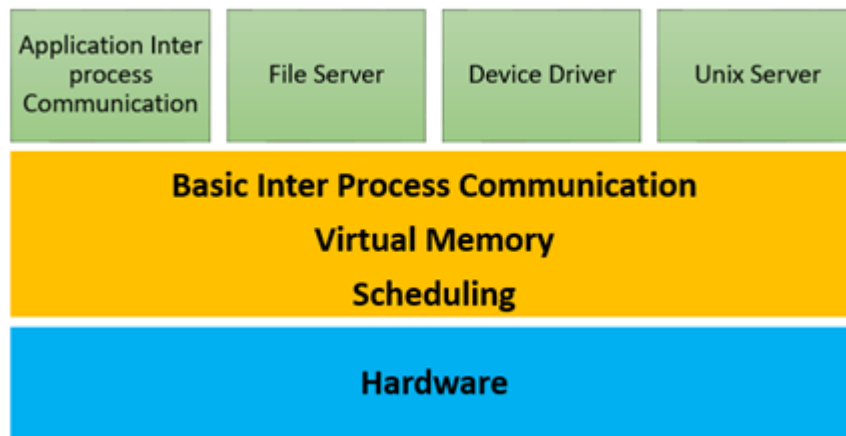
Microkernel Based Operating System

A microkernel comprises only the core functionalities of the system like memory, process scheduling mechanisms, and inter-process communication. A component is included in the Microkernel only if putting it outside would interrupt the functionality of the system. All other non-essential components should be put in the user mode.

Q3.

A. Discuss the importance of "Multithreading". Differentiate between kernel and user thread.
Ans: Definition and   Example

A thread is also known as lightweight process. The idea is to achieve parallelism by dividing a process into multiple threads. For example, in a browser, multiple tabs can be different threads. MS Word uses multiple threads: one thread to format the text, another thread to process inputs, etc. More advantages of multithreading are discussed below

Advantages of Thread over Process

1. Responsiveness: If the process is divided into multiple threads, if one thread completes its execution, then its output can be immediately returned.

2. Faster context switch: Context switch time between threads is lower compared to process context switch. Process context switching requires more overhead from the CPU.

3. Effective utilization of a multiprocessor system: If we have multiple threads in a single process, then we can schedule multiple threads on multiple processors. This will make process execution faster.

4. Resource sharing: Resources like code, data, and files can be shared among all threads within a process.

Note: stack and registers can't be shared among the threads. Each thread has its own stack and registers.

5. Communication: Communication between multiple threads is easier, as the threads share common address space. While in process we have to follow some specific communication technique for communication between two processes.

Difference between User-Level & Kernel-Level Thread

S.N.	User-Level Threads	Kernel-Level Thread
1	User-level threads are faster to create and manage.	Kernel-level threads are slower to create and manage.
2	Implementation is by a thread library at the user level.	Operating system supports creation of Kernel threads.
3	User-level thread is generic and can run on any operating system.	Kernel-level thread is specific to the operating system.
4	Multi-threaded applications cannot take advantage of multiprocessing.	Kernel routines themselves can be multithreaded.

B. Calculate AWT of the following processes using Shortest job first (Non Preemptive).

Process	Arrival Time	Burst Time

	(ms)	(ms)
P1	**1**	**7**
P2	**2**	**5**
P3	**3**	**1**
P4	**4**	**2**
P5	**5**	**8**

Ans:

P1		P3	P4	P2		P5	
1	8		9	11	16		24

AWT=(0+9+5+5+11)/5=6

C. Advantage of interrupt driven IO over Programmed IO

PROGRAMMED I/O	INTERRUPT INITIATED I/O
The CPU stays in the loop to know if the device is ready for transfer and has to continuously monitor the peripheral device.	There is no need for the CPU to stay in the loop as the interrupt command interrupts the CPU when the device is ready for data transfer.
This leads to the wastage of CPU cycles as CPU remains busy needlessly and thus the efficiency of the system gets reduced.	The CPU cycles are not wasted as CPU and hence this method is more efficient.
CPU cannot do any work until the transfer is complete as it has to stay in the loop to continuously monitor the peripheral device.	CPU can do any other work until it is interrupted by the command indicating the readiness of device for data transfer
Its module is treated as a slow module.	Its module is faster than the programmed I/O module.
The performance of the system is severely degraded.	The performance of the system is enhanced to some extent.

D. What is Mutual Exclusion? Explain its significance

Ans: Mutual exclusion is a property of concurrency control, it states that "no two processes can exist in a critical section at the same time". Mutual exclusion is one of the conditions for a deadlock to occur. It must be holding true for non-shareable resources.

Significance of mutual execution:

- · Prevents race around condition.
- · Prevents multiple threads from entering critical sections at the same time.
- · Prevents Deadlock
- · Provides Concurrency control

E. Explain Thrashing.

Ans: Diagram and explanation

Ans: Thrashing in computing is an issue caused when virtual memory is in use. It occurs when the virtual memory of a computer is rapidly exchanging data form hard disk.. As the main memory gets filled, additional pages need to be swapped in and out of virtual memory. The swapping causes a very high rate of hard disk access. Thrashing can continue for a long duration until the underlying issue is addressed. Thrashing can potentially result in total collapse of the hard drive of the computer. Figure showing thrashing causes when degree of multiprogramming increases which lower CPU utilization
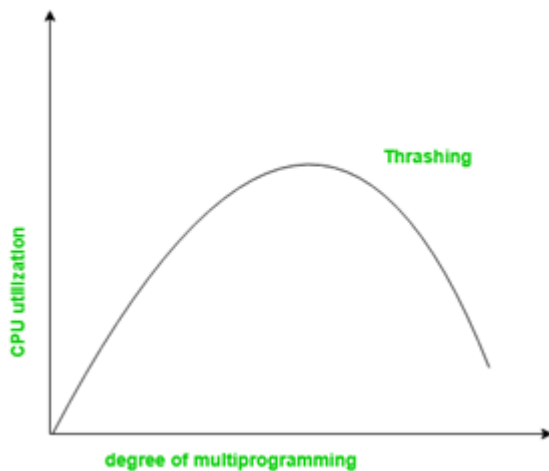
F. Given memory partitions of 150k,500k,200k,300k,550k(in order) how would each of the first fit algorithms places the processes of 220k,430k,110k,425k(in order).

Ans: First Fit:

150	500	200	300	550
110	220			430

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The first UNIX OS was written in
Option A:	Java
Option B:	Pascal
Option C:	C Programming
Option D:	Machine Language
2.	Thrashing Occur when
Option A:	When requested Page is in Memory
Option B:	When Processes on system frequently access page not memory
Option C:	When Exception is thrown
Option D:	When a page is Corrupted
3.	Page Fault Occur when
Option A:	When requested Page is in Memory
Option B:	When requested Page is not in Memory
Option C:	When Exception is thrown
Option D:	When a page is Corrupted
4.	Virtual Memory is
Option A:	Largest Secondary Memory
Option B:	Smallest Secondary Memory
Option C:	Large Main Memory
Option D:	Illusion of Large Main Memory
5.	The interface is provided by the _____ to access the services of operating system,
Option A:	Assembly instructions
Option B:	API
Option C:	Library
Option D:	System calls
6.	One that is a peripheral device of the computer system is
Option A:	Keyboard
Option B:	Register
Option C:	Memory
Option D:	BIOS
7.	The Producer – Consumer problem is also known as _____

Option A:	bounded buffer
Option B:	semaphore
Option C:	Single buffer
Option D:	System call
8.	The dining – philosophers problem will occur in case of _____
Option A:	5 philosophers and 5 chopsticks
Option B:	4 philosophers and 5 chopsticks
Option C:	3 philosophers and 5 chopsticks
Option D:	6 philosophers and 5 chopsticks
9.	_____falls under the category of preemptive scheduling.
Option A:	Round robin scheduling
Option B:	First come first serve
Option C:	Priority Scheduling
Option D:	Shortest Job First
10.	The algorithm which first executes the job that came in first in the queue is
Option A:	FILO
Option B:	LIFO
Option C:	FIFO
Option D:	SJF
11.	The system can allocate resources to each process in some order and still avoid a Deadlock is a _____
Option A:	Safe state
Option B:	Unsafe state
Option C:	Safe Sequence
Option D:	Unsafe Sequence
12.	Deadlock preventive methods helps to _____
Option A:	ensure that at least one of the necessary conditions cannot hold
Option B:	ensure that all the necessary conditions do not hold
Option C:	decide if the requested resources for a process have to be given or not
Option D:	recover from a deadlock
13.	The _____is a deadlock detection algorithm that is applicable when all resources have a single instance
Option A:	wait-for graph
Option B:	Bankers Algorithm
Option C:	ostrich algorithm
Option D:	Deadlock avoidance
14.	When a process completes its normal execution , then it enters in _____ state
Option A:	aborted
Option B:	rolled back
Option C:	terminated
Option D:	queued
15.	Page table base register points at_____

Option A:	The address of a page table in memory
Option B:	The address of a page table in backing store
Option C:	The address of a program counter
Option D:	The address of a page register
16.	___ is a technique for overcoming external fragmentation
Option A:	compaction
Option B:	contraction
Option C:	paging
Option D:	concatenation
17.	Which of the following are the two parts of the file name?
Option A:	name & identifier
Option B:	identifier & type
Option C:	extension & name
Option D:	type & extension
18.	In which file allocation method ,all the pointers to scattered blocks are placed together in one location
Option A:	Contiguous Allocation
Option B:	Linked Allocation
Option C:	Indexed Allocation
Option D:	Linked List
19.	Consider a disk queue with requests for I/O to blocks on cylinders. 98 183 37 122 14 124 65 67 Considering FCFS (first cum first served) scheduling, the total number of head movements is, if the disk head is initially at 53 is?
Option A:	600
Option B:	620
Option C:	630
Option D:	640
20.	The interrupt vector contains _____
Option A:	the interrupts
Option B:	the memory addresses of specialized interrupt handlers
Option C:	the identifiers of interrupts
Option D:	the device addresses

Q2 (20 Marks)	Solve any Four out of Six	5 marks each
A	What is an effect of page size on performance of operating system	
B	Calculate hit ratio for LRU and FIFO page replacement policy for the following string. Page frame size is 4. Calculate the hit ratio for the same. 1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2	
C	Explain Shell. Explain use of chmod command in Linux.	
D	Explain Data structures used in Banker's Algorithm.	
E	Discuss Operating System as a Resource Manager.	
F	Describe Microkernel with a diagram.	

Q3 (20 Marks)	Solve any Four out of Six		5 marks each	
A	Discuss the importance of "Multithreading". Differentiate between kernel and user thread.			
B	Process	Arrival Time (ms)	Burst Time (ms)	
	P1	1	7	
	P2	2	5	
	P3	3	1	
	P4	4	2	
	P5	5	8	
	Calculate AWT of the following processes using Shortest job first (Non-Preemptive).			
C	Discuss advantages of interrupt driven IO over Programmed IO.			
D	What is Mutual Exclusion? Explain its significance.			
E	Explain Thrashing.			
F	Given memory partitions of 150k,500k,200k,300k,550k (in order) how would each of the first fit algorithm places the processes of 220k,430k,110k,425k(in order).			

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Examination 2020 under cluster ___ (Lead College Short name)

Program: S.E.(Computer) Engineering
Curriculum Scheme: Rev2016
Examination: S.E.   Semester IV
Course Code: CSC401 and Course Name: Applied Mathematics IV

Time: 1 hour   Max. Marks: 50

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

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Program: S.E.(Computer Engineering)
Curriculum Scheme: Rev2016
Examination: Second Year   Semester IV
Course Code: CSC401 and Course Name: Applied Mathematics IV

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

Q1.	The order of singular points z = 5 and z = 3 of function $f(z) = \frac{z+1}{(z-5)^2\,(z-3)^4}$ are respectively
Option A:	1, 2
Option B:	1, 4
Option C:	2, 4
Option D:	4, 2
Q2.	If $I = \int_c \frac{e^z}{z-2}\, dz$, where c : |z| = 3 then value of I is
Option A:	0
Option B:	$2\pi i e^2$
Option C:	$2\pi i e$
Option D:	$2\pi i$
Q3.	The Eigenvalues of $\begin{bmatrix} 2 & -1 & 4 \\ 0 & 3 & 6 \\ 0 & 0 & -1 \end{bmatrix}$ are
Option A:	-1, 0, 4
Option B:	6, 3, -2
Option C:	3, 2, -1
Option D:	3, 0, -1
Q4.	If one of the eigenvalues of matrix A is zero, it implies that
Option A:	Det(A) = 1
Option B:	Det (A) = -1
Option C:	Det (A) = 0

Option D:	Det (A) = 2
Q5.	A discrete random variable X has the following probability distribution <table><tr><td>X</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>P(X=x)</td><td>0.1</td><td>k</td><td>0.2</td><td>2k</td><td>0.3</td><td>3k</td></tr></table>Then P(X=1) =
Option A:	$\dfrac{1}{15}$
Option B:	$\dfrac{2}{15}$
Option C:	$\dfrac{1}{5}$
Option D:	$\dfrac{4}{15}$
Q6.	A binomial variate X(n ,p) has mean 7/3 and variance 14/9, then value of n =
Option A:	5
Option B:	7
Option C:	9
Option D:	11
Q7.	A random sample of size 100 has mean 160 and standard deviation 10, drawn from a population with mean 165.The absolute value of test statistic in testing the significance of difference between sample mean and population mean is
Option A:	2
Option B:	3
Option C:	4
Option D:	5
Q8.	If the basic solution of a LPP is x = 1, y = 0, then the solution is

Option A:	Feasible and Degenerate
Option B:	Feasible and Non-Degenerate
Option C:	Non-Feasible and Degenerate
Option D:	Non-Feasible and Non-Degenerate
Q9.	If $A = \begin{bmatrix} 3 & 0 & 0 \\ -1 & 4 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, the eigen values of $A^2 - I$ are
Option A:	9, 16, 1
Option B:	3, 4, 1
Option C:	8, 0, 15
Option D:	0, 2, 4
Q10.	The value of $\int_c \frac{e^z}{(z-1)^2} dz$, where c is the circle given by $\lvert z-2 \rvert = \frac{1}{2}$ is
Option A:	2π
Option B:	-2
Option C:	0
Option D:	πi
Q11.	Bag B1 contains 7 red and 3 black balls and bag B2 contains 4 red and 5 black balls. One ball is transferred from bag B1 to bag B2 and then a ball is drawn from bag B2. If the ball drawn is red, the probability that a black ball was transferred is
Option A:	$\dfrac{12}{47}$
Option B:	$\dfrac{7}{47}$
Option C:	$\dfrac{5}{47}$
Option D:	$\dfrac{3}{47}$

Q12.	In the canonical form of LPP, the constraint equations are of type
Option A:	$<$
Option B:	$\leq$
Option C:	$>$
Option D:	$\geq$
Q13.	Consider the function $f(z) = \frac{\sin z}{z^2}$, then z = 0 is a pole of order
Option A:	4
Option B:	3
Option C:	2
Option D:	1
Q14.	If matrix $A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ is diagonalized by matrix $B = \begin{bmatrix} 1 & 1 \\ -2 & 1 \end{bmatrix}$ to diagonal matrix D =
Option A:	$\begin{bmatrix} 2 & 0 \\ 0 & 5 \end{bmatrix}$
Option B:	$\begin{bmatrix} 4 & 0 \\ 0 & 3 \end{bmatrix}$
Option C:	$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
Option D:	$\begin{bmatrix} 1 & 0 \\ 0 & -2 \end{bmatrix}$
Q15.	A discrete random variable has probability density function

X	-2	-1	0	1	2	3
P(X=x)	2/10	3/25	1/10	6/25	1/10	6/25

Then E(X) =

Option A:	293/625
Option B:	73/250
Option C:	18/25
Option D:	16/25

Q16.	Ten individuals are chosen at random from a population with height 65 inches and their heights are found to be 63, 63, 64, 65, 66, 69, 69, 70, 70, 71 inches. The value of test statistic in testing the significance of difference between sample mean and population mean is
Option A:	1.01
Option B:	2.02
Option C:	3.03
Option D:	4.04
Q17.	Kuhn-Tucker conditions are used to solve
Option A:	Linear Programming Problem
Option B:	Non-Linear Programming Problem
Option C:	Linear equation
Option D:	Non-Linear equation
Q18.	If matrix A $= \begin{bmatrix} 7 & 3 \\ 2 & 6 \end{bmatrix}$, then A^{50} is given by
Option A:	$aA + bI$
Option B:	$aA^2 + bB + cI$
Option C:	$aA^2 + bB$
Option D:	$aA^2 + cI$
Q19.	If E(X) = 2, E(Y) = 3, then E(X-Y) =
Option A:	5
Option B:	1
Option C:	-1
Option D:	6
Q20.	If the primal LPP has an unbounded solution, then the dual has
Option A:	Unbounded solution
Option B:	Bounded solution

Option C:	Feasible solution
Option D:	Infeasible solution
Q21.	If $f(z) = \dfrac{z^2}{(z-1)^2 \, (z+1)}$, the residue of f(z) at z = -1 is
Option A:	1/4
Option B:	1/2
Option C:	0
Option D:	1
Q22.	The distribution of the difference between means $\overline{x_1} - \overline{x_2}$ of two large samples follows
Option A:	Binomial distribution
Option B:	Poisson distribution
Option C:	Normal distribution
Option D:	Uniform distribution
Q23.	While writing the dual problem from its primal, if basic variable x is unrestricted, then it is expressed as
Option A:	x
Option B:	-x
Option C:	x'+x''
Option D:	x'-x''
Q24.	A random variable X had pdf $f(x) = \begin{cases} 2e^{-2x}, & x > 0 \\ 0, & x \le 0 \end{cases}$, then standard deviation of X is
Option A:	1/2
Option B:	-1/2
Option C:	1/4
Option D:	-1/4
Q25.	In Artificial variable method, while expressing the constraint

	ax + by ≥ c in standard form, the variables to be introduced in the constraint equation are
Option A:	Slack variables
Option B:	Surplus variable and Artificial variable
Option C:	Slack variables and Artificial variables
Option D:	Dual variable

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Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)
Program: **Computer Engineering**
Curriculum Scheme: Rev2016
Examination: Second Year Semester IV
Course Code: CSC402 and Course Name: Analysis of Algorithm

Time: 1 hour   Max. Marks: 50

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

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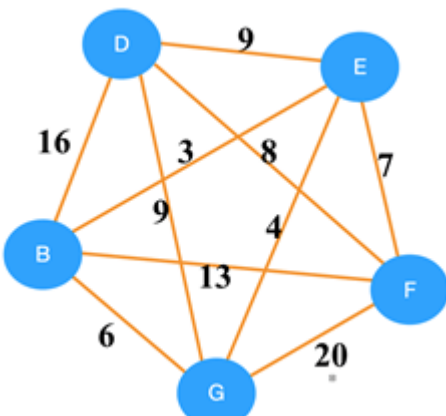Course Code: CSC402 and Course Name: Analysis of Algorithm

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

Q1.	What is recurrence for worst case of QuickSort?
Option A:	T(n) = T(n-2) + O(n)
Option B:	T(n) = T(n-1) + O(n)
Option C:	T(n) = 2T(n/2) + O(n)
Option D:	T(n) = T(n/10) + T(9n/10) + O(n)
Q2.	When an algorithm X is asymptotically more efficient than Y?
Option A:	X will be a better choice for all inputs
Option B:	X will be a better choice for all inputs except possibly small inputs
Option C:	X will be a better choice for all inputs except possibly large inputs
Option D:	Y will be a better choice for small inputs
Q3.	What is the time complexity of Floyd–Warshall algorithm with n vertices?
Option A:	O(n^2logn)
Option B:	Theta(n^2logn)
Option C:	Theta(n^4)
Option D:	Theta(n^3)
Q4.	A problem in NP is NP-complete if
Option A:	It can be reduced to the 3-SAT problem in polynomial time
Option B:	The 3-SAT problem can be reduced to it in polynomial time
Option C:	It can be reduced to any other problem in NP in polynomial time
Option D:	some problem in NP can be reduced to it in polynomial time
Q5.	The 8-Queen's problem can be solved using
Option A:	Backtracking
Option B:	Divide and Conquer
Option C:	Dynamic Programming
Option D:	Greedy Method
Q6.	The Complexity of travelling salesman problem is:
Option A:	Polynomial time using dynamic programming algorithm
Option B:	Polynomial time using branch-and-bound algorithm
Option C:	Exponential time using dynamic programming algorithm or branch-and-bound algorithm
Option D:	Polynomial time using backtracking algorithm
Q7.	Consider a weighted complete graph G on the vertex set {v1, v2, ... vn} such that

	the weight of the edge (vi, vj) is 4 | i – j|. The weight of minimum cost spanning tree of G is :
Option A:	4n^2
Option B:	n
Option C:	2n – 2
Option D:	4n – 4
Q8.	Given two sequences X and Y : X = < a, b, c, b, d, a, b > Y = < b, d, c, a, b, a > . The longest common subsequence of X and Y is :
Option A:	< b, c, a>
Option B:	< c, a, b>
Option C:	< b, c, b, a>
Option D:	< b, c, a, a>
Q9.	What is time complexity of the pre-processing of Rabin and Karp Algorithm?
Option A:	Theta(m^2)
Option B:	Theta(mlogn)
Option C:	Theta(m)
Option D:	Big-Oh(n)
Q10.	Which of the following sequence of edges form a MST using Kruskal's
Option A:	(B-E)(G-E)(E-F)(D-F)
Option B:	(B-E)(G-E)(E-F)(B-G)(D-F)
Option C:	(B-E)(G-E)(E-F)(D-E)
Option D:	(B-E)(G-E)(E-F)(D-F)(D-G)
Q11.	What is a chromatic number?
Option A:	The maximum number of colors required for proper edge coloring of graph
Option B:	The maximum number of colors required for proper vertex coloring of graph
Option C:	The minimum number of colors required for proper vertex coloring of graph
Option D:	The minimum number of colors required for proper edge coloring of graph
Q12.	Given items as {value,weight} pairs {{40,20},{30,10},{20,5}}. The capacity of knapsack=20. Find the maximum value output assuming items to be divisible.
Option A:	60
Option B:	80

Option C:	100
Option D:	40
Q13.	Bellman Ford Algorithm can be applied for _____
Option A:	Undirected and weighted graphs
Option B:	Undirected and unweighted graphs
Option C:	Directed and weighted graphs
Option D:	All directed graphs
Q14.	For the improvement of efficiency of quick sort the pivot can be
Option A:	the first element
Option B:	the mean element
Option C:	the last element
Option D:	middle element
Q15.	What is the recurrence relation used in Strassen's algorithm?
Option A:	7T(n/2) + Theta(n^2)
Option B:	8T(n/2) + Theta(n^2)
Option C:	7T(n/2) + O(n^2)
Option D:	8T(n/2) + O(n^2)
Q16.	Identify the problem solved by multistage graph
Option A:	Travelling Sales person problem
Option B:	Assembly line scheduling problem
Option C:	Resource allocation problem
Option D:	Producer consumer problem
Q17.	Greedy Job Scheduling with deadlines is having complexity
Option A:	O(N)
Option B:	Theta(NlogN)
Option C:	O(N^2)
Option D:	O(N^2logN)
Q18.	Which is optimal job sequence for item : 1, 2, 3, 4, 5 and profit: 20, 15, 10, 5, 1 and Deadlines: 2, 2, 3, 3, 3
Option A:	1,3,4
Option B:	4,3,2
Option C:	1,2,3
Option D:	1,5,2
Q19.	Following is a advantage of MaxMin algorithm over straight maxmin
Option A:	Less time complexity
Option B:	Less space Complexity
Option C:	High accuracy
Option D:	High time complexity
Q20.	When solution to the problem can be viewed as sequence of decisions to the problem following algorithmic strategy is used

Option A:	Divide and Conquer
Option B:	Backtracking
Option C:	Branch and Bound
Option D:	Dynamic Programming
Q21.	Binary search cannot be applied to
Option A:	Sorted Linked list
Option B:	Sorted Linear array
Option C:	Sorted list
Option D:	Sorted Binary array
Q22.	In the dynamic programming implementation of the assembly line scheduling problem, how many lookup tables are required?
Option A:	0
Option B:	1
Option C:	2
Option D:	3
Q23.	If an optimal solution can be created for a problem by constructing optimal solutions for its subproblems, the problem possesses _____ property.
Option A:	Overlapping subproblems
Option B:	Optimal substructure
Option C:	Memoization
Option D:	Greedy
Q24.	What is a subset sum problem?
Option A:	finding a subset of a set that has sum of elements equal to a given number
Option B:	checking for the presence of a subset that has sum of elements equal to a given number and printing true or false based on the result
Option C:	finding the sum of elements present in a set
Option D:	finding the sum of all the subsets of a set
Q25.	_____ is the class of decision problems that can be solved by non-deterministic polynomial algorithms?
Option A:	NP
Option B:	P
Option C:	Hard
Option D:	Complete

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)
Program: **Computer Engineering**
Curriculum Scheme: Rev2016
Examination: Second Year Semester IV
Course Code: CSC 403 and Course Name: Computer Organization and Architecture

Time: 1 hour   Max. Marks: 50

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

University of Mumbai
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Time: 1 hour   Max. Marks: 50
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For the students:- All the Questions are compulsory and carry equal marks .

Q1.	Microinstructions are stored in control memory in groups, with each group specifying
Option A:	microprogram
Option B:	routine
Option C:	mapping
Option D:	subprogram
Q2.	A microprogrammed control unit -
Option A:	Is faster than a hardwired unit
Option B:	Facilitates easy implementation of a new instruction
Option C:	Is useful when small programs are to be run
Option D:	Makes efficient use of control logic
Q3.	Which of the following is not a standard method of implementing control unit?
Option A:	Hardwired control
Option B:	Softwired control
Option C:	Microprogrammed control
Option D:	Microinstruction control
Q4.	The key characteristic of Microprogrammed control is
Option A:	Expensive
Option B:	Complex hardware
Option C:	RISC
Option D:	Flexibility of adding new instructions

Q5.	The performance of the Cache memory is measured as -
Option A:	Hit Ratio
Option B:	Miss Ratio
Option C:	Frequency
Option D:	Bandwidth
Q6.	The larger memory placed between the primary cache and the memory is called
Option A:	Level 1 cache
Option B:	Level 2 cache
Option C:	Registers
Option D:	TLB
Q7.	While using the direct mapping technique, in a 16 bit system the higher order 5 bits are used for
Option A:	Id
Option B:	Word
Option C:	Tag
Option D:	Block
Q8.	In memory interleaving, the lower order bits of the address is used to
Option A:	Get the data
Option B:	Get the address of the module
Option C:	Get the address of the data within the module
Option D:	Get block address
Q9.	In associative mapping during LRU, the counter of the new block is set to '0' and all the others are incremented by one, when ------- occurs.
Option A:	Delay
Option B:	Hit
Option C:	Miss

Option D:	Failure
Q10.	The cache memory of 1K words uses direct mapping with a block size of 4 words. How many blocks can the cache accommodate?
Option A:	128 words
Option B:	256 words
Option C:	512 words
Option D:	1024 words
Q11.	In Flynn's taxonomy, a multi-core superscalar processor is classified as
Option A:	MIMD processor
Option B:	SISD
Option C:	MISD
Option D:	SIMD
Q12.	Superscalar architecture is a method of -----------.
Option A:	parallel computing
Option B:	multi-core computing.
Option C:	very long instruction word (VLIW)
Option D:	explicitly parallel instruction computing (EPIC),
Q13.	In out-of-order processor, the instructions are executed
Option A:	in an order of availability of operands
Option B:	one after the other as per program sequence
Option C:	different sub-steps of sequential instructions simultaneously
Option D:	original order of the instructions in the program
Q14.	To overcome the conflict over the possession of the BUS we use _____
Option A:	Optimizers
Option B:	BUS arbitrators
Option C:	Multiple BUS structure

Option D:	Priority access
Q15.	In DMA transfers, the required signals and addresses are given by the _____
Option A:	Processor
Option B:	Device drivers
Option C:	DMA controllers
Option D:	The program itself
Q16.	When the process is returned after an interrupt service _____ should be loaded again.
Option A:	Register contents & Condition codes
Option B:	Return addresses
Option C:	Instruction register
Option D:	ISR addresses
Q17.	The main advantage of multiple bus organization over a single bus is _____
Option A:	Reduction in the number of cycles for execution
Option B:	Increase in size of the registers
Option C:	Better Connectivity
Option D:	None of the mentioned
Q18.	In Booth's multiplication algorithm, if the multiplier and multiplicand are 5 bits each, then the arithmetic shift right operation performed in each iteration on ___ number of bits.
Option A:	11
Option B:	10
Option C:	5
Option D:	6
Q19.	Which one of the following parameters is not a part of Computer Organization?
Option A:	Control signals

Option B:	Instruction set
Option C:	Memory interface techniques
Option D:	Activation of control signals
Q20.	Which one of the following statement is not applicable to the Von-Neumann machine?
Option A:	Simple design
Option B:	Slower speed
Option C:	Simple OS
Option D:	Common memory for Program & data
Q21.	In Restoring division algorithm of Binary division, the restoring operation is _____ .
Option A:	A ← A + M
Option B:	A ← A - M
Option C:	A ← A + Q
Option D:	A ← A × Q
Q22.	Which one of the following is not the representation of negative number in IEEE 754 format?
Option A:	(8AC4 0000)H
Option B:	(CAC4 0000)H
Option C:	(6AC4 0000)H
Option D:	(9AC4 0000)H
Q23.	Instruction interpretation is achieved inside the processor architecture by _____ .
Option A:	Instruction decoder
Option B:	Instruction register
Option C:	Program Counter
Option D:	Stack Pointer
Q24.	If branch instruction enters in the pipeline and gets successfully executed, then

	which one of the following sentence is not true?
Option A:	Pipeline must be flushed
Option B:	Reduces the efficiency & throughput
Option C:	Next instruction to be fetched from the target address
Option D:	Maintains CPI = 1
Q25.	In the Instruction fetch cycle, the PC register is used to point _____.
Option A:	Stack top location
Option B:	address of the data
Option C:	address of the next instruction to be executed
Option D:	both the address of the current instruction as well as the data

University of Mumbai
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Curriculum Scheme: Rev2016
Examination: Second Year Semester IV
Course Code: CSC404 and Course Name: Computer Graphics

Time: 1 hour   Max. Marks: 50

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

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All the Questions are compulsory and carry equal marks.

Q1.	The process of converting the picture definition into a set of pixel-intensity for storage in the refresh buffer is called
Option A:	Rendering
Option B:	Shadowing
Option C:	Scan Conversion
Option D:	Transformation
Q2.	In which of the following display devices 3 electron guns are used?
Option A:	Traditional CRT
Option B:	Beam Penetration method
Option C:	Shadow mask method
Option D:	Flat panel display
Q3.	If we scale a circle only in one direction it becomes a ?
Option A:	Parabola
Option B:	Ellipse
Option C:	Rhombus
Option D:	Square
Q4.	_____ is a method for testing a pixel inside of a polygon
Option A:	Even-odd
Option B:	Scan line
Option C:	In-Test
Option D:	Mid-point
Q5.	For a circle with radius r , which of the following represents correct initial decision parameter for midpoint circle drawing algorithm?
Option A:	$(1-r)$
Option B:	$(1+r)$
Option C:	$(1-r/4)$
Option D:	$(1/4-r)$
Q6.	Given a circle with center (0,0) and radius r =12, the midpoint circle drawing algorithm starts by plotting its first point as
Option A:	(0,12)
Option B:	(12,0)
Option C:	(0, 0)
Option D:	(12,12)

Q7.	Given the center (Xc,Yc) = (10, 10) and radius as r = 8, The first four points that will be plotted using mid-point circle drawing algorithm are
Option A:	(10,18),(11,18),(11,18),(12,17)
Option B:	(10,18),(10,17),(12,17),(13,16)
Option C:	(10,18),(11,18),(12,18),(12,17)
Option D:	(10,18),(11,18),(12,18),(13,17)
Q8.	For a scan line polygon fill algorithm which of the following statements is not correct?
Option A:	It processes the polygon one scan line at a time
Option B:	It takes the advantage of edge coherence property to calculate X intersections
Option C:	It is a recursive algorithm to fill the polygon
Option D:	It calculates the X-intersections of a scan line with polygon edges and fills the pixels between the pair of X-intersections.
Q9.	In scaling transformation if Sx=Sy and scaling factors are not equal to 1, then _____
Option A:	The size as well as shape of object changes
Option B:	The size of object changes but the shape doesn't changes
Option C:	The size of object doesn't changes but its shape changes
Option D:	The size as well as shape of object doesn't change
Q10.	If a line is represented by y=x+5 then to make this line to pass through the origin , the transformation required is _____
Option A:	Translation with Tx = 0 and Ty = -5
Option B:	Translation with Tx = 0 and Ty = +5
Option C:	Translation with Tx = -5 and Ty = 0
Option D:	Translation with Tx = +5 and Ty = 0
Q11.	A line passes through origin and coincides with y axis, To make this line to pass through origin but coincide with x axis we need to apply ___ transformation.
Option A:	Scaling
Option B:	Translation
Option C:	Rotation
Option D:	Shear
Q12.	In Cohen Sutherland line clipping algorithm if the region code is decided by ABRL where A is Above , B is Below , R is Right and L is Left, then the region code for **top right** region will be____
Option A:	0000
Option B:	0100
Option C:	1010
Option D:	0101
Q13.	_____ line clipping uses parametric equation to represent a line.
Option A:	Cohen Sutherland
Option B:	Mid Point
Option C:	Liang Barsky

Option D:	Sutherland Hodgman
Q14.	Sutherland Hodgman algorithm may not clip _____ successfully.
Option A:	Convex Polygon
Option B:	Concave Polygon
Option C:	A polygon which falls totally outside the Window
Option D:	A polygon which falls totally inside the Window
Q15.	_____ Algorithm attempts to overcome the drawback of Sutherland Hodgman algorithm.
Option A:	Cohen Sutherland
Option B:	Boundary Fill
Option C:	Bresenham Line
Option D:	Wieler Atherton
Q16.	What is the full form of CSG
Option A:	Common Solid Graph
Option B:	Constructive Solid Geometry
Option C:	Constant Solid Graph
Option D:	Constructive Spline Graph
Q17.	The types of parallel projections are
Option A:	Orthographic and Quadric
Option B:	Quadric and one point
Option C:	Orthographic and Oblique
Option D:	Quadric and Oblique
Q18.	In ------ curve, the degree of the polynomial defining the curve segment is one less than the total number of control points
Option A:	Bezier
Option B:	B-Spline
Option C:	Koch
Option D:	Hilbert's
Q19.	For a point (4,1,4) if we apply 3D reflection about XY Plane, then the new point will become _____.
Option A:	(4,-1,4)
Option B:	(4, 1,-4)
Option C:	(4, -1,-4)
Option D:	(-4,-1,4)
Q20.	Bezier curve comes under the category of ------ curve and it is -------curve
Option A:	Interpolation, Non parametric
Option B:	Approximation, Parametric
Option C:	Approximation, Non parametric
Option D:	Interpolation, Parametric
Q21.	In 3D viewing Pipeline, the device coordinates are obtained through

Option A:	MC→VC →WC→PC→NDC→DC
Option B:	WC→MC →VC→NDC→PC→DC
Option C:	MC→WC →VC→PC→NDC→DC
Option D:	WC→MC →VC→PC→NDC→DC
Q22.	Backface Detection Algorithm comes under the category of
Option A:	Object space method
Option B:	Image space method
Option C:	System space method
Option D:	Polygon space method
Q23.	Which algorithm is also known as Painter's Algorithm?
Option A:	Depth-sorting Algorithm
Option B:	Ray-Casting Algorithm
Option C:	Depth-buffer Algorithm
Option D:	Depth-compare Algorithm
Q24.	A model for the interaction of light with a surface is called
Option A:	Shading model
Option B:	Reflection model
Option C:	Illumination model
Option D:	Surface model
Q25.	Which shading algorithm gives more accurate result
Option A:	Phong shading
Option B:	Gouraud shading
Option C:	Fast Phong shading
Option D:	Constant intensity shading

University of Mumbai
Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)
Program: **Computer Engineering**
Curriculum Scheme: Rev2016
Examination: Second Year Semester IV
Course Code: CSC405 and Course Name: Operating system

Time: 1 hour   Max. Marks: 50

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

University of Mumbai
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Q1.	One of the most important aspects of Operating System is:
Option A:	Multiprogramming
Option B:	Shared memory
Option C:	Multiprocessor
Option D:	Scheduling
Q2.	Logical extension of multiprogramming operating system is
Option A:	Time Consuming
Option B:	Single programing
Option C:	Multi-casting
Option D:	Multi-tasking
Q3.	Multiprocessor system have
Option A:	Increased Throughput
Option B:	Expensive hardware
Option C:	Decreased Throughput
Option D:	Non sensitive
Q4.	In the layered approach of Operating Systems _____
Option A:	Bottom Layer(0) is the User interface
Option B:	Highest Layer(N) is the User interface
Option C:	Bottom Layer(N) is the hardware
Option D:	Highest Layer(N) is the hardware
Q5.	Semaphore is a/an _____ to solve the critical section problem.
Option A:	Hardware for a system
Option B:	Special program for a system
Option C:	Integer variable
Option D:	Character Variable
Q6.	The clock interrupt handler on a certain computer requires 2 msec (including process switching overhead) per clock tick. The clock runs at 60Hz. What fraction of the CPU is devoted to the clock?
Option A:	8%
Option B:	12%
Option C:	14%
Option D:	16%

Q7.	.The link between two processes P and Q to send and receive messages is called :
Option A:	Communication link
Option B:	Message passing link
Option C:	Synchronization link
Option D:	Proper link
Q8.	A computer system has enough room to hold four programs in its main memory. These programs are idle waiting for I/O half the time. What fraction of the CPU time is wasted?
Option A:	1/2
Option B:	1/4
Option C:	1/8
Option D:	1/16
Q9.	Databases, Semaphore, Secondary memory and I/O devices are the examples of
Option A:	Reusable Resources
Option B:	Single Process Resources
Option C:	Consumable Resources
Option D:	Produced Resources
Q10.	Semaphores are used to solve the problem of
Option A:	Race condition
Option B:	Process synchronization
Option C:	Mutual exclusion
Option D:	Belady problem
Q11.	Banker's algorithm deals with
Option A:	Deadlock prevention
Option B:	Deadlock avoidance
Option C:	Deadlock recovery
Option D:	Mutual exclusion
Q12.	_____ is a high level abstraction over Semaphore.
Option A:	Shared memory
Option B:	Message passing
Option C:	Monitor
Option D:	Mutual exclusion
Q13.	Calculate number of page faults for the page replacement policies Optimal and LRU for given reference string 6, 0, 5, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 5, 2, 0, 5, 6, 0, 5 (assuming three frame size).
Option A:	optimal=7,LRU=12
Option B:	optimal 8,LRU=12
Option C:	Optimal=9,LRU=12
Option D:	Optimal=10,LRU=12
Q14.	What is starvation?

Option A:	System is not deadlocked, but at least one process is indefinitely postponed.
Option B:	System is deadlocked, but at least one process is indefinitely postponed.
Option C:	System is blocked
Option D:	System stops working
Q15.	Select types of resources we might not consider in deadlock problems on computers.
Option A:	CPU cycles
Option B:	I/O Bus
Option C:	I/O devices
Option D:	Tape drives
Q16.	Which of the following is not valid for deadlock prevention scheme?
Option A:	Release all resource before requesting a new resource
Option B:	Number all resources uniquely and never request a lower numbered resource than the last one requested
Option C:	Never request a resource after releasing any resource
Option D:	Request and allocate all required resource before execution
Q17.	Which one of the following is true?
Option A:	Block size is not equal to the frame size
Option B:	Need to allocate frames into the blocks of the RAM.
Option C:	Every memory access has an additional overhead, which can be reduced by using a TLB.
Option D:	Per process page table is stored in hard disk
Q18.	The principle of locality of reference justifies the use of _____.
Option A:	Virtual Memory
Option B:	Interrupts
Option C:	Main memory
Option D:	Cache memory
Q19.	The high paging (page in / out) activity is called _____.
Option A:	Inter process communication
Option B:	Thrashing
Option C:	Context Switch
Option D:	Swapping
Q20.	Airline reservation systems and inventory control system are the examples of
Option A:	Pile system
Option B:	Sequential file system
Option C:	Indexed sequential file system
Option D:	Indexed file system
Q21.	Contiguous allocation of a file is defined by _____
Option A:	Disk address of the first block & length
Option B:	Length & size of the block
Option C:	Size of the block

Option D:	Total size of the file
Q22.	Mapping of file is managed by _____
Option A:	File metadata
Option B:	Page table
Option C:	Virtual memory
Option D:	File system
Q23.	In which of followings Device drivers are not implemented to interface _____
Option A:	Character devices
Option B:	Block devices
Option C:	Network devices
Option D:	Damaged Devices
Q24.	The set of tracks that are at one arm position make up a _____
Option A:	Magnetic disks
Option B:	Cylinders
Option C:	Assemblies
Option D:	Electrical disks
Q25.	The time taken for the desired sector to rotate to the disk head is called as
Option A:	Rotational latency
Option B:	Positioning time
Option C:	Random access time
Option D:	Seek time

Examinations Commencing from 23rd December 2020 to 6th January 2021

Program:Computer Engineering

Curriculum Scheme: Rev2016

Examination:SE   Semester IV

Course Code: CSC401   Course Name: Applied Maths IV

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	A
Q6	A
Q7	D
Q8.	B
Q9.	C
Q10.	C
Q11.	A
Q12.	A
Q13.	C
Q14.	B
Q15.	C
Q16.	C
Q17.	D
Q18.	C
Q19.	B
Q20.	B

University of Mumbai

Examinations Commencing from 23rd December 2020 to 6th January 2021
Program: **Computer Engineering**
Curriculum Scheme: Rev 2016
Examination: SE   Semester IV
Course Code: CSC401   Course Name: Applied Maths IV

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.	If A = $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ the eigen values of A^3 are
Option A:	1, 27
Option B:	1,9
Option C:	0,2
Option D:	1,3
2.	The value of the integral $\int_c \frac{e^z}{z-5} dz$ where c is the circle $|z| = 1$ is
Option A:	$2\pi i$
Option B:	-2πi
Option C:	0
Option D:	e^5
3.	If f(z) = $\frac{2}{z-3}$, $z = 3$ is a
Option A:	Zero of f(z)
Option B:	Singular point of f (z)
Option C:	Pole of order 2
Option D:	Pole of order 3
4.	In a Maximization type of a Linear programming problem the coefficient of artificial variable in the objective function is
Option A:	−M
Option B:	M
Option C:	0
Option D:	1
5.	The moment generating function of the following distribution is

X	-2	3	1
P(X=x)	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{6}$

Option A:	$\frac{1}{3}e^{-2t} + \frac{1}{2}e^{3t} + \frac{1}{6}e^{t}$
Option B:	$\frac{1}{3}e^{2t} + \frac{1}{2}e^{-3t} + \frac{1}{6}e^{-t}$
Option C:	$\frac{1}{3}e^{t} + \frac{1}{2}e^{2t} + \frac{1}{6}e^{3t}$
Option D:	0
6.	If f(z)= $\frac{1}{z^2} + \frac{1}{z} + \frac{1}{2!} + \frac{z}{3!} + \frac{z^2}{4!} + \cdots$ then z=0 is
Option A:	A pole of order 2
Option B:	A pole of order 1
Option C:	Not a pole
Option D:	A pole of order 0
7.	A square matrix is said to be diagonalisable if it is similar to a
Option A:	Identity matrix
Option B:	Null matrix
Option C:	Upper triangular matrix
Option D:	Diagonal matrix
8.	The Kuhn -Tucker conditions can be used to solve
Option A:	Linear programming problems with inequality constraints
Option B:	Non linear programming problems with inequality constraints
Option C:	Linear programming problems with equality constraints
Option D:	Any Linear programming problem
9.	The probability of getting 4 heads in 6 tosses of a fair coin is
Option A:	$\frac{13}{64}$
Option B:	$\frac{15}{32}$
Option C:	$\frac{15}{64}$
Option D:	$\frac{11}{32}$
10.	If the objective of the Primal is to maximize with constraints of the type $\leq$ then
Option A:	Objective of the Dual is to minimize with constraints of the type $\leq$
Option B:	Objective of the Dual is to maximize with constraints of the type $\geq$

Option C:	Objective of the Dual is to minimize with constraints of the type $\geq$
Option D:	Objective of the Dual is to maximize with constraints of the type $\leq$
11.	If the Eigen values of a 3x3 matrix A are 1,3,5 then
Option A:	Determinant of A = 15
Option B:	Determinant of A = 45
Option C:	Determinant of A = 0
Option D:	Determinant of A $\neq$ 15
12.	Any hypothesis which is tested for the purpose of rejection under the assumption that it is true is called
Option A:	Null hypothesis
Option B:	Alternative hypothesis
Option C:	Composite hypothesis
Option D:	Statistical hypothesis
13.	If the Primal possesses a finite optimal then
Option A:	The dual also possesses a finite optimal solution and $Z_{min} = W_{min}$
Option B:	The dual does not possesses a finite optimal solution
Option C:	The dual also possesses a finite optimal solution and $Z_{max} = W_{min}$
Option D:	The dual also possesses a finite optimal solution and $Z_{max} > W_{min}$
14.	A variable which does not appear in the basic variable column of simplex table is
Option A:	Never equal to zero
Option B:	Always equal to zero
Option C:	Called a basic variable
Option D:	Always a slack variable
15.	In random experiment, observations of random variable are classified as
Option A:	Events
Option B:	Composition
Option C:	Trials
Option D:	Moments
16.	If x has a Poisson distribution such that P(x=k) = P(x=k+1) for some positive integer k then the mean of x is
Option A:	k
Option B:	k-1
Option C:	k+1
Option D:	2k+1
17.	If f(z) is an analytic function in a region R bounded by a simple closed curve C, then
Option A:	$\int_c f(z)dz = 2\pi i$

Option B:	$$\int_c f(z)dz \neq 0$$
Option C:	$\int_c f(z)dz = 2\pi i f(z_0)$
Option D:	$$\int_c f(z)dz = 0$$
18.	If one of the eigen values of a matrix A is zero then
Option A:	$|A| \neq 0$
Option B:	$|A| > 0$
Option C:	$|A| = 0$
Option D:	$|A| < 0$
19.	The eigen vector of A $= \begin{bmatrix} 2 & 2 \\ 1 & 3 \end{bmatrix}$ corresponding to eigen value $\lambda = 1$ is
Option A:	$\begin{bmatrix} 2 \\ 1 \end{bmatrix}$
Option B:	$\begin{bmatrix} 2 \\ -1 \end{bmatrix}$
Option C:	$\begin{bmatrix} 4 \\ 1 \end{bmatrix}$
Option D:	$\begin{bmatrix} 1 \\ -1 \end{bmatrix}$
20.	The optimal solution to the Linear programming problem Maximize Z= $3x_1 + 2x_2$ subject to the constraints $-2x_1 + x_2 \leq 1$ $x_1 \leq 2$ $x_1 + x_2 \leq 3$ and $x_1, x_2 \geq 0$
Option A:	(0,1)
Option B:	(2,1)
Option C:	(2,0)
Option D:	$(^2/_3, {}^7/_3)$

Q2 (20 Marks	Solve any Four out of Six							5 marks each
A	The probability density function of random variable X is							

x	0	1	2	3	4	5	6
P(X=x)	k	3k	5k	7k	9k	11k	13k

Find K and P (X< 4)

B	Evaluate $\int_c \frac{z+6}{z^2-4} dz$ where c is the circle $|z - 2| = 1$

C	Solve the following LPP by Simplex Method. Maximize Z= $x_1 + 4x_2$ subject to the constraints $\qquad 2x_1 + x_2 \le 3$ $\qquad 3x_1 + 5x_2 \le 9$ $\qquad x_1 + 3x_2 \le 5 \qquad$ where $x_1, x_2 \ge 0$
D	Show that A= $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$ is Non derogatory.
E	300 digits were chosen at random from a table of random variables. The frequency of digits were as follows. Digit: 0 1 2 3 4 5 6 7 8 9 TOTAL Frequency : 28 29 33 31 26 35 32 30 31 25 300 Using χ^2 test examine the hypothesis that the digits were distributed in equal numbers in the table.
F	Evaluate $\int_c \frac{sinz}{z-\pi} dz$ where c is the circle $\|z\| = 4$

Q3. (20 Marks)	Solve any Four Questions out of Six $\qquad$ 5 marks each
A	The income of a group of 10,000 persons was found to be normally distributed with mean of Rs. 750 and standard deviation of Rs. 50 . What is the lowest income of richest 250 ?
B	If the Eigen values of A= $\begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$ are 1,2,2 find the eigen vectors corresponding to the eigen value $\lambda = 2$ of A.
C	A factory turns out an article by mass production methods . From the past experience it is found that 20 articles on an average are rejected out of every batch of 100. Find the mean and the variance of the number of rejected articles.
D	Write the following LPP in the standard form : Maximize z=$3x_1 + 2x_2 + 5x_3$ $\qquad$ subject to $\qquad 2x_1 - 3x_2 \le 3$ $\qquad x_1 + 2x_2 + 3x_3 \ge 5$ $\qquad 3x_1 + 2x_3 \le 2 \qquad$ where $x_1, x_2, x_3 \ge 0$
E	Verify the Cayley Hamilton theorem for the matrix A= $\begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$
F	Determine the poles of the function f(z) = $\frac{3z+1}{z(z-2)}$ and calculate the residues at the poles.