K. J. Somaiya Institute of Engineering and Information Technology
Sion, Mumbai - 400022
NAAC Accredited Institute with 'A' Grade
NBA Accredited 3 Programs (Computer Engineering, Electronics & Telecommunication Engineering and Electronics Engineering) Permanently Affiliated to University of Mumbai

EXAMINATION TIME TABLE (JUNE 2021)

PROGRAMME - S.E. (Computer) (REV. -2016) (Choice Based)

SEMESTER - IV

Days and Dates	Time	Paper Code	Paper
Tuesday, June 1, 2021	11:30 a.m. to 1:30 p.m.	CSC401	APPLIED MATHEMATICS - IV
Thursday, June 3, 2021	11:30 a.m. to 1:30 p.m.	CSC402	ANALYSIS OF ALGORITHMS
Saturday, June 5, 2021	11:30 a.m. to 1:30 p.m.	CSC403	COMPUTER ORGANIZATION AND ARCHIECTURE
Tuesday, June 8, 2021	11:30 a.m. to 1:30 p.m.	CSC404	COMPUTER GRAPHICS
Thursday, June 10, 2021	11:30 a.m. to 1:30 p.m.	CSC405	OPERATING SYSTEM

Important Note: ● Change if any, in the time table shall be communicated on the college web site.

Mumbai
12th May, 2021

Principal

University of Mumbai

Examination 2021 under cluster __ (Lead College: _____)

Examinations Commencing from 1st June 2021 to 10th June 2021

Program: BE (COMPUTER ENGINEERING)

Curriculum Scheme: 2016

Examination: SE Semester IV

Course Code: CSC401 and Course Name: Applied Mathematics IV

Time: 2hour 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 random variable X has following probability distribution, then find the moment generating function **x** 0 1 2 3 4 **P (X= x)** 1/5 1/5 1/5 1/5 1/5
Option A:	$\frac{1}{8}[1-e^{t}+e^{2t}-e^{3t}+e^{4t}]$
Option B:	$\frac{1}{16}[1+e^{t}+e^{4t}+e^{9t}+e^{16t}]$
Option C:	$\frac{1}{16}[1-e^{t}+e^{2t}-e^{3t}+e^{4t}]$
Option D:	$\frac{1}{5}[1+e^{t}+e^{2t}+e^{3t}+e^{4t}]$
2.	Evaluate $\int_c z^3 dz, where\ c\ is\ the\ upper\ half\ of\ a\ circle\ \|z\|=1$
Option A:	0
Option B:	$2/3$
Option C:	$-2/3$
Option D:	$2/3i$
3.	*Three factories A, B and C produces 30%, 50% and 20% of the total production of an item. Out of their production 80% , 50% and 10% are defective respectively. An item is chosen randomly and found to be defective. Find the probability that it was produced by the factory A?*
Option A:	0.47
Option B:	0.57
Option C:	0.67
Option D:	0.77
4.	The average marks scored by 33 boys is 73 with standard deviation 9 while that of 37 girls is 71 with standard deviation 7 find the value of calculated standard normal variate 'z'
Option A:	2
Option B:	2.32
Option C:	1.03
Option D:	1.72

5.	The dual of the following LPP is $Max\ z = 5x_1 + 2x_2$ Subject to : $3x_1 + 2x_2 \leq 17,$ $2x_1 + 2x_2 \leq 7$ $x_1 + 2x_2 \leq 19$
Option A:	$Min\ z = 17y_1 + 7y_2 + 19y_2$ Subject to : $3y_1 + 2y_2 + y_3 \leq 5,$ $2y_1 + 2y_2 + 2y_3 \leq 19$ $y_1, y_2, y_3 \geq 0$
Option B:	$Min\ z = 17y_1 + 7y_2 + 19y_2$ Subject to : $3y_1 + 2y_2 + y_3 \geq 5,$ $2y_1 + 2y_2 + 2y_3 \leq 19$ $y_1, y_2, y_3 \geq 0$
Option C:	$Min\ z = 5y_1 + 2y_2 + 19y_2$ Subject to : $3y_1 + 2y_2 + y_3 \geq 17,$ $2y_1 + 2y_2 + 2y_3 \geq 7$ $y_1, y_2, y_3 \geq 0$
Option D:	$Min\ z = 17y_1 + 7y_2 + 19y_2$ Subject to : $3y_1 + 2y_2 + y_3 \geq 5,$ $2y_1 + 2y_2 + 2y_3 \geq 2$ $y_1, y_2, y_3 \geq 0$
6.	If $A = \begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$, *then the minimal polynomial of a matrix A is*
Option A:	$x^2 - 5x + 36$
Option B:	$x^2 - 4$
Option C:	$x^2 - 15x + 36$
Option D:	$x^3 - 7x^2 + 16x - 12$
7.	Suppose we know that births in a hospital occur randomly at an average rate of 1.8 births per hour. What is the probability that we observe 5 births in a given 2-hour interval
Option A:	0.3681
Option B:	0.1377
Option C:	0.031
Option D:	0.0253
8.	Evaluate $\int_C \frac{e^{2\pi z}}{z+i} dz$, *where c is a circle* $\lvert z + i \rvert = 1$
Option A:	$-2\pi i/e$
Option B:	$2\pi i$
Option C:	$-2\pi i e^3$
Option D:	$-2\pi i e^{-3}$
9.	The optimal solution of the LPP, $Max.Z = 2x_1 + 5x_2$ subject to $x_1 + 3x_2 \leq 3$ $3x_1 + 2x_2 \leq 6,\ x_1, x_2 \geq 0$ is
Option A:	$x_1 = 0, x_2 = -2\ , Z = -10$
Option B:	$x_1 = 2, x_2 = 0\ , Z = -4$
Option C:	$x_1 = 2, x_2 = 0\ , Z = 4$

Option D:	$x_1 = 2, x_2 = 0, Z = 2$
10.	If $A = \begin{bmatrix} -2 & 0 \\ 0 & -3 \end{bmatrix}$, *the the matrix* e^A *is*
Option A:	$\begin{bmatrix} 3^{-A} & 0 \\ 0 & 2^{-A} \end{bmatrix}$
Option B:	$\begin{bmatrix} 2^A & 0 \\ 0 & 3^A \end{bmatrix}$
Option C:	$\begin{bmatrix} e^{-2} & 0 \\ 0 & e^{-3} \end{bmatrix}$
Option D:	$\begin{bmatrix} e^3 & 0 \\ 0 & e^2 \end{bmatrix}$
11.	In a LPP the constants $c_1, c_2, \ldots . c_n$ in the objective function of the primal appear in ---------- of the dual
Option A:	Objective function
Option B:	RHS of constraints
Option C:	Coefficients of the variables in constraints
Option D:	Slack variables
12.	If a continuous random variable X has a probability density function $f(x) = \frac{x}{2}, 0 < x < 2,$ then find the probability that x is greater than 1
Option A:	1/3
Option B:	1/2
Option C:	1/4
Option D:	3/4
13.	If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$, *then the matrix* $A^2 - 2A - 3I$ is
Option A:	a Null matrix
Option B:	The matrix A itself
Option C:	$\begin{bmatrix} -2 & -1 \\ 0 & -1 \end{bmatrix}$
Option D:	$\begin{bmatrix} -2 & -2 \\ -1 & -1 \end{bmatrix}$
14.	The Eigen values of the Matrix $A = \begin{bmatrix} 2 & 1 & -2 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ are
Option A:	1, 1, 9
Option B:	0, 1, -1
Option C:	1, 9, 2
Option D:	1, 2, -1
15.	The number of the accidents in a city during a week is given as follows. Find the χ^2 calculated value and test the hypothesis that accidents are distributed evenly over the week. [*given* $\chi^2 = 12.59$ *at* 6 *degrees of freedom and* 5% *LOS*]

Day	1	2	3	4	5	6	7
No. of accidents	10	11	9	8	12	9	11

Option A:	$\chi^2 = 2.2, Hypothesis\ rejected$
Option B:	$\chi^2 = 1.2, Hypothesis\ rejected$
Option C:	$\chi^2 = 1.2, Hypothesis\ accepted$
Option D:	$\chi^2 = 2.2, Hypothesis\ accepted$
16.	The oil paint is marketed in the tin of 12 kgs. If sample of 40 tins showed the mean weight as 11.8kg with standard deviation 2 kgs. Find the calculated absolute value of test statistic z .
Option A:	0.8975
Option B:	0.6325
Option C:	0.8124
Option D:	0.7895
17.	The residue of $f(z) = \frac{e^{2z}}{z^3}\ \ at\ its\ pole$
Option A:	4
Option B:	2
Option C:	0
Option D:	-2/3
18.	If $f(z) = \frac{1}{z-2} - \frac{1}{z-1}, then\ the\ Taylor's\ series of\ f(z) in$ $the\ region\ of\ convergence\ \|z\| < 1\ is$
Option A:	$-\frac{1}{2}\left[1 - \frac{z}{2} + \frac{z^2}{4} - \frac{z^3}{8} + \cdots\right] + [1 + z + z^2 + z^3 + \cdots]$
Option B:	$-\frac{1}{2}\left[1 + \frac{z}{2} + \frac{z^2}{4} + \frac{z^3}{8} + \cdots\right] + [1 - z + z^2 - z^3 + \cdots]$
Option C:	$-\frac{1}{z}\left[1 + \frac{z}{2!} + \frac{z^2}{4!} + \frac{z^3}{8!} + \cdots\right] + [1 + z + z^2 + z^3 + \cdots]$
Option D:	$-\frac{1}{2}\left[1 + \frac{z}{2} + \frac{z^2}{4} + \frac{z^3}{8} + \cdots\right] + [1 + z + z^2 + z^3 + \cdots]$
19.	For Diagonalizable matrix $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 4 & 5 \\ 0 & 4 & 3 \end{bmatrix}$,
Option A:	Algebraic Multiplicity ≠ Geometric Multiplicity
Option B:	Algebraic Multiplicity = Geometric Multiplicity = 1
Option C:	Algebraic Multiplicity = 2, Geometric Multiplicity = 1
Option D:	Algebraic Multiplicity = Geometric Multiplicity = 2
20.	The value of the $\int_{-\infty}^{\infty} \frac{1}{x^2+4} dx\ using\ contour\ integration$ is
Option A:	$\frac{\pi}{2}$
Option B:	π
Option C:	$\frac{1}{2i}$
Option D:	$2\pi i$

Q2	**Solve any Four out of Six** **5 marks each**
A	*Evaluate* $\int_c \frac{e^{2z}}{(z-1)^3} dz, \quad c: \lvert z+i \rvert = 2$ *using Cauchy'sResidue theorem*
B	*Find the Eigen values and Eigen vectors of* $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$
C	*Find the probability that at most 2 defective fuses will be found in a box of 200 fuses. If experience shows that 2% of such fuses are defective?*
D	A Principal at certain school claims that the students in his school are above average intelligence. A random sample of 30 students IQ scores have a mean score of 112.5. Is there sufficient evidence to support the principal's claim? The mean population IQ is 100 with standard deviation of 15.
E	The manufacturer of a certain make of LED bulb claims that his bulbs have a mean life of 20 months. A random sample of 7 such bulbs gave the following values. Life of bulbs in months: 19, 21, 25, 16, 17, 14, 21. Can you regard the producer's claim to be valid at 1% level of significance?
F	Solve the LPP by simplex method, $Max\ Z = 4x_1 + 10x_2$ $Sub.to.\ 2x_1 + x_2 \leq 50$ $2x_1 + 5x_2 \leq 100$ $2x_1 + 3x_2 \leq 90, \qquad x_1, x_2 \geq 0$

Q3	**Solve any Four out of Six** **5 marks each**
A	*Obtain Taylor's and Laurent's expansions of* $f(z) = \frac{z-1}{z^2-2z-3}$ *about* $z = 2$ *in the region of convergence* $\lvert z-2 \rvert < 1$
B	*If* $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$, *Obtain the minimal polynomial and Eigen values of* $3A^{-1}$
C	*If the probability that an individual suffers a bad reaction from particular infection is 0.001, determine the probability that out of 2000 individuals i) exactly three ii) more than two individuals will suffer a bad reaction.*
D	In the Normal distribution exactly 30% of items are below 45 and 8% of the items are above 64. Find the mean and variance of normal distribution.
E	The following table gives the data of boys and their fathers. Do these figures support hypothesis that educated fathers have intelligent boys?

	Intelligent sons	Unintelligent sons	Total
Educated Fathers	50	45	95
Uneducated fathers	45	90	135
Total	95	135	230

F	Optimize $x_1^2 + x_2^2 + x_3^2 - 6x_1 - 8x_2 - 10x_3$

University of Mumbai

Examination 2021 under cluster __ (Lead College: _____)

Examinations Commencing from 1st June 2021 to 10th June 2021

Program: BE (COMPUTER ENGINEERING)

Curriculum Scheme: 2016

Examination: SE Semester IV

Course Code: CSC401 and Course Name: Applied Mathematics IV

Time: 2hour Max. Marks: 80

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

University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester IV

Course Code: CSC402 and Course Name: Analysis of Algorithm

Time: 2 hour Max. Marks: 80

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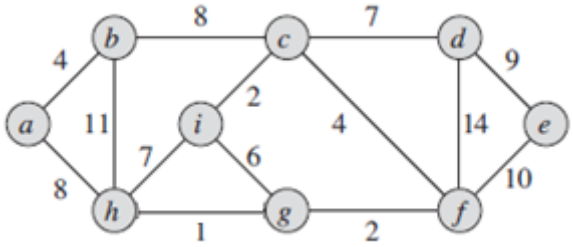
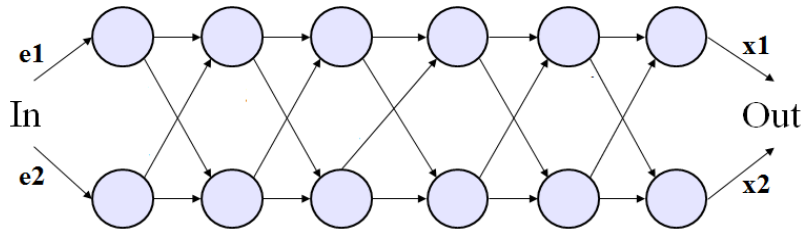
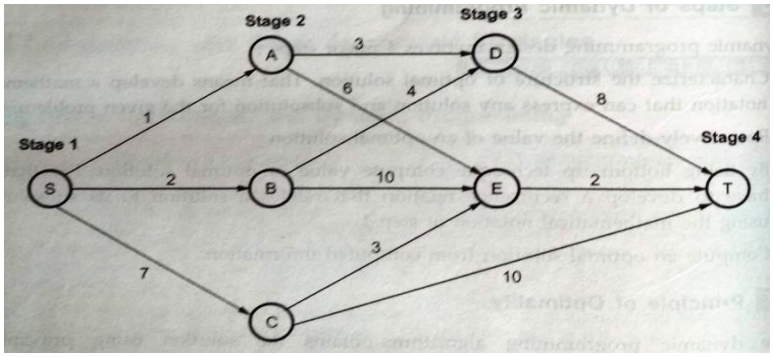
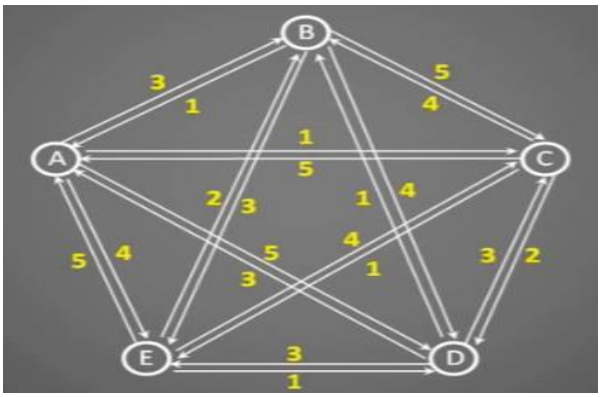
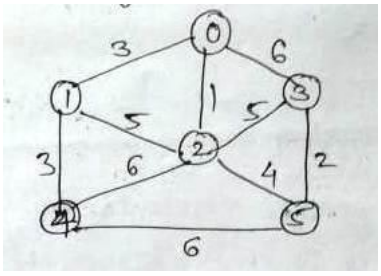
Q1.	**Choose the correct option for following questions.** **All the Questions are compulsory and carry equal marks**
1.	For f(n) = $2n^2 + 5$ and g(n)= 7n what is the value of n where f(n) $\in$ Ω(g(n))
Option A:	1
Option B:	2
Option C:	3
Option D:	4
2.	For given elements 70, 30, 20, 50, 60, 10, 40, if sort them using selection sort then what will be the output after iteration (pass) 3
Option A:	70, 30, 20, 50, 10, 60, 40
Option B:	70, 30, 20, 50, 60, 10, 40
Option C:	10, 20, 30, 50, 60, 70, 40
Option D:	10, 30, 20, 50, 60, 70, 40
3.	In the problem of finding minimum and maximum using straightforward algorithm, it take ___ run time
Option A:	$O(n^2)$
Option B:	Ω (n)
Option C:	O(n)
Option D:	θ(n)
4.	What is time complexity for following list using Quick sort algorithm If pivot is the last element. 7 6 10 12 8 3 1
Option A:	O(n)
Option B:	O(log n)
Option C:	O(nlogn)
Option D:	$O(n^2)$
5.	What is the time complexity if binary search algorithm used for finding element from a set of n elements.
Option A:	O(n)
Option B:	O(nlogn)

Option C:	O(log n)
Option D:	$O(n^2)$
6.	In fractional Knapsack Problem, suppose n = 3, profit = (25, 24, 15),Weight (in kg) = (18, 15, 10) and capacity = 20, then optimal solution having total profit is____
Option A:	28.2
Option B:	31
Option C:	31.5
Option D:	32.2
7.	What is the cost of following graph using Kruskal's algorithm 
Option A:	37
Option B:	38
Option C:	36
Option D:	39
8.	For a problem, it is strategy that builds a sequence of choices for getting the optimal solution.
Option A:	Backtracking and Branch-and-bound
Option B:	Divide and Conquer
Option C:	Greedy technique
Option D:	Dynamic Programming
9.	In assembly line scheduling problem to go in stations at stage 5 what are the probable ways 
Option A:	16
Option B:	25
Option C:	32
Option D:	5
10.	In multistage graphs with source S and sink T, which vertex is backward vertex

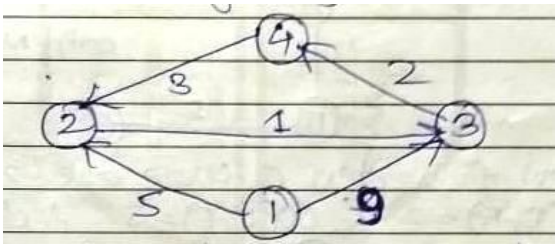
	while finding the distance from each vertex A, B, C to vertex T. 
Option A:	B
Option B:	C
Option C:	D
Option D:	E
11.	In following graph for the TSP, if the intermediate set S= ϕ , then using dynamic programming the Cost (B, ϕ, E) is _____ 
Option A:	2
Option B:	3
Option C:	7
Option D:	9
12.	Identify spurious hit in the given text string for pattern of length- 5 window Pattern: 3 1 4 1 5 Modulus: 10 Text: 1 2 5 9 7 8 6 3 1 4 1 5 7 9 4 3 2 1 5 8 3 1 4 1 5 6 8
Option A:	8-21
Option B:	13-17
Option C:	3-7
Option D:	7-20
13.	Apply naive string matching algorithm to find the shift count where pattern matches with the Text= abcdabcdyabcdadbadf and pattern= abcdad
Option A:	8
Option B:	9

Option C:	10
Option D:	11
14.	In 15 puzzle problem a node currently being expanded is called _____
Option A:	Live node
Option B:	E node
Option C:	Dead node
Option D:	Root node
15.	Which of the following statement about 0/1 knapsack and fractional knapsack problem is correct?
Option A:	In 0/1 knapsack problem items are divisible and in fractional knapsack items are indivisible
Option B:	0/1 knapsack and fractional knapsack both are the same
Option C:	0/1 knapsack is solved using a greedy algorithm and fractional knapsack is solved using dynamic programming
Option D:	In 0/1 knapsack problem items are indivisible and in fractional knapsack items are divisible
16.	Backtracking algorithm is implemented by constructing a tree of choices called as?
Option A:	State-space tree
Option B:	State-chart tree
Option C:	Backtracking tree
Option D:	Node tree
17.	Of the following given options, which one of the following is a correct option that provides an optimal solution for 4-queens problem?
Option A:	(4,3,2,1)
Option B:	(2,3,1,4)
Option C:	(3,1,4,2)
Option D:	(4,2,3,1)
18.	_____ is the class of decision problems that can be solved by non-deterministic polynomial algorithms?
Option A:	P
Option B:	NP
Option C:	Complete
Option D:	Hard
19.	To which of the following class does a CNF-satisfiability problem belong?
Option A:	NP class
Option B:	P class
Option C:	NP hard

Option D:	NP complete
20.	What is vertex coloring of a graph?
Option A:	A condition where all vertices should have same color
Option B:	A condition where any two vertices having a common edge should always have same color
Option C:	A condition where any two vertices having a common edge should not have same color
Option D:	A condition where all vertices should have a different color

Q2	**Solve any Four out of Six** **5 marks each**
A	Define O, Ω, θ notations and find complexity of following recurrence relations i) $T(n) = 4T(n/2) + n^2$ ii) $T(n) = 2T(n/2) + n^3$
B	Find all possible subsets of weight that sum to m, let n=6,m=30 and w[1:6]={5,10,12,13,15,18} and draw portion of state space tree.
C	Find the MST and its cost using Prim and Kruskal algorithm 
D	Describe terms P, NP, NP complete and NP hard. Explain the NP completeness and reducibility
E	Sort following list using Quick sort and show the output in passes. 2 8 7 1 3 5 6 4
F	Describe the String matching with finite automata with suitable example.

Q3.	
A	**Solve any Two** **5 marks each**
i.	Find an optimal solution to the knapsack instance n=7, W=15, Profit – (10,5,15,7,6,18,3), Weight – (2,3,5,7,1,4,1)
ii.	Describe 8 queen problem using backtracking method and write minimum 2 different ways of keeping the 8 queen where no two queens can attack other.
iii.	Using Rabin karp string matching algorithm, find the all position where the string

	matches with given pattern. Text= “569821987632198” Pattern = “2198” and q =10
B	**Solve any One** **10 marks**
i.	Apply all pair shortest path Floyd-Warshall algorithm to following graph and find the all pair shortest path and draw the final graph. 
ii.	Determine the LCS of X = <101000111010> and Y = <01001001010>

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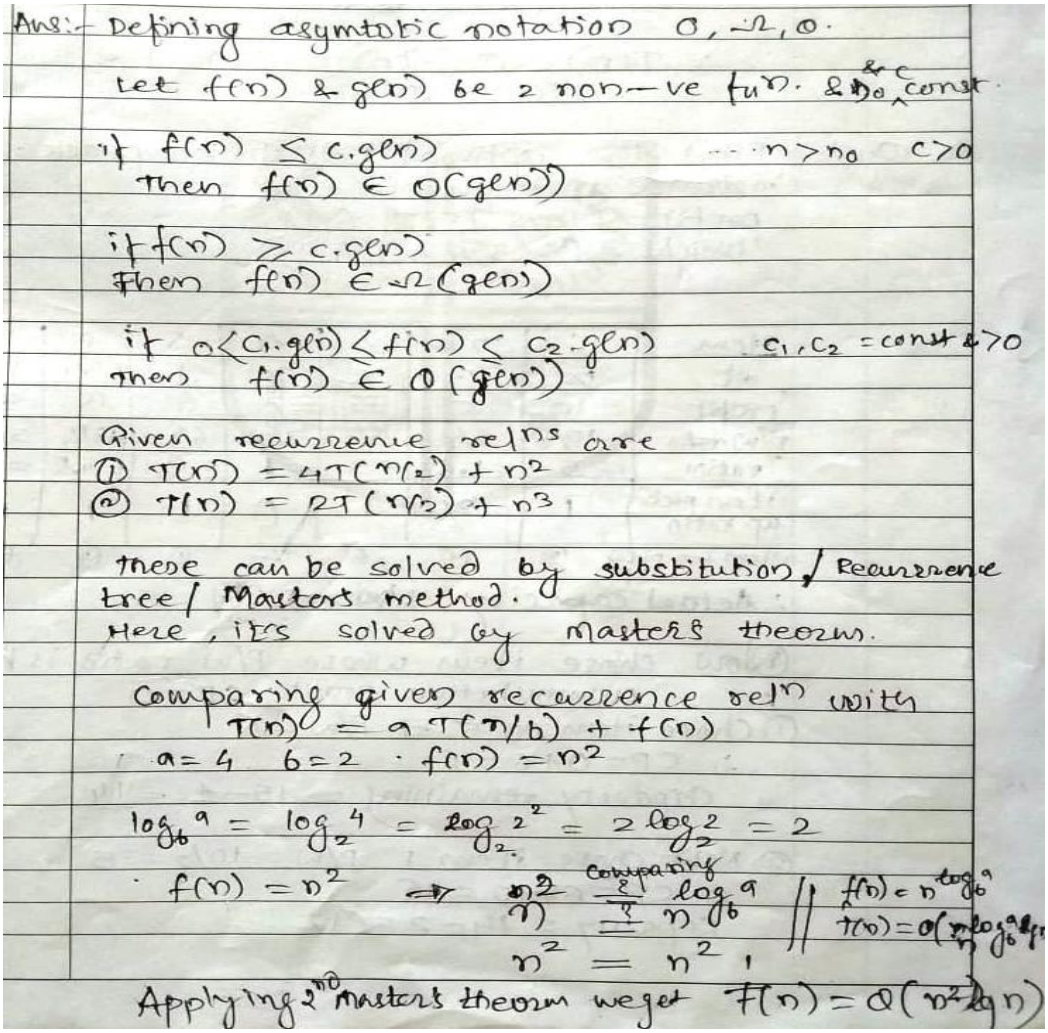
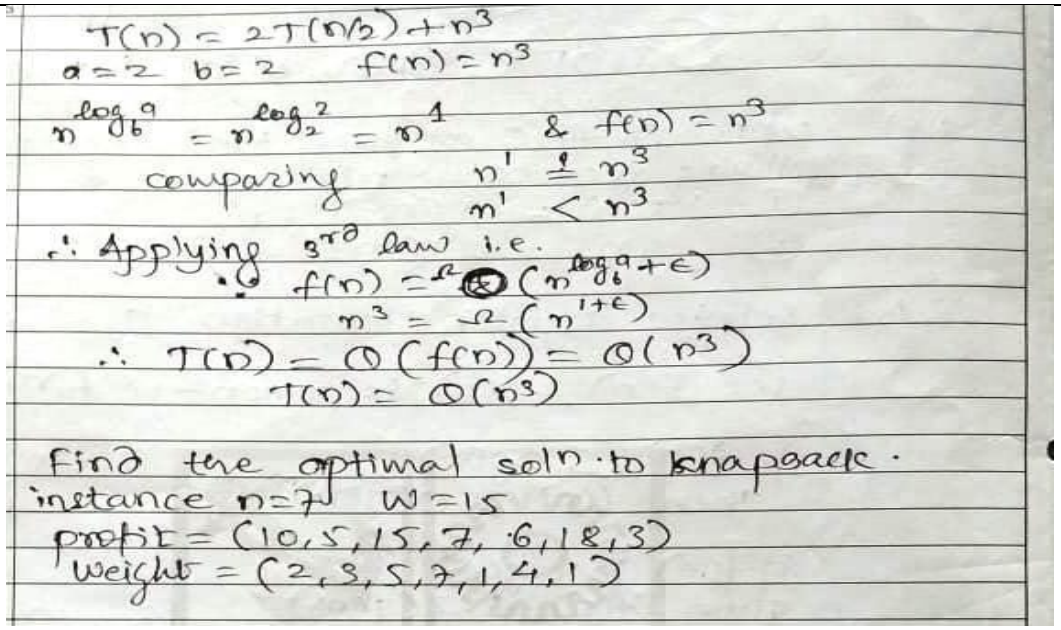
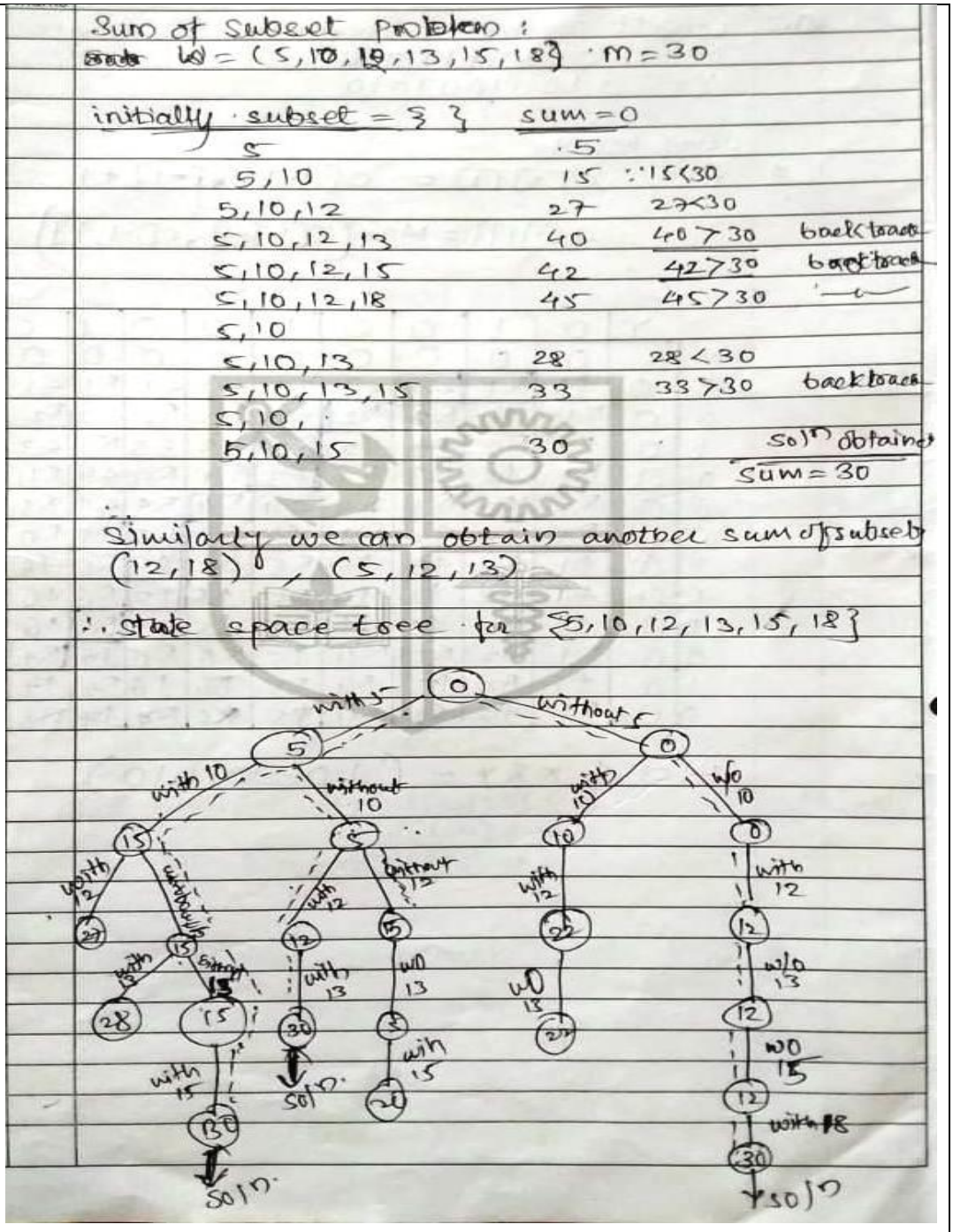
Q1 Question	**Correct Option** (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	C
Q2.	C
Q3.	D
Q4	D
Q5	B
Q6	C
Q7	A
Q8.	C
Q9.	C
Q10.	D
Q11.	B
Q12.	D
Q13.	B
Q14.	B
Q15.	D

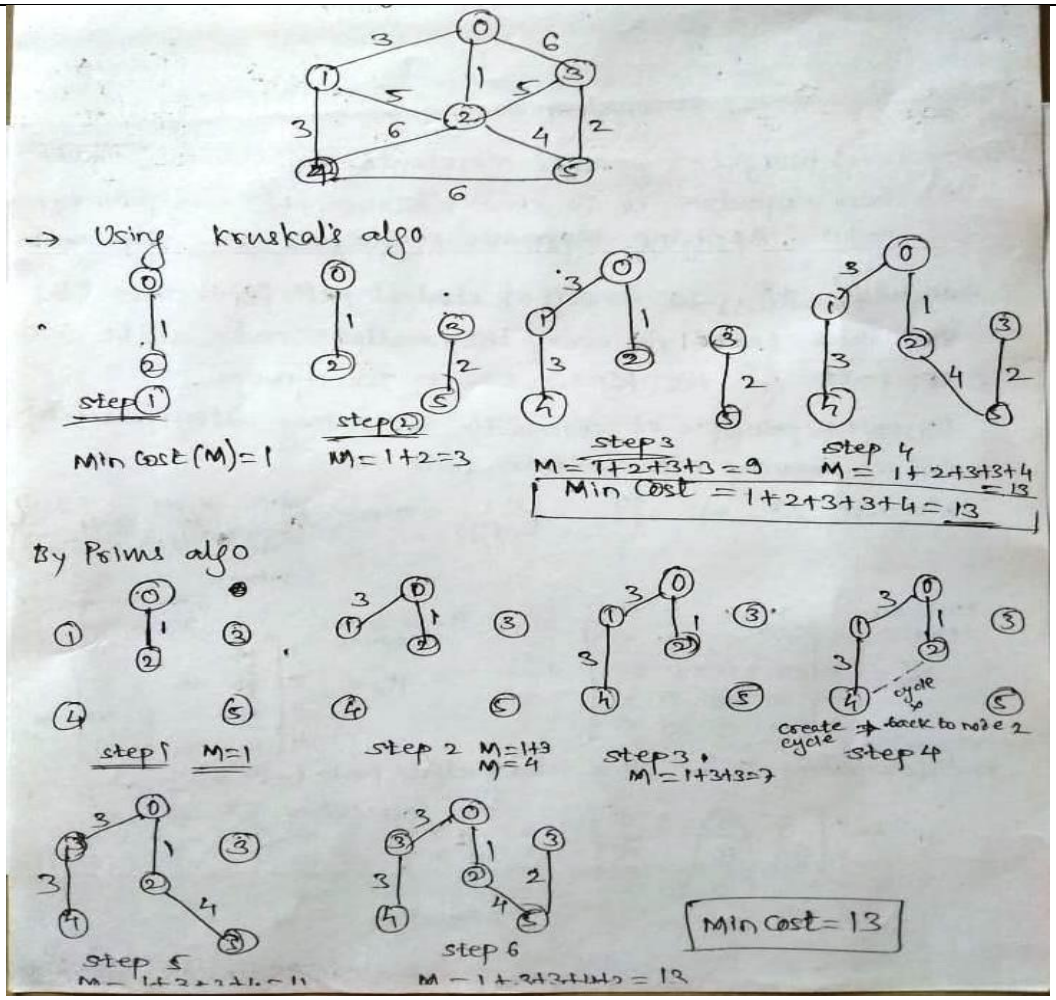
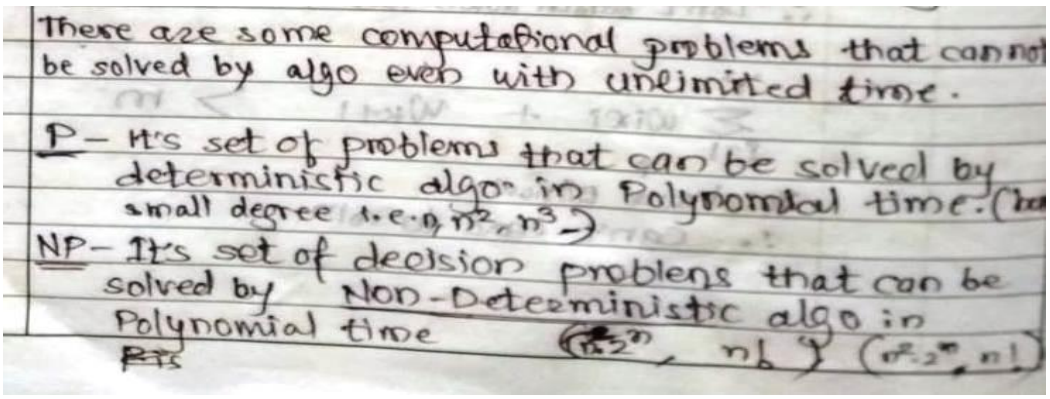
Q16.	A
Q17.	C
Q18.	B
Q19.	D
Q20.	C

Q2	**Solve any Four out of Six** **5 marks each**
A	Define O, Ω, θ notations and find complexity of following recurrence relations $T(n) = 4T(n/2) + n^2$ ii) $T(n) = 2T(n/2) + n^3$



	
B	Find all possible subsets of weight that sum to m, let n=6,m=30 and w[1:6]={5,10,12,13,15,18} and draw portion of state space tree.

	
C	Find the MST and its cost using Prim and Kruskal algorithm

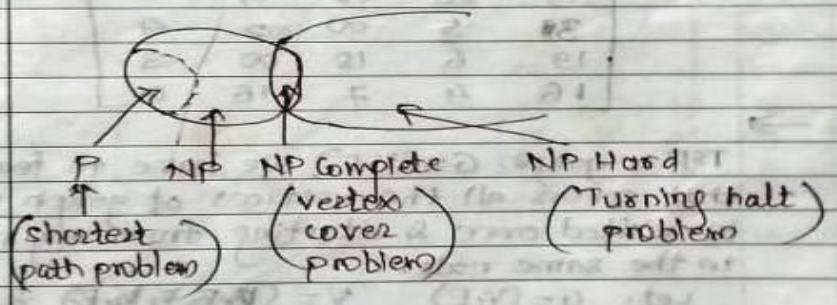
	
D	Describe terms P, NP, NP complete and NP hard. Explain the NP completeness and reducibility 

P is subset of NP i.e. any problem which is solved by Deterministic algo in polynomial time can be solved by non-deterministic algo in polynomial time.

NP-complete: problems are the hardest problems in NP set. A decision problem L is NP complete if

1) L is in NP (any given soln for NP-complete problems can be verified quickly, but there is no efficient known solution)
2) Every problem in NP is reducible to L in polynomial time (Reduction is defined below)

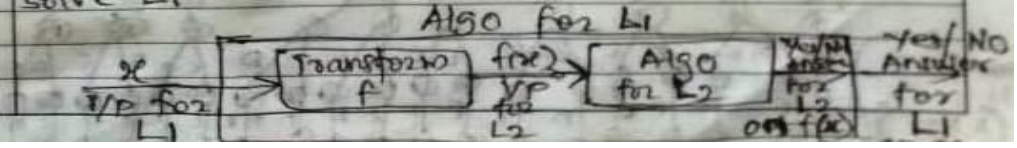
NP Hard – A problem is NP hard if it follows pro property 2 from above, doesn't need to follow property 1. Therefore, NP-complete set is also subset of NP-Hard set.

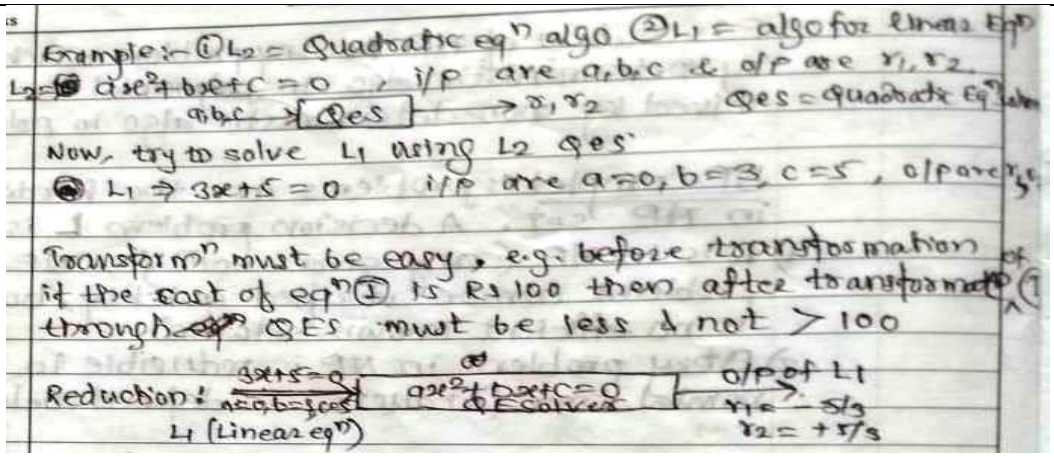
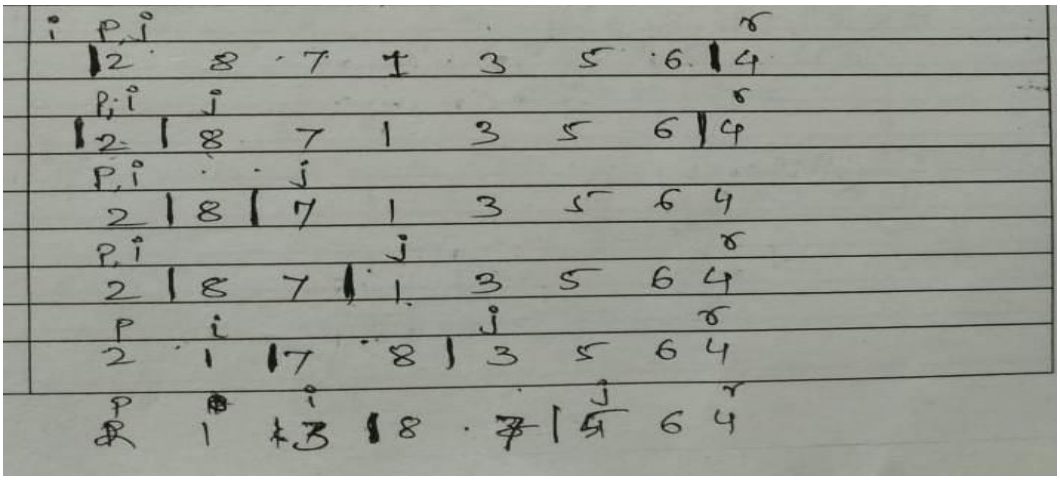
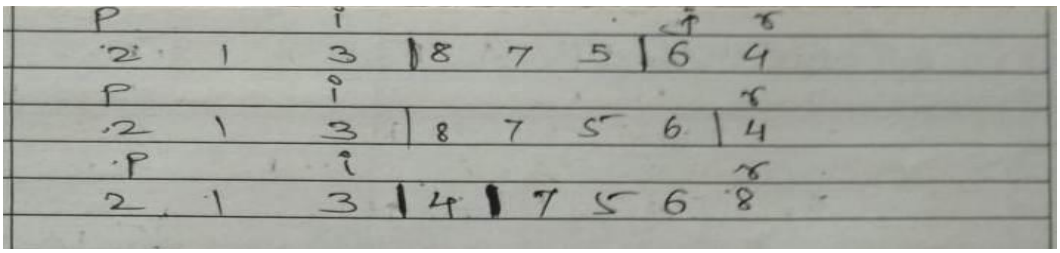


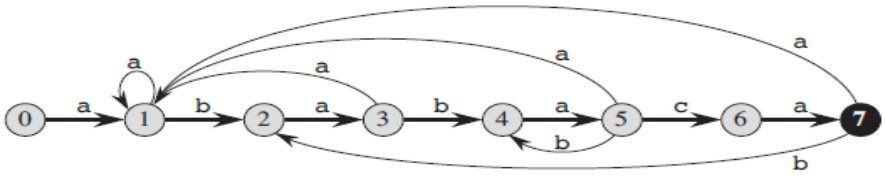
Reduction / Reducibility :->

Let L_1 & L_2 be two decision problems. Suppose algo A_2 solves L_2. That is, if y is i/p for L_2 then A_2 will o/p Yes/No, depending upon whether y belongs to L_2 or not.

The idea is to find a Transformation from L_1 to L_2 so that algo A_2 can be part of algo A_1 to solve L_1



	
E	Sort following list using Quick sort and show the output in passes. 2 8 7 1 3 5 6 4  
F	Describe the String matching with finite automata with suitable example. A ***finite automaton*** M, illustrated in Figure 32.6, is a 5-tuple. $(Q, q_0, A, \Sigma, \delta)$ Example: - string-matching automaton that accepts all strings ending in the string ababaca.



(a)

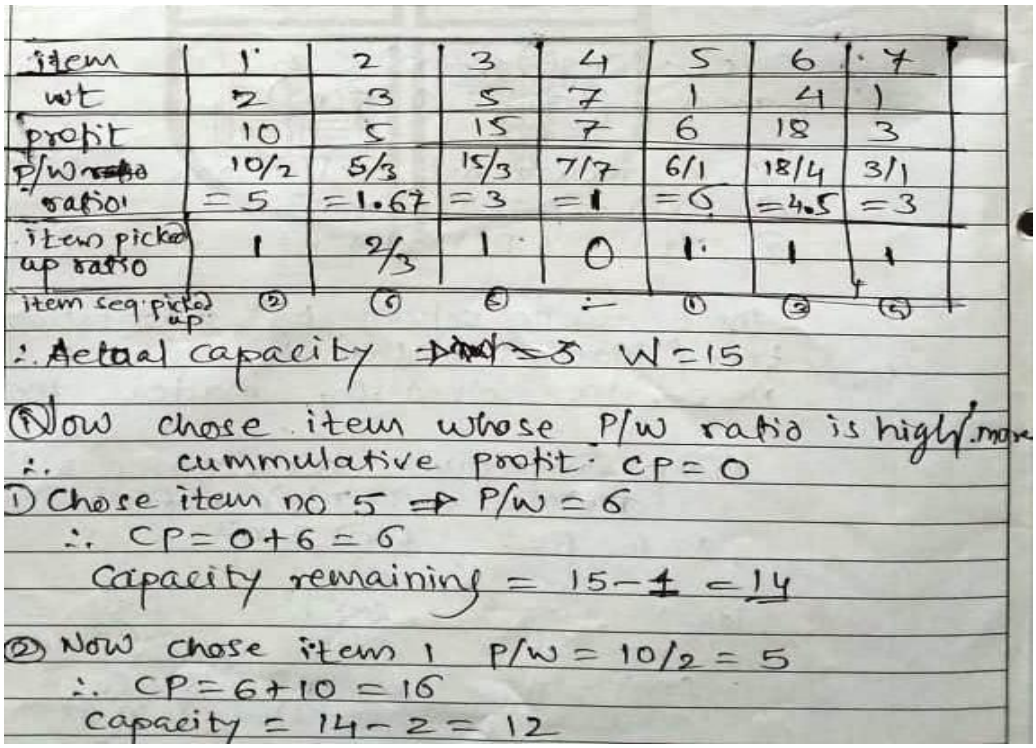
state	input a	b	c	P
0	1	0	0	a
1	1	2	0	b
2	3	0	0	a
3	1	4	0	b
4	5	0	0	a
5	1	4	6	c
6	7	0	0	a
7	1	2	0	

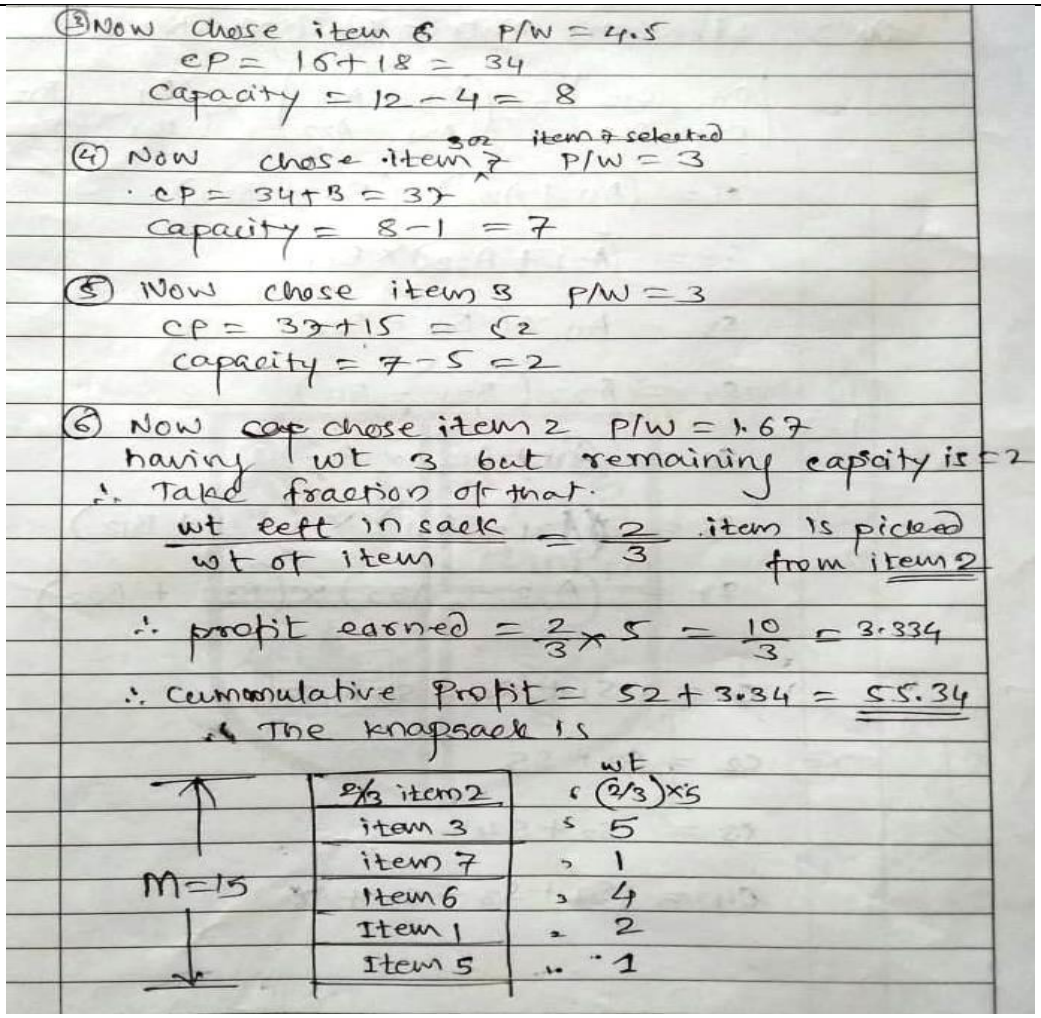
(b)

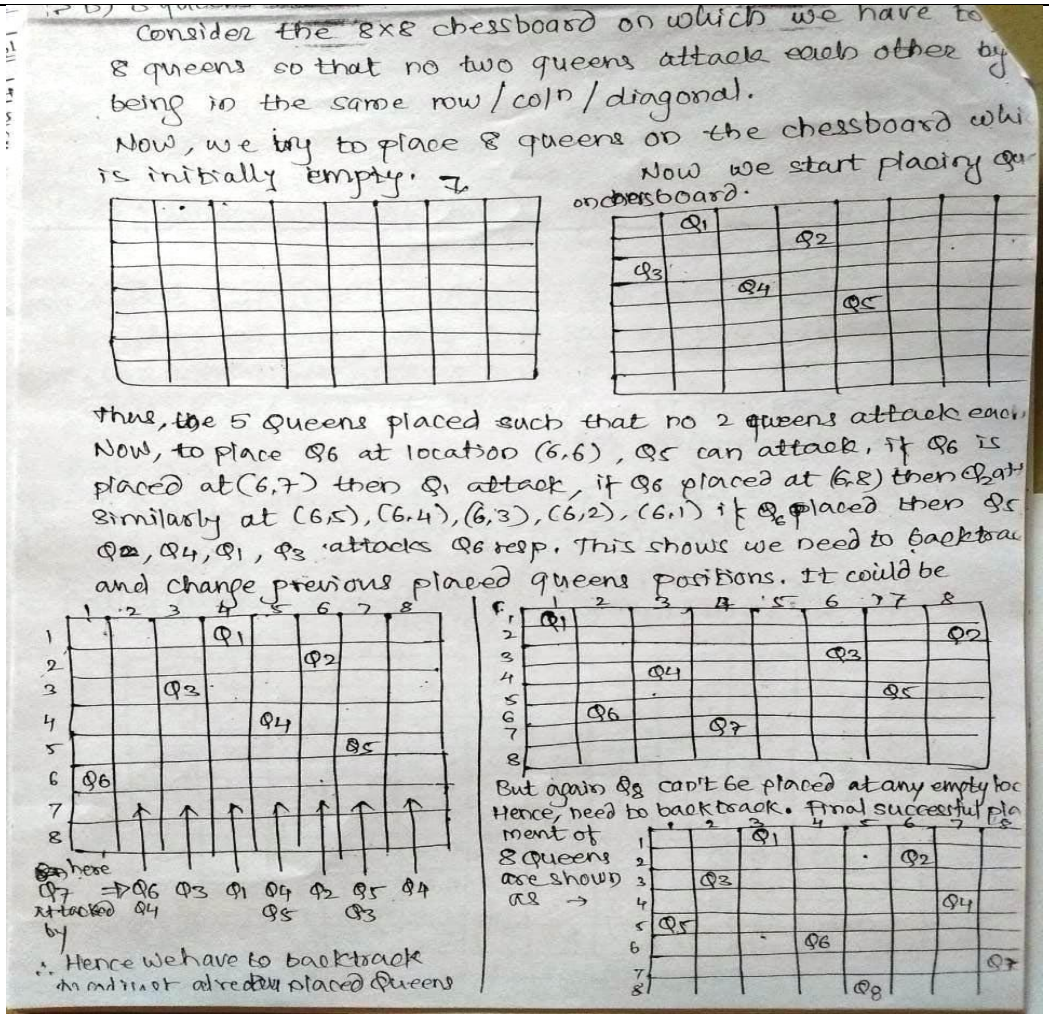
i	—	1	2	3	4	5	6	7	8	9	10	11
$T[i]$	—	a	b	a	b	a	b	a	c	a	b	a
state $\phi(T_i)$	0	1	2	3	4	5	4	5	6	**7**	2	3

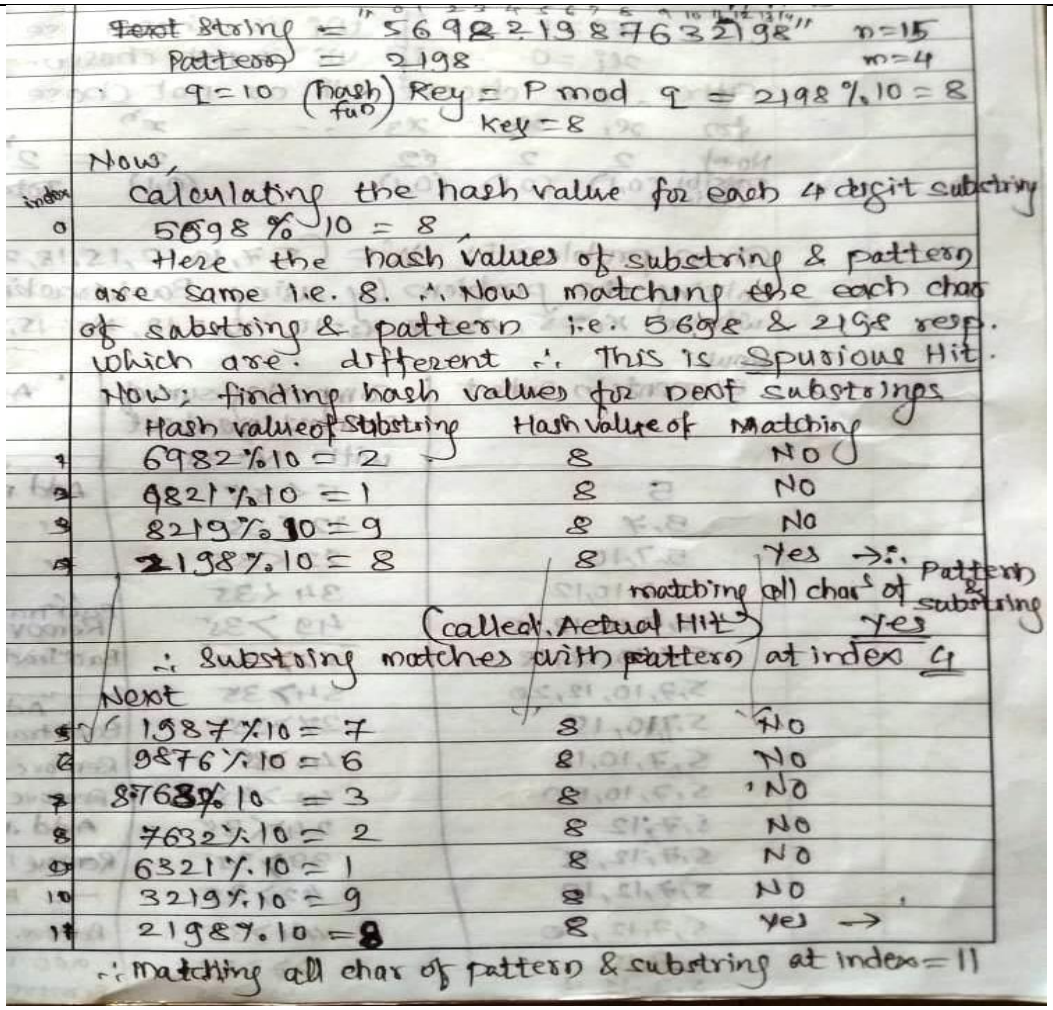
(c)

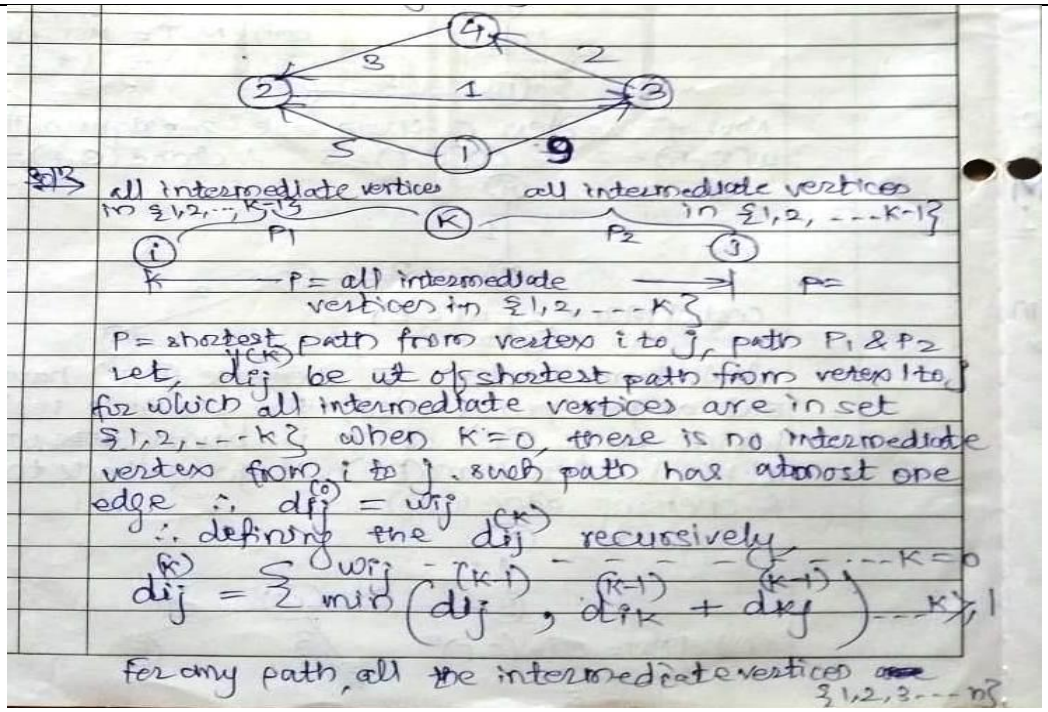
Q3.	
A	**Solve any Two** **5 marks each**
i.	Find all possible subsets of weight that sum to m, let n=6,m=30 and w[1:6]={5,10,12,13,15,18} and draw portion of state space tree.

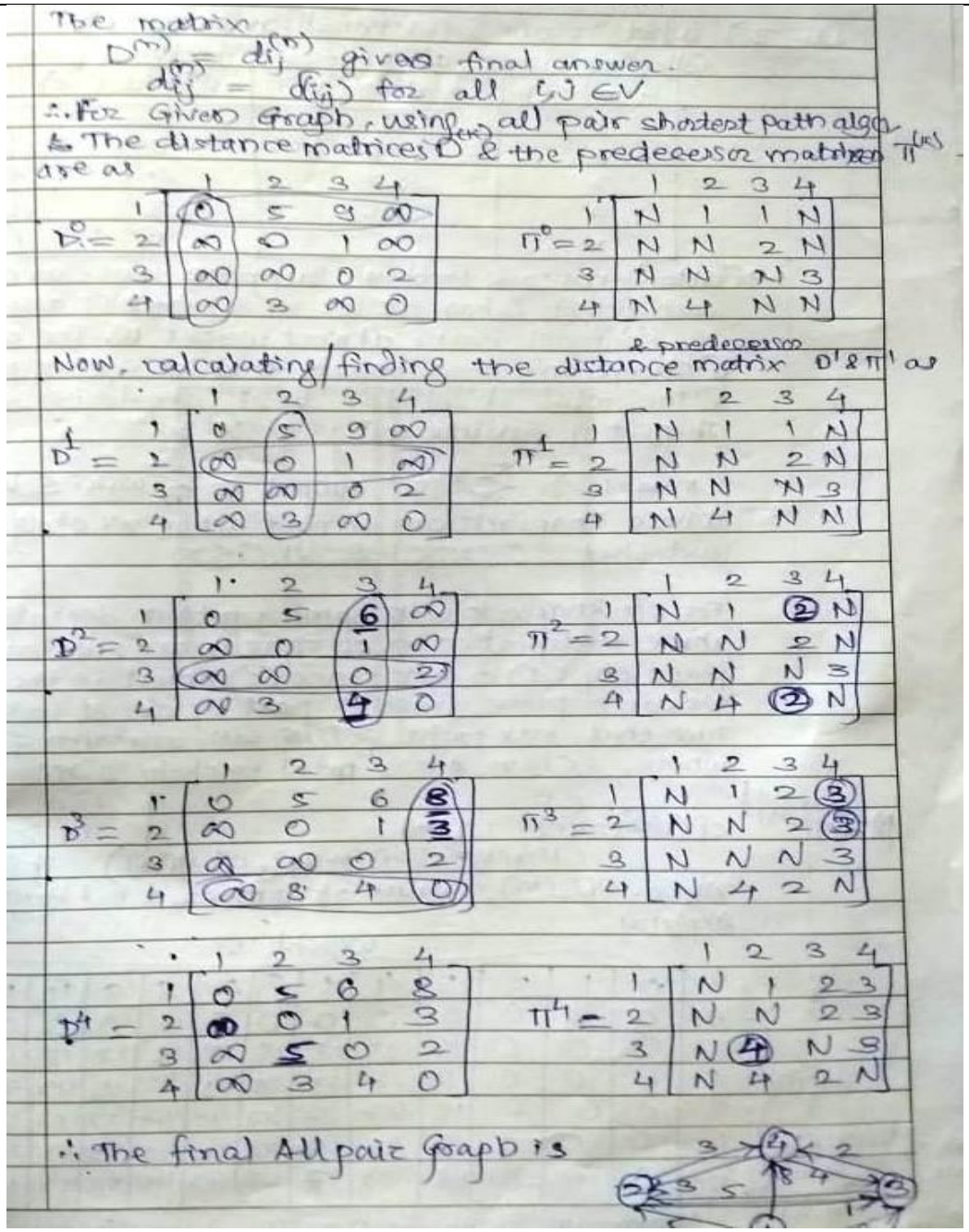


	 ③ Now chose item 6 P/W = 4.5 CP = 16+18 = 34 Capacity = 12 − 4 = 8 ④ Now chose item 7 (3 or item 7 selected) P/W = 3 CP = 34+3 = 37 Capacity = 8 − 1 = 7 ⑤ Now chose item 3 P/W = 3 CP = 37+15 = 52 capacity = 7 − 5 = 2 ⑥ Now ~~cap~~ chose item 2 P/W = 1.67 having wt 3 but remaining capacity is 2 ∴ Take fraction of that. wt left in sack / wt of item = 2/3 item is picked from item 2 ∴ profit earned = 2/3 × 5 = 10/3 = 3.334 ∴ Cummulative Profit = 52 + 3.34 = 55.34 ∴ The knapsack is M=15 2/3 item 2 wt (2/3)×5 item 3 " 5 item 7 " 1 item 6 " 4 Item 1 " 2 Item 5 " 1
ii.	Describe 8 queen problem using backtracking method and write minimum 2 different ways of keeping the 8 queen where no two queens can attack other.

	
iii.	Using Rabin karp string matching algorithm, find the all position where the string matches with given pattern. Text= “569821987632198” Pattern = “2198” and q =10

	
B	**Solve any One** **10 marks**
i.	Apply all pair shortest path Floyd-Warshall algorithm to following graph and find the all pair shortest path and draw the final graph.


4
8
2
2
1
3
5
1
9
all intermediate vertices in {1,2,...,K-1}
K
all intermediate vertices in {1,2,...,K-1}
i
P1
P2
j
P = all intermediate vertices in {1,2,...,K}
P = shortest path from vertex i to j, path P1 & P2
Let, $d_{ij}^{(K)}$ be wt of shortest path from vertex i to j for which all intermediate vertices are in set {1,2,...K} when K=0, there is no intermediate vertex from i to j, such path has atmost one edge ∴ $d_{ij}^{(0)} = w_{ij}$
∴ defining the $d_{ij}^{(K)}$ recursively
$d_{ij}^{(K)} = \begin{cases} w_{ij} & K=0 \\ \min\left(d_{ij}^{(K-1)}, d_{iK}^{(K-1)} + d_{Kj}^{(K-1)}\right) & K \geq 1 \end{cases}$
For any path, all the intermediate vertices are {1,2,3...n}.

	
ii.	Determine the LCS of X = <101000111010> and Y = <01001001010>

Longest common subsequence for strings

X = 1 0 1 0 0 0 1 1 0 1 0

Y = 0 1 0 0 1 0 0 1 0 1 0

Using formula.

$$c[i][j] = c[i-1, j-1] + 1 \quad \text{... } x[i] = y[j]$$

$$c[i][j] = \max(c[i, j-1], c[i-1, j]) \quad \text{... otherwise}$$

		Y	0	1	0	0	1	0	0	1	0	1	0
	X		0	0	0	0	0	0	0	0	0	0	0
1		0	↑0	↖1	←1	←1	↖1	←1	←1	↖1	←1	↖1	←1
0		0	↖1	↑1	↖2	↑2	←2	↖2	↖2	←2	↖2	←2	↖2
1		0	↑1	↖2	↑2	↑2	↖3	←3	←3	↖3	←3	↖3	↖3
0		0	↖1	↑2	↖3	↖3	↑3	↖4	↖4	←4	↖4	←4	↖4
0		0	↖1	↑2	↖3	↖4	←4	↖4	↖5	←5	↖5	←5	↖5
0		0	↖1	↑2	↖3	↖4	↑4	↖5	↖5	↑5	↖6	←6	↖6
1		0	↑1	↖2	↑3	↑4	↖5	↑5	↑5	↖6	↑6	↖7	←7
1		0	↑1	↖2	↑3	↑4	↖5	↑5	↑5	↖6	↑6	↖7	↑7
1		0	↑1	↖2	↑3	↑4	↖5	↑5	↑5	↖6	↑6	↖7	↑7
0		0	↖1	↑2	↖3	↖4	↑5	↖6	↖6	↑6	↖7	↑7	↖8
1		0	↑1	↖2	↑3	↑4	↖5	↑6	↑6	↖7	↑7	↖8	↑8
0		0	↖1	↑2	↖3	↖4	↖5	↖6	↖7	↑7	↖8	↑8	↖9

LCS of X & Y = (1 0 1 0 0 1 0 1 0)

University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: SE Semester IV

Course Code: CSC403 and Course Name: Computer Organization and Architecture

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	In restoring division algorithm, after performing operations left shift operation on A,Q and A=A-M, if MSB of A = 1 then
Option A:	Q0= 1
Option B:	Q0=0, A=A+M
Option C:	A=A+M
Option D:	A= A+Q
2.	Exponent overflow is defined as
Option A:	a negative exponent exceeds the minimum possible exponent value
Option B:	a negative exponent exceeds the maximum possible exponent value
Option C:	a positive exponent exceeds the maximum possible exponent value
Option D:	a positive exponent exceeds the minimum possible exponent value
3.	Two's complement representation of +18 and -18 using 16 bits are
Option A:	0000000000011010, 1111111111101010
Option B:	0000000000010011, 1111111111111110
Option C:	0000000000010110, 1111111111101111
Option D:	0000000000010010, 1111111111101110
4.	Arithmetic and logic unit does not consist of
Option A:	Status flag
Option B:	Complementer

<table>
<tr><td>Option C:</td><td>Shifter</td></tr>
<tr><td>Option D:</td><td>Control Unit</td></tr>
<tr><td></td><td></td></tr>
<tr><td>5.</td><td>To minimize main memory references, the machine or assembly language programmer optimize the use of</td></tr>
<tr><td>Option A:</td><td>Control registers</td></tr>
<tr><td>Option B:</td><td>User visible registers</td></tr>
<tr><td>Option C:</td><td>Status registers</td></tr>
<tr><td>Option D:</td><td>Instruction register</td></tr>
<tr><td></td><td></td></tr>
<tr><td>6.</td><td>Identify the correct matching
<table>
<tr><th>Addressing Modes</th><th>Description</th></tr>
<tr><td>1. Direct</td><td>a. The address field refers to the address of a word in register, which in turn contains a full-length address of the operand.</td></tr>
<tr><td>2. Immediate</td><td>b. The address field refers to the address of a word in memory, which in turn contains a full-length address of the operand.</td></tr>
<tr><td>3. Indirect</td><td>c. Used to define and use constants or set initial values of variables.</td></tr>
<tr><td>4. Register Indirect</td><td>d. the address field contains the effective address of the operand</td></tr>
</table></td></tr>
<tr><td>Option A:</td><td>1-d, 2-c, 3-b, 4-a</td></tr>
<tr><td>Option B:</td><td>1-a, 2-b, 3-c, 4-d</td></tr>
<tr><td>Option C:</td><td>1-b, 2-d, 3-a, 4-c</td></tr>
<tr><td>Option D:</td><td>1-c, 2-a, 3-d, 4-b</td></tr>
<tr><td></td><td></td></tr>
<tr><td>7.</td><td>_____ contains a word to be stored in memory or sent to the I/O unit, or is used to receive a word from memory or from the I/O unit.</td></tr>
<tr><td>Option A:</td><td>Instruction Register</td></tr>
<tr><td>Option B:</td><td>Memory Address Register</td></tr>
<tr><td>Option C:</td><td>Memory Buffer Register</td></tr>
<tr><td>Option D:</td><td>Instruction Buffer Register</td></tr>
</table>

8.	When an instruction is to be fetched following micro-operations may be performed
Option A:	t1: MAR <- (IR(Address)), t2: MBR <- Memory, t3: IR(Address) <- (MBR(Address))
Option B:	t1: MAR <- (PC), t2: MBR <- Memory, PC <- (PC) + 1, t3: IR <- (MBR)
Option C:	t1: MBR <- (PC), t2: MAR <- Save-address, PC <- Routine- address, t3: Memory <- (MBR)
Option D:	t1: MBR <- (PC), t2: MAR <- Save-address, PC <- Routine- address, t3: Memory <- (MAR)
9.	A microprogrammed control unit design method
Option A:	contain complex logic for sequencing through the many micro-operations of the instruction cycle.
Option B:	is used to implement a control unit that simplifies its design
Option C:	is faster than a hardwired unit
Option D:	is useful when small programs are to be executed
10.	The set of microinstructions is stored in
Option A:	main memory
Option B:	cache memory
Option C:	interleaved memory
Option D:	control memory
11.	Possible approaches to cache coherency does not include
Option A:	Non-cacheable memory
Option B:	Hardware transparency
Option C:	Bus watching with write through
Option D:	Associative memory
12.	In Interleaved memory, the upper order bits of the address is used to
Option A:	get block address

Option B:	get the data
Option C:	select a word within a memory bank
Option D:	select the given memory bank.
13.	Which of the following statements is correct in regards of memory
Option A:	The memory that is farthest away from processor is the costliest
Option B:	The memory that is smallest is the farthest.
Option C:	The smallest and fastest memory are always closer to the processor
Option D:	As we move away from the processor, the speed increases
14.	Which of the following type of memory is used for cache memory?
Option A:	DRAM
Option B:	SRAM
Option C:	SDRAM
Option D:	EPROM
15.	_____ mapping permits each main memory block to be loaded into any line of the cache
Option A:	Associative Mapping
Option B:	Direct Mapping
Option C:	Set Associative Mapping
Option D:	Data Mapping
16.	Interrupt is a signal
Option A:	which has highest priority from hardware or software which processor should process its signal immediately
Option B:	which has lowest priority from hardware or software which processor should process its signal later
Option C:	which has highest priority from hardware or software which processor should process its signal later
Option D:	which has lowest priority from hardware or software which processor should process its signal immediately.

17.	Which I/O data transfer technique has direct I/O to memory transfer?
Option A:	I/O module
Option B:	Programmed I/O
Option C:	Interrupt driven I/O
Option D:	DMA
18.	In Flynn's taxonomy, vector and array processors are classified as
Option A:	MIMD
Option B:	SISD
Option C:	SIMD
Option D:	MISD
19.	A hazard that occurs if the write operations take place in the reverse order of the intended sequence is
Option A:	RAR
Option B:	WAW
Option C:	RAW
Option D:	WAR
20.	In out-of-order processor, the instructions are executed
Option A:	original order of the instructions in the program
Option B:	different sub-steps of sequential instructions simultaneously
Option C:	one after the other as per program sequence
Option D:	in an order of availability of operands

Q2 **(20 Marks)**	
A	**Solve any Two** **5 marks each**
i.	Write a note on Performance measures for computer system

ii.	Explain State table and delay element methods for Hardwired Control Unit Design.
iii.	Explain DMA with diagram
B	**Solve any One** **10 marks each**
i.	Explain Booth's Algorithm with flowchart. Hence solve -7 * -3
ii.	Explain the concept of paging with allocation of free frames

Q3 **(20 Marks)**	
A	**Solve any Two** **5 marks each**
i.	Explain IEEE 754 floating point number representation. Hence represent 186.42 in single precision format
ii.	Explain Cache Coherency with Write Policies
iii.	Explain Flynn's Classification with examples and diagrams
B	**Solve any One** **10 marks each**
i.	Explain 6 stages instruction pipelining with effect of conditional branch
ii.	Explain Multi-core processor architecture with diagram

University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: SE Semester IV

Course Code: CSC403 and Course Name: Computer Organization and Architecture

Time: 2 hour Max. Marks: 80

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

Q2 A

i. Different performance measures of computer system 5 Marks

ii. Explanation of State table method with diagram 2.5 Marks

Explanation of Delay element method with diagram 2.5 Marks

iii. DMA diagram 1 Mark

DMA flowchart 1 Mark

Explanation of DMA 3 Marks

Q2 B

i. Booth's Algorithm 2 Marks

Booth's Flowchart 2 Marks

Numerical 6 Marks

ii. Concept of paging with allocation of free frames along with diagram 10 Marks

Q3 A

i. IEEE 754 floating point number representation for single precision and double precision with the formats 2 Marks

Representing 186.42 in single precision format 3 Marks

ii. Concept of Cache Coherency 2 Marks

Write Policies 3 Marks

iii. Flynn's Classification with examples and diagrams 5 marks

Q3 B

i. Explanation of 6 stages instruction pipelining with diagram 6 Marks

effect of conditional branch 4 Marks

ii. Explanation of Multi-core processor architecture with diagram 10 Mraks

University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: Computer Engineering

Curriculum Scheme: Rev2016

Examination: SE Semester IV

Course Code: CSC404 and Course Name: Computer Graphics

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The anti-aliasing procedure that increases the number of intensity levels for each pixel to the total number of sub-pixels is called _____.
Option A:	Pixel shaping
Option B:	Area-sampling
Option C:	Pixel Phasing
Option D:	Super-sampling
2.	Random (vector) scan display uses _____ to store the picture/image information and they are mainly used for applications like _____.
Option A:	Bitmap file, Color drawing application
Option B:	Data file, pixel drawing application
Option C:	Frame buffer, image drawing application
Option D:	Display file, line drawing application
3.	Reflection of a point about x-axis ,followed by a counter-clockwise rotation of 90˚ is equivalent to reflection about the line _____.
Option A:	X = - Y
Option B:	Y = - X
Option C:	X = Y
Option D:	X+Y=1

4.	By applying properties of _____ computations are reduced in Scan Line Polygon Fill Algorithm.
Option A:	Relativity
Option B:	Coherence
Option C:	Reference
Option D:	Symmetry
5.	A picture is stored in the computer's memory in _____.
Option A:	PDCS
Option B:	WCS
Option C:	NDC
Option D:	WDS
6.	Which curve can be controlled locally?
Option A:	B-Spline
Option B:	Bezier curve
Option C:	Helmite curve
Option D:	Bezier Surface
7.	The projection in which the projection plane is allowed to intersect the x, y and z-axes at equal distances.
Option A:	Wire frame model
Option B:	Constructive solid geometry methods
Option C:	Isometric projection
Option D:	Back face removal
8.	The process of representing continuous graphics object as a collection of discrete pixels is called:
Option A:	Rasterization
Option B:	Scan conversion
Option C:	Rendering

Option D:	Discretization
9.	Shear transformations can be expressed in terms of _____.
Option A:	Rotation only
Option B:	Reflection only
Option C:	Scaling only
Option D:	Product of scaling and rotation
10.	If we rasterize a line segment AB with A(-3,3) and B(4,-4) using DDA line algorithm, which are the points that will lie on the line segment?
Option A:	(-3,3), (-3,2), (-2,1), (1,0), (1,-1), (2,-2), (3,-3), (4,-4)
Option B:	(-3,3), (-2,2), (-1,1), (1,1), (1,-1), (2,-2), (3,-3), (4,-4)
Option C:	(-3,3), (-2,2), (-1,1), (0,0), (1,-1), (2,-2), (3,-3), (4,-4)
Option D:	(-3,3), (-2,2), (-1,1), (1,0), (1,-1), (2,-2), (3,-3), (4,-4)
11.	The scale factor of view-port transformation for x co-ordinate is _____.
Option A:	Sx = (xvmax – xvmin)/ (xwmax – xwmin)
Option B:	Sx = (xvmax – xvmin)/ (xwmax + xwmin)
Option C:	Sx = (xvmin – xvmax)/ (xwmax – xwmin)
Option D:	Sx = (xvmax + xvmin)/ (xwmax – xwmin)
12.	_____ are the three dimensional analogs of quad trees.
Option A:	Quadric
Option B:	Octrees
Option C:	Geometry
Option D:	Wireframe models

13.	Painter's algorithm is also called as:
Option A:	Wornock algorithm
Option B:	Area subdivision algorithm
Option C:	Z-buffer algorithm
Option D:	Depth-sort algorithm
14.	Given a circle with radius of 6-units centered at (10,15), the following are the points that will lie on the 1/8th part of the circle:
Option A:	(10,21), (11,21), (12,21), (13,20), (14,19)
Option B:	(0,6), (1,6), (2,6), (3,5), (4,4)
Option C:	(0,6), (1,6), (2,5), (3,5), (4,4)
Option D:	(10,21), (11,21), (12,20), (13,20), (14,19)
15.	Back face detection is:
Option A:	Object space method
Option B:	Image space method
Option C:	Coordinate space method
Option D:	Geometry space method
16.	A triangle ABC with coordinates A(4,3), B(1,1) and C(7,1) is translated by 3-units in x-direction and 2-units in y-direction, followed by anticlockwise rotation of the triangle by 90 degrees. The resulted triangle is further scaled to double in x-direction without any scaling in y-direction. What will be the resultant position of the triangle?
Option A:	A'(-10,7), B'(-6,4), C'(-6,-10)
Option B:	A'(-10,7), B'(-6,-4), C'(-6,10)
Option C:	A'(-10,-7), B'(-6,4), C'(-6,10)
Option D:	A'(-10,7), B'(-6,4), C'(-6,10)
17.	The phenomenon of apparent increase in the number of available intensities by considering combine intensity of multiple pixels is known as _____.
Option A:	Dithering

Option B:	Half toning
Option C:	Printing
Option D:	Scanning
18.	_____ is used to calculate the intensity of light that is reflected at a given point on surface.
Option A:	Illumination model
Option B:	Rendering model
Option C:	Diffusion model
Option D:	Warn model
19.	In Liang-Barsky line clipping algorithm, if pk=0 and qk>=0, then
Option A:	line is parallel to any one clipping boundary and is completely inside the clipping boundary.
Option B:	line is parallel to any one clipping boundary and is completely outside the clipping boundary.
Option C:	The line is an entering line (outside to inside).
Option D:	The line is exiting line (inside to outside).
20.	Construct the Bezier curve of order-3 with the polygon vertices A(0,0), B(1,2), C(3,2), and D(2,0). Generate at least 5 points on the curve. (Consider t=0.15,0.35,0.5,0.65,0.85)
Option A:	(0.50,0.76), (1.24,1.36), (1.75,1.5), (2.12,1.36), (2.14,0.76)
Option B:	(0.60,0.76), (1.4,1.36), (1.75,1.5), (2.12,1.36), (2.14,0.76)
Option C:	(0.50,0.76), (1.24,1.36), (2.75,1.5), (2.12,2.36), (2.14,0.76)
Option D:	(0.50,0.96), (1.24,1.36), (1.75,1.5), (2.12,1.36), (2.14,0.76)

Q2.	
A	**Solve any Two** **5 marks each**
i.	If an ellipse with x-radius of 4-units and y-radius of 3-units is rasterized using mid-point ellipse algorithm, find the points that lie on the ellipse in the first quadrant.

ii.	Explain Depth buffer algorithm.
iii.	Write a short note on sweep representations.
B	**Solve any One** **10 marks each**
i.	Triangle PQR has vertices as P(4,3), Q(6,5) and R(5,7). It is Desired to reflect through an arbitrary line L whose equation is y = x + 3. Calculate the new vertices of triangle.
ii.	Explain any one polygon clipping algorithm in detail.

Q3.	
A	**Solve any Two** **5 marks each**
i.	Given a circle with radius of 6-units centered at (10,15), Find the points that will lie on the 1/8th part of the circle.
ii.	Write a short note on fractals.
iii.	Explain any one shading techniques in detail.
B	**Solve any One** **10 marks each**
i.	Find the clipping co-ordinates to clip the line segment AB against the window using any one line clipping algorithm A(5,12), B(70,50) and the window co-ordinates are lower left corner of the window is (10,10) and upper right corner is (60,60).
ii.	Explain 3D clipping in detail.

University of Mumbai
Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Computer Engineering**

Curriculum Scheme: **Rev2016**

Examination: **SE Semester IV**

Course Code: **CSC404** and Course Name: **Computer Graphics**

Time: 2 hour Max. Marks: 80

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

Answer Key for Subjective Questions:

Q.2 A)

i) Ans: (0,3), (1,3), (2,3), (3,2), (4,1), (4,0) --- 5Mks

ii) Explanation of Depth buffer algorithm --- 2 Mks

Algorithm -- 2 Mks

Adv & Dis adv -- 1 Mks

iii) Sweep representations:-

Translational sweep ---- 2.5 Mks

Rotational sweep ---- 2.5 Mks

Q.2 B)

i) Ans: Ans: P'(0,7), Q'(2,9), R'(4,8)

ii)Sutherland Hodgeman / Weiler Artherton Polygon clipping

Explanation of algo and steps of algo -- 5 Mks

Example of algo working --- 5 Mks

Q.3 A)

i) Ans: (10,21), (11,21), (12,21), (13,20), (14,19) --- 5 Mks (1 Mks for each point)

ii) Explanation of fractal and their uses/ application : 2 Mks

Examples of fractal : Koch curve / Hilbert's Curve ---- 3 Mks

iii) Explanation of Gouraud / Phong shading with proper diagram-----3Mks

Merits --- 1Mks
Demerits --- 1Mks

Q.3 B)

i) Ans: A'(10,15.33) and B'(60,48.66)

ii) Explanation of 3D clipping : defining region codes for all regions, clipping process, algorithm steps ----- 5 Mks

Algorithm steps with suitable examples--- 3 Mks

Merits and Demerits --- 2 Mks

University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: Computer Engineering

Curriculum Scheme: Rev2016

Examination: BE Semester IV

Course Code: CSC405 and Course Name: Operating System

Time: 2 hour Max. Marks: 80

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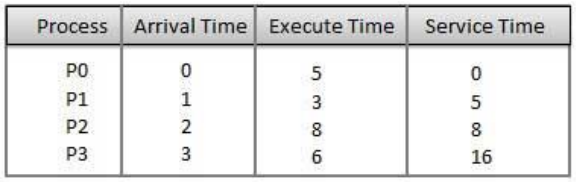
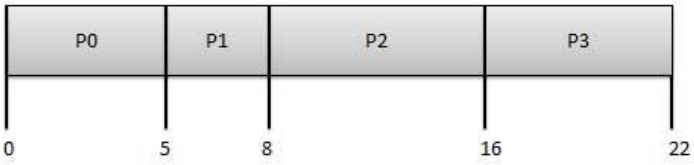
Q1.	A program is called as
Option A:	Active
Option B:	Passive
Option C:	Running
Option D:	Dead
Q2.	Which of following is not the function of the Kernel?
Option A:	Process Management
Option B:	Memory Management
Option C:	Device Management
Option D:	Program Compilation
Q3.	A Binary semaphore is restricted to values of
Option A:	0 or 1
Option B:	1 or 2
Option C:	-1 or +1
Option D:	0 or -1
Q4.	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
Q5.	

	  Consider above processes to be executed on first come, first serve basis. It is a non-preemptive. What the waiting time of P2?
Option A:	6
Option B:	8
Option C:	16
Option D:	0
Q6.	If the time quantum is made very large for a Round Robin (RR) scheduler, then which one of the following assertions would be true?
Option A:	The scheduling algorithm degenerates to the First Come First Served (FCFS) algorithm
Option B:	More context switches occur.
Option C:	The average turnaround time decreases
Option D:	The scheduling algorithm degenerates to the Shortest Job Next (SJN) algorithm
Q7.	The Primary distinction between Short term scheduler and Long-term scheduler is
Option A:	The Length of their queues
Option B:	The type of process they schedule
Option C:	The frequency of their execution
Option D:	The device for which the schedule the process
Q8.	Determine the number of page faults when references to pages occur in the following order: 1, 2, 4, 5, 2, 1, 2, 4. Assume that the main memory can accommodate 3 pages and the main memory already has the pages 1 and 2, with page 1 having been brought earlier than page 2. (LRU algorithm is used)
Option A:	3
Option B:	5
Option C:	4
Option D:	1
Q9.	Disk requests are received by a disk drive for cylinders 5, 25,18,3,39,8 and 35 in this order. A seek takes 7ms per cylinder moved. How much seek time is needed to server these requests for a Shortest Seek First (SSF) Algorithm? Assume that arm cylinder is at 20 when the last of these requests are made with one of the request yet served
Option A:	125ms
Option B:	413ms

Option C:	368ms
Option D:	750ms
Q10.	A counting semaphore was initialized to 13. Then 10 P (wait) operations and 4V (signal) operations were completed on this semaphore. The resulting value of the semaphore is
Option A:	10
Option B:	8
Option C:	7
Option D:	16
Q11.	In Dinning Philosopher Problem, deadlock can occur
Option A:	If all philosophers pick their left chopstick simultaneously and wait for the other chopstick to be available
Option B:	If all philosophers pick up both the sticks
Option C:	If no philosopher picks up sticks
Option D:	If only two philosophers pick up two sticks
Q12.	Three processes having burst time of 3, 10 and 7 time units each arrive simultaneously at time 0. Using non-preemptive SJF scheduling, their total waiting time is
Option A:	4
Option B:	3
Option C:	20
Option D:	10
Q13.	Consider a disk where blocks 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 17, 18, 25, 26 and 27 are free and the rest of the blocks are allocated. Then the free space bitmap would be
Option A:	1000011000000111001111110001111…1
Option B:	1100001100000011100111111000111111…
Option C:	0111100111111000110000001110000…
Option D:	1111100111111000110000001110000…
Q14.	Which of following two atomic operations semaphore uses for process synchronization.
Option A:	Wait , Signal
Option B:	add, del
Option C:	W,X
Option D:	not wait , not signal
Q15.	In segmentation, each address is specified by
Option A:	An offset & value
Option B:	A value & segment number
Option C:	A key & value
Option D:	A segment number & offset
Q16.	Working set model for page replacement is based on the assumption of
Option A:	Modularity

Option B:	Locality
Option C:	Globalization
Option D:	Random access
Q17.	Thrashing occurs when
Option A:	When a page fault occurs
Option B:	Processes on system frequently access pages not memory
Option C:	Processes on system are in running state
Option D:	Processes on system are in waiting state
Q18.	Which statement is true for indexed file allocation method?
Option A:	Each file must occupy a set of contiguous blocks on the disk
Option B:	All the pointers to scattered blocks are placed together in one location
Option C:	All pointer are NULL
Option D:	Entire file is stored in one block
Q19.	Which of following is responsible for all file I/O initiation and termination.
Option A:	Device drivers
Option B:	Physical I/O
Option C:	Basic I/O supervisor
Option D:	Logical I/O
Q20.	A Translation look aside buffer can be used to
Option A:	To reduce the time taken to access the page table again and again.
Option B:	To increase the time taken to access the page table again and again.
Option C:	To equalize the time taken to access the page table again and again.
Option D:	To moderate the time taken to access the page table again and again.

Q2	
A	**Solve any Two** **5 marks each**
i.	Describe the Producer and Consumer synchronization problems.
ii.	Explain the difference between preemptive and non-preemptive scheduling.
iii.	Write about Banker's Algorithm for Single & Multiple Resources to avoid deadlock.
B	**Solve any One** **10 marks each**
i.	Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here: i T(pi) 0 80 1 20 2 10 3 20 4 50 a. Suppose a system uses FCFS scheduling .Create a Gantt chart illustrating the execution of these processes? b. What is the turnaround time for process p3? c. What is the average wait time for the processes?

ii.	A system uses 3 page frames for storing process pages in main memory. It uses the First in First out (FIFO) page replacement policy. Assume that all the page frames are initially empty. What is the total number of page faults that will occur while processing the page reference string given below- 4 , 7, 6, 1, 7, 6, 1, 2, 7, 2 Also calculate the hit ratio and miss ratio.

Q3.	**Solve any Four out of Six** **5 marks each**
A	Describe Inter process communication (IPC) in brief.
B	Define and describe the Memory Allocation Strategies Best-Fit, First Fit, and Worst Fit & Next Fit.
C	List the various functions of operating system and describe any one in brief.
D	Differentiate between paging and segmentation.
E	List the different accessing methods of a file and describe any one in detail**.**
F	Compare the various Disk-Scheduling algorithms.

University of Mumbai
Examination June 2021
Examinations Commencing from 1st June 2021
Program: Computer Engineering
Curriculum Scheme: Rev2016
Examination: BE 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.	B
Q2.	D
Q3.	A
Q4	C
Q5	A
Q6	A
Q7	C
Q8.	C
Q9.	B
Q10.	C
Q11.	A
Q12.	D
Q13.	D
Q14.	A
Q15.	D
Q16.	B
Q17.	B
Q18.	B
Q19	C
Q20	A

Q2	
A	**Solve any Two** **5 marks each**
i.	**Describe the Producer and Consumer synchronization problems**. **Ans**: Probable points in answer should be The producer consumer problem is a synchronization problem. There is a fixed size buffer and the producer produces items and enters them into the buffer. The consumer removes the items from the buffer and consumes them. A producer should not produce items into the buffer when the consumer is consuming an item from the buffer and vice versa. So the buffer should only be accessed by the producer or consumer at a time. The producer consumer problem can be resolved using semaphores.
ii.	**Explain the difference between preemptive and non-preemptive scheduling.** **Ans**: Preemptive scheduling allows a process to be interrupted in the midst of its execution, taking the CPU away and allocating it to another process. Non preemptive scheduling ensures that a process relinquishes control of the CPU only when it finishes with its current CPU burst.
iii.	**Write about Banker's Algorithm for Single & Multiple Resources to avoid deadlock.** **Ans**: Probable points in answer should be The Banker's algorithm is a resource allocation and deadlock avoidance algorithm that tests for safety by simulating the allocation for predetermined maximum possible amounts of all resources, then makes an "s-state" check to test for possible activities, before deciding whether allocation should be allowed to continue.
B	**Solve any One** **10 marks each**
i.	**Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here:** **i T(pi)** **0 80** **1 20** **2 10** **3 20** **4 50** **a. Suppose a system uses FCFS scheduling .Create a Gantt chart illustrating the execution of these processes?** **b. What is the turnaround time for process p3?** **c. What is the average wait time for the processes?** **Ans:** a. The Gantt chart: 0 -80 -100 -110 -130 -180 b. The turnaround time for process p3 is T.A. (p3) = T (p3) + T.A. (p2) = T (p3) + (T (p2) + T.A. (p1)) = T (p3) + (T (p2) + (T (p1) + T.A. (p0))) = T (p3) + (T (p2) + (T (p1) + T (p0))) = 20 + 10 + 20 + 80 = 130.

	c. Average waiting time calculation: Waiting Time for process p0 = 0 sec., p1 = 80 sec., p2 = 100 sec. , p3 = 110 sec. , p4 = 130 sec. The average waiting time = (0+80+100+110+130)/5 = 84 sec
ii.	**A system uses 3 page frames for storing process pages in main memory. It uses the First in First out (FIFO) page replacement policy. Assume that all the page frames are initially empty. What is the total number of page faults that will occur while processing the page reference string given below-** **4 , 7, 6, 1, 7, 6, 1, 2, 7, 2** **Also calculate the hit ratio and miss ratio.** **Ans:** Total number of references = 10 Total number of page faults occurred = 6 Hit ratio- Total number of page hits = Total number of references – Total number of page misses or page faults = 10 – 6 = 4 Hit ratio = Total number of page hits / Total number of references = 4 / 10 = 0.4 or 40% Miss ratio- Total number of page misses or page faults = 6 Miss ratio = Total number of page misses / Total number of references = 6 / 10 = 0.6 or 60%

Q3.	**Solve any Four out of Six**	**5 marks each**

A	**Describe Inter process communication (IPC) in brief.** **Ans**: Probable answer should be Interposes communication is the mechanism provided by the operating system that allows processes to communicate with each other. This communication could involve a process letting another process know that some event has occurred or the transferring of data from one process to another
B	**Define and describe the Memory Allocation Strategies Best-Fit, First Fit, and Worst Fit & Next Fit**. **Ans:** Probable points in answer should be In the first fit approach is to allocate the first free partition or hole large enough which can accommodate the process. It finishes after finding the first suitable free partition. The best fit deals with allocating the smallest free partition which meets the requirement of the requesting process
C	**List the various functions of operating system and describe any one in brief.** **Ans**: An operating system has three main functions: (1) manage the computer's resources, such as the central processing unit, memory, disk drives, and printers, (2) establish a user interface, and (3) execute and provide services for applications software.
D	**Differentiate between paging and segmentation.** **Ans: Paging** in operating systems, is a memory management scheme, operating system retrieves data from secondary storage in same-size blocks referred to as pages. Paging is to divide each process in the form of pages. The main memory will also be divided in the form of frames and therefore one page of the process is to be stored in one frames of the memory. Paging decreases the efficiency of the system as it can divide the same function into different pages which may or may not be loaded into memory at the same time. **Segmentation o**n the other hand, is a memory management technique in which, the memory is divided into the variable size parts. Each part is then referred to as segment that means, it can be allocated to a process. Though paging is more close to operating system rather than the user because it divides all the processes into the form of pages, segmentation is far better because it divides the process into segments whereby each segment constitutes same type of functions such as main function being in one segment and library function being in the other segment
E	**List the different accessing methods of a file and describe any one in detail.** **Ans:** Probable points in answer should be Direct Access, Indexed access, Sequential Access

	Sequential Access: This is the most common method. Here the information present in the file is accessed in a sequential fashion, one record after the other. ...
F	**Compare the various Disk-Scheduling algorithms.** **Ans:** Comparison of scheduling algorithms FCFS SJF RR SRTN Multilevel Feedback Etc. along with their performance parameters