SOMAIYA VIDYAVIHAR UNIVERSITY

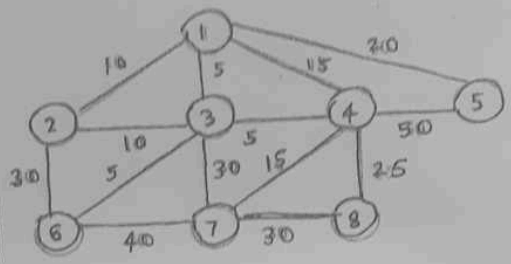
20/05/2022 (A)

Maximum Marks: 100	**Semester: January 2022 – May 2022** **Examination: ESE Examination**	**Duration:** 3 Hrs.
Programme code: 01 **Programme:** B. Tech Computer Engineering	**Class:** ~~FY~~/SY/~~TY/LY~~	**Semester:** ~~I/II/III~~/IV/~~V/VI/VII/VIII~~ **(SVU 2020)**
Name of the Constituent College: K. J. Somaiya College of Engineering	**Name of the department:** /COMP/~~ETRX/EXTC/IT/MECH~~	
Course Code: 116U01C402	**Name of the Course:** Analysis of Algorithm	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

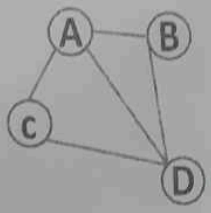
Question No.		Max. Marks

Q1 (a)	Explain the significance of Big-Oh, Big–Theta and Big-Omega notations. Compute Space complexity and time complexity for the following codes.
	Code segment 1:
	factorial(int n)
	{
	if (n==0 || n==1) return 1;
	else return (n*factorial(n-1));
	}
	
	Code segment 2:
	int factorial (int n)
	{ int fact=1;
	for(i=1; i<n;i++)
	fact=fact*i;
	return fact;
	}
		10 M

Q1 (b)	I. Derive Average case complexity of quick sort. II. Solve the recurrence T (n) =T (n/2) +1 using recurrence tree method.	10 M
Q2 (a)	I. Differentiate between Greedy approach and Dynamic programming strategies. Also list and explain steps in a dynamic programming solution. II. Explain Dynamic programming approach to solve knapsack problem. Find optimal solution to knapsack instance n = 4, m = 9 (P1, P2, P3,P4) = (4,5,7,10) and (W1, W2, W3,W4) = (1,3,4,6). **OR** Given a chain of four matrices A1, A2, A3, A4 with P0=5, P1=7, P2= 8, P3= 4 & P4=3 . Find m [1, 4].	10 M
Q2 (b)	Define Minimum Spanning Tree. Compute MSTs using Kruskal's and Prim's algorithm.	10 M



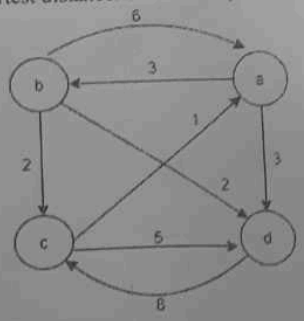
Q3 (a)	For the given graph, compute the minimum chromatic number to color the graph such that no two adjacent vertices have the same color. Give all possible combinations of such color assignments using backtracking. Draw state space tree, backtracking tree, solution tree.	10 M

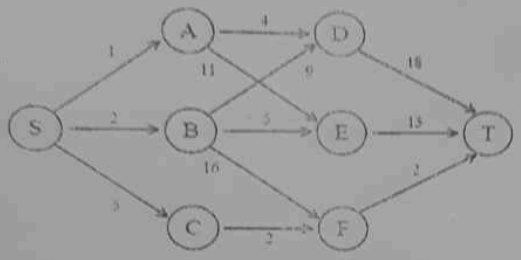


OR

Define N-Queens problem. Explain the need of backtracking concept by using state space tree and backtracking tree for 4-Queen's problem.
Solve the 4-queen's problem to compute all possible solutions by using the principle of backtracking. Draw state space tree and backtracking tree both.

Q3 (b)	For Given graph, apply Floyd Wars hall's Algorithm to compute all pairs shortest distance. Show all steps.	10 M



Q4 (a)	Solve Traveling Salesperson problem using dynamic programming. Find a minimum cost tour starting and ending at Vertex 1. Also write the cost of the tour. $\begin{vmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{vmatrix}$	10 M
Q4 (b)	Solve the given problem instance of Multistage graphs with forward or backward (either of the methods)  **OR** Solve 8 -puzzle problem for the given initial and goal state using branch and bound strategy. Initial state: $\begin{vmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & & 6 \end{vmatrix}$ Goal State: $\begin{vmatrix} 1 & 4 & \\ 2 & 5 & 7 \\ 3 & 6 & 8 \end{vmatrix}$	10 M
Q5 (a)	Define Longest Common Subsequence Problem. Give Dynamic programming Solution. Solve given example : X – MANTRALAYA Y- MALAYALAM **OR** Explain the concept of String matching with finite automata with suitable examples. State its complexity.	10 M
Q5 (b)	Explain different complexity classes with suitable examples. Comment relationship among P, NP, NP-Hard and NP-Complete problems.	10 M

18/5/2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: January 2022 – May 2022		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration: 3hrs**
Programme code: 01&04 **Programme: B Tech Comp/IT**	**Class: SY**	**Semester: IV (SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department:** COMP/IT	
Course Code: 116U01C401 /116U04C401	**Name of the Course: Probability, Statistics and Optimization Techniques**	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

Q No			MAX MARKS
Q1	a	If X_1 has mean 5 and variance 5, X_2 has mean -2 and variance 3, find $E(2X_1+3X_2-5)$, $V(2X_1+3X_2-5)$	5
	b	**Solve any THREE of the following**	21
	(i)	Determine the constant 'a' and find mean, $P(4 \le x \le 7)$ if the distribution function of a continuous random variable is defined as $f(x) = \frac{a}{x^5}, 2 \le x \le 10$	
	(ii)	If the height of 1000 students is normally distributed with mean 69 inches and standard deviation 4 inches. Find the expected number of students having heights: i) greater than 67 inches, ii) less than 68 inches, iii) between 65 & 71 inches	
	(iii)	The number of phone calls coming in to a telephone exchange between 2 & 4 P.M. say X is a random variable has Poisson distribution with parameter 2. Similarly the number of phone calls coming between 4 & 6 P.M. say Y is a random variable has Poisson distribution with parameter 6. If X& Y are independent Poisson random variables find the probability that during 2&6 P.M. there will be i) no phone calls at all ii) more than 3 calls. (iii) at most two calls	
	(iv)	A box to be constructed so that its height is 12 inches and its base is X inches by X inches. If X has a uniform distribution over the interval (2, 10), then what is the expected volume of the box in cubic inches?	
	(v)	The joint probability distribution function of (X,Y) is given by $f(x,y) = e^{-(x+y)} \quad 0 \le x, \ 0 \le y$ Compute $P(X > 2), P(1 < X+Y < 3))$	

Q2	a	A data for selection of students regarding placement is given below. Find the probability that a boy is selected for the placement and log of odds of this probability	

Students	Selection in placement		Total
	yes	no	
Girls	753	102	855
Boys	382	158	540
Total	1145	250	135

	b	**Solve any ONE of the following**	
	(i)	Calculate the correlation coefficient from the following data.	

x	23	27	28	29	30	31	33	35	36	39
y	18	22	23	24	25	26	28	29	30	32

	(ii)	Obtain two lines of regression and coefficient of correlation from the following data-	

X	65	66	67	68	69	70	72	67
y	67	68	65	72	72	69	71	66

Q3	a	Two samples are drawn from two different population gave the following results. Find 95% confidence limits for the difference between the population means.	5

	Size	Mean	S.D
Sample I	400	124	14
Sample II	250	120	12

	b	**Solve any TWO of the following**	14
	(i)	Intelligence tests of two groups of boys & girls obtained from two normal populations having the same standard deviations gave the following results. Test at 1% level of significance whether the boys perform better than the girls.	

	Size	Mean	S.D
Girls	121	84	10
Boys	181	81	12

	(ii)	A certain injection administered to 12 patients resulted in the following change of blood pressure 5,2,8, -1,3,0,6, -2,1,5,0,4. Can be concluded that the injection will be in general accompanied by an increase in blood pressure at 5% LOS?	
	(iii)	From the following table, showing the number of plants having certain character, test the hypothesis that the flower colour is independent of flatness of leaf.	

				Flat leaves	Curved leaves	Total
			White Flowers	99	36	135
			Red Flowers	20	5	25
			Total	119	41	160
Q4	a	Construct the Dual of the following LPP Maximize $z = 5x_1 + 2x_2 - 3x_3$ Subject to $2x_1 - 2x_2 + x_3 \geq 4 \quad 2x_1 + x_3 \leq 8 \quad x_1 + x_2 + 3x_3 = 20$ $x_1, x_3 \geq 0, \quad x_2$ unrestricted				5
	b	**Solve any THREE of the following**				21
	(i)	Using Simplex method solve the following LPP Maximize $z = 3x_1 + 2x_2 + 5x_3$ Subject to $x_1 + x_2 + x_3 \leq 9 \quad 2x_1 + 3x_2 + 5x_3 \leq 30 \quad 2x_1 - x_2 - x_3 \leq 8$ $x_1, x_2, x_3 \geq 0$				
	(ii)	Using Big M method solve the following LPP Maximize $z = 6x_1 + 4x_2$ Subject to $2x_1 + 3x_2 \leq 30, \quad 3x_1 + 2x_2 \leq 24, x_1 + x_2 \geq 3, \quad x_1, x_2 \geq 0$				
	(iii)	Using Duality Solve the following linear programming problem Minimize $z = 4x_1 + 3x_2 + 6x_3$ Subject to $x_1 + x_3 \geq 2, \quad x_2 + x_3 \geq 5, \quad x_1, x_2, x_3 \geq 0$				
	(iv)	Using Dual simplex method Solve the following linear programming problem Minimize $z = 2x_1 + 2x_2 + 4x_3$ Subject to $2x_1 + 3x_2 + 5x_3 \geq 2, \quad 3x_1 + x_2 + 7x_3 \leq 3, \quad x_1 + 4x_2 + 6x_3 \leq 5$ $x_1, x_2, x_3 \geq 0$				
	(v)	Solve the following NLPP Maximize $z = 2x_1^2 - 7x_2^2 + 12x_1x_2$ Subject to $2x_1 + 5x_2 \leq 98, \quad x_1, x_2 \geq 0$				
Q5	a	In a bank cheques are cashed at a single 'teller' counter. Customers arrive at the counter in a Poisson manner at an average rate of 30 customers per hour. The teller takes, on an average, a minute and a half to cash a cheque The service time has been shown to be exponentially distributed. Calculate the % of time the teller is busy.				3

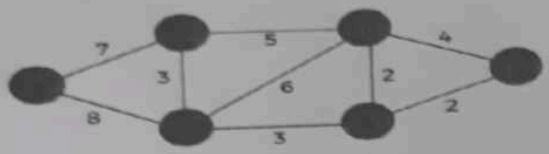
Sem VIII, VI, IV, III (IT Comp)

	b	**Solve any TWO of the following**
	(i)	Patients arrive at a clinic according to Poissondistribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. The examination time per patient is exponential with mean rate of 20 per hour. (a) Find number of patients in the clinic before the examination (b) What is the probability that an arriving patient will not wait. (c) What is the expected waiting time until a patient is discharged from the clinic ?
	(ii)	Trucks arrival at a factory is for collecting finished goods that are supposed to be transported to distant markets. As and when they come they are required to join awaiting line and are served on first come, first served basis. Trucks arrive at the rate of 10 per hour where as the loading rate is 15 per hour. It is also given that arrivals are Poisson and loading is exponentially distributed. (a) Transporters have complained that their trucks have to wait for nearly 12 minutes at the plant. Examine whether the complaint is justified. (b) Determine the number of trucks waiting in the queue before getting loaded. (c) Find the probability that a truck cannot be loaded immediately.
	(iii)	Customer arrives at a box office window, being manned by a single individual, according to a Poisson input process with a mean rate of 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 seconds Find the average time spent by a customer. Also determine the average number of customers in the system and the average queue length

Maximum Marks: 100
Programme code: 04
Programme: B Tech Informati
Name of the Constituent Colle
K. J. Somaiya College of Engi
Course Code: 116U04C403
Instructions: 1)Draw neat di

Question No.	
Q1 (a)	Discuss the an Give logarith
Q1 (b)	Solve recur
Q2 (a)	Explain best cas
Q2 (b)	Expla exam
Q3 (a)	

Maximum Marks: 100	**Semester: January 2022 – May 2022 Examination: ESE Examination**		**Duration:3 Hours**
Programme code: 04			
Programme: B Tech Information Technology		**Class: SY**	**Semester: IV (SVU 2020)**
Name of the Constituent College: K. J. Somaiya College of Engineering		**Name of the department: Information Technology**	
Course Code: 116U04C403	**Name of the Course: Analysis of Algorithms**		
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary			

Question No.		Max. Marks
Q1 (a)	Discuss the analysis of the algorithm using Big – O asymptotic notation. Give logarithmic example of run time analysis.	10
Q1 (b)	Solve recurrence relation $T(n) = 2T(n/2)+n^2$.	10
Q2 (a)	Explain selection sort algorithm. Discuss the time complexity of selection sort in best case, average case and worst case scenario.	10
Q2 (b)	Explain Divide and conquer technique. Explain merge sort algorithm with example. **Or** Prove that the average case complexity of quick sort for sorting n elements is "n log n"	10 10
Q3 (a)	What is Minimum Cost Spanning Tree? Calculate minimum spanning tree of the below graph using kruskal's algorithm. 	10
Q3 (b)	Given two sequences X [1...m] and Y [1.....n]. Find the longest common subsequences to both. x: A B C B D A B y: B D C A B A **Or** Differentiate between dynamic programming and greedy method. Explain Travelling sales man problem in Dynamic programming.	10 10

Contd...

Q4 (a)	Explain sum of subset problem. Solve the sum of subset problems using backtracking algorithmic strategy for the following data: n = 4 W =(w1, w2, w3, w4) = (11, 13, 24, 7) and M = 31.
Q4 (b)	Explain Hamiltonian Circuit Problem with example
Q5	Write short note:(**any two**) 1)N queens Problem 2)NP reducibility 3)NP completeness 4)Strassen's matrix multiplication

30/5/2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Maximum Marks: 100	Semester: January 2022 – May 2022 Examination: ESE Examination		Duration: 3 Hours
Programme code: 66			
Programme: Honours in Artificial Intelligence		Class: SY	Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: IT	
Course Code: 116h66C401	Name of the Course: Fundamentals of Data Science		
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary			

Question No.		Max. Marks
Q1 (a)	Discuss the nature of the time series data and spatial data. Give valid example of each. OR What is the nominal data; give examples considering any 5 attributes (with its values) which holds the nominal data.	10
Q1 (b)	Explain any three transformations required to make the data suitable for the data analytics / mining?	10
Q2 (a)	What is the purpose of finding the similarity or dissimilarity among the data elements? Explain the similarity measures applicable for binary data with suitable example.	10
Q2 (b)	For the below given data points pairs, calculate the Euclidean and Manhattan distance, i) A(0, 4), B(6, 2) ii) B(6, 2), C(9, 1) OR Find edit distance between the following pair of string, consider two operations, Insert and Delete: i) "abcdef" and "bcdesg" ii) "AABBCCDD" and "ABCDD"	10
Q3 (a)	Use the two methods below to normalize the following group of data: 200,300,400,600,1000 (i) Min-max normalization by setting min=0 and max=1 (ii) Z-score normalization.	10
Q3 (b)	Discuss any four applications of Histogram with suitable example. OR Why to discretize the data? Discuss any three methods for data discretization with example.	10

(P.T.O)

Q4 (a)	Why there is a need of data reduction in data analytics? Discuss any three techniques for the data reductions with suitable example.	10
Q4 (b)	What is an outlier? With suitable example demonstrate any one of the outlier detection method.	10
Q5 (a)	How does the icon based visualization technique works? Give any two applications where this visualization technique is most suitable.	10
Q5 (b)	Discuss in detail (Any Two). i. Dashboard ii Scoreboard iii Frequency polygon iv. Chart Vs Graph	10

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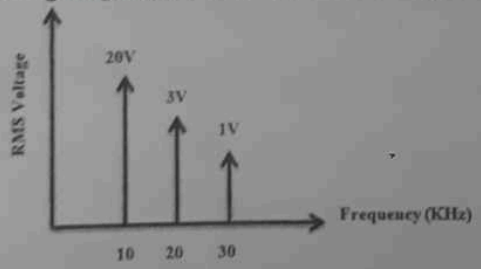
23/05/2022 (E)

Semester: January 2022 – May 2022		
Maximum Marks: 100	Examination: ESE Examination	Duration:3 Hrs
Programme code:03 Programme: B.Tech Electronics and Telecommunication Engineering	Class: SY	Semester: IV(SVU2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: EXTC	
Course Code: 116U03C403	Name of the Course: Communication Systems	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

Question No.		Max. Marks
Q1 (a)(i)	A 400 W carrier is modulated to a depth of 75%. Find : 1)The total power in the amplitude - modulated wave 2)Power in lower and upper side bands **OR** Derive amount of power wasted in DSBFC considering 100% modulation.	05
Q1 (a)(ii)	One input to a conventional AM modulator is 500 KHz carrier with amplitude of 20VP. The second input is a 10 KHz modulating signal that is of sufficient amplitude to cause a change in the output wave of ±7.5VP. Determine A. Upper and lower side frequencies B. Modulation coefficient and percent modulation C. Peak amplitude of the modulated carrier and the upper and lower side frequency voltages D. Expression for the modulated wave.	05
Q1 (b)	Explain Armstrong method of FM generation using suitable neat and diagrams.	10
Q2 (a)(i)	What is correlated noise? Give its type. Determine percentage total harmonic distortion for the figure given below if fundamental frequency is 10KHz.  	05
Q2 (a)(ii)	A radio receiver with 10kHz bandwidth has noise figure of 30dB. Determine the signal power required at the input of receiver to achieve input SNR of 30dB.	05

Q2 (b)	Explain working of Ring modulator circuit with neat diagrams and waveforms. **OR** Draw the block diagram of filter method of SSB generation and explain this method requiring multiple oscillators to convert signal to high frequency.
Q3 (a)	A FM wave is represented by the following equation, $V = 10 \sin [5 \times 10^8 t + 4 \sin 1250 t]$ Find: 1. Carrier and modulating frequencies 2. Carrier amplitude 3. Modulation index and maximum deviation 4. Power dissipated by this FM wave in a 50 ohm resistor 5. If Em= 2 Volts, find frequency sensitivity kf
Q3 (b)	Write short notes on (any two) 1. Frequency spectrum of FM wave 2. Noise triangle 3. Selection of I.F. frequency 4. Delayed AGC
Q4 (a)	Explain Double spotting problem faced in receivers. If fs = 800 kHz, IF = 455kHz, calculate image frequency and discuss problem of double spotting in above given case. **OR** A SHR is tuned to 3MHz - 30 MHz and I.F. frequency is 40.525MHz, bandwidth= 10kHz. Find: 1. Range of local oscillator frequency 2. Range of image frequency
Q4 (b)	1. Draw waveforms for FM and PM 2. How PM can be obtained from FM?
Q5 (a)(i)	Determine the Nyquist rate for following continuous-time signal $x(t) = 6 \cos 50 \pi t + 20 \sin 300 \pi t - 10 \cos 100 \pi t$
Q5 (a)(ii)	Explain in brief PWM generation with neat diagrams. **OR** What are advantages and disadvantages of PCM?
Q5 (b)	Explain delta modulation method with neat diagram and suitable example. **OR** Explain PAM generation with neat diagram

Sem

aximum Marks: 100
ogramme code: 03
ogramme: B.Tech Electronics a
lecommunication Engineering
me of the Constituent College:
J. Somaiya College of Engineer
urse Code: 116U03C405
tructions: 1)Draw neat diagram

uestion No.	
(a) (i)	Point charge Q1=300μC **F1**= (**8ax -8ay** + 4**az**) N Q2. Find the flux density at 1) A point charge Q of 2) A uniform charge d
(a) (ii)	For x, y and z positiv region defined by 0≤ x Derive equation for El
(b)	Given the potential V P (-2,1,5)m
2 (a) (i)	A current filament of Find magnetic field in Using Biot-Savart's Idl = 3π (ax+2ay+3a
2(a) (ii)	Find the flux crossin if **B**= (20/r) aφ Tesl
2 (b)	Write short notes on 1. Lorenz Force eq 2. Boundary condi 3. Magnetic mater 4. Ampere's circu
3 (a)	Given **E**= 10 sin (α

30/5/2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: January 2022 – May 2022		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration:03 Hrs**
Programme code: 41		
Programme: Minor in Artificial Intelligence & Machine Learning	**Class: SY**	**Semester: IV(SVU 2020)**
Name of the Constituent College: K. J. Somaiya College of Engineering	**Name of the department:** ETRX and MKCH	
Course Code: 116m41C401	**Name of the Course: Data Science and Analytics**	
Instructions: 1) All questions are compulsory 2)Draw neat diagrams 3)Assume suitable data if necessary		

Question No.		Max. Marks
Q1 (a)	What is meant by NoSQL Database? Explain MongoDB in detail. **OR** Describe the terms along with skill sets needed for various applications in following domain: • Big Data • Data Science	10 M
Q1 (b)	What are discrete random variables? Derive the Probability Distribution Function (PDF) of any two discrete random variables.	10 M
Q2 (a)	Let X be a discrete random variable with the following PMF $P_X(k) = \begin{cases} 0.1 & \text{for } k = 0 \\ 0.4 & \text{for } k = 1 \\ 0.3 & \text{for } k = 2 \\ 0.2 & \text{for } k = 3 \\ 0 & \text{otherwise} \end{cases}$ a) Find the CDF of X. b) Find EX. c) Find Var(X). d) If $Y=(X-2)^2$, find EY.	10 M
Q2 (b)	Explain Gaussian (normal) distribution with respect to PDF and CDF along its use in statistics. **OR** The number of touchdown (TD) passes thrown by each of the 31 teams in the National Football League in the 2000 season are shown below: 37, 33, 33, 32, 29, 28, 28, 23, 22, 22, 22, 21, 21, 21, 20, 20, 19, 19, 18, 18, 18, 18, 16, 15, 14, 14, 14, 12, 12, 9, 6.	10 M

	i. Compute the mean, median, and mode of above dataset ii. Comment on its central tendency measure.	
Q3 (a)	List and elaborate the steps involved in Exploratory Data Ana	
Q3 (b)	Costco sells paperback books in their retail stores and wants relationship between the prices and sales. The price of a book adjusted each week and the weekly sales are in the following ta	

Sales	5	3	3	4	4
Price	$14	$6	$11	$15	$14

i. Apply simple linear regression model that uses price as above dataset.

ii. Predict weekly sales for the novel when priced is $10.

Q4 (a) A database has five transactions. Let min_sup(s) = 3 and min_

TID	Items_bought
T100	{M,O,N,K,E,Y}
T200	{D,O,N,K,E,Y}
T300	{M,A,K,E}
T400	{M,U,C,K,Y}
T500	{C,O,O,K,I,E}

i. Find all frequent itemsets using Apriori Algorithm.

ii. List all of the strong association rules (with support s and

Q4 (b) Illustrate the DGIM algorithm for counting ones in a data stream

OR

Explain how Flajolet Martin Algorithm works for counting dis given stream.

Q5 Attempt *any TWO* of the following: (2x10 M)

a) Illustrate the need of Data Visualization. Summarize k effective Data Visualization.

b) Describe in detail any two data visualization tools with ex

c) Elaborate on following data visualization techniques with p

i. Pie Chart
ii. Histogram
iii. Heat Map
iv. Word Cloud

Semester: Ja
Examination: E

ogramme code: 02
rogramme : B. Tech Electronics Enginee
me of the Constituent College:
J. Somaiya College of Engineering

urse Code: 116U02C401 | Name: Engine
ax Marks: 100 | Time

estion No.	
	Find the directional derivative of of $2i - j - 2k$.
(A)	**OR**
	Show that $\vec{F} = (y^2 - z^2 + 3yz -$ is both solenoidal and irrotational
(B)	Attempt any **TWO** of the follow
(i)	Show that $\vec{F} = (x^2 - yz)i + (y^2 -$ scalar potential.
(ii)	Find the scalars p, q if $(\vec{a} \times \vec{b})$ $\vec{a} = pi + j + 2k$, $\vec{b} = i - j$,
(iii)	Prove that $\nabla f(r) = f'(r)\frac{\vec{r}}{r}$ and he where $\vec{r} = xi + yj + zk$.
	Evaluate $\int (x^2 - y^2)dx + (y^2 -$ $x = t, y = t^2 + 1$.
A)	**OR**
	Find the total work done in movi $(x^2 - y^2 + x)i - (2xy + y)j$ mov along the parabola $y^2 = x$.

25/5/2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

imum Marks:100	Semester: January 2022 – May 2022 Examination: ESE Examination		Duration:3Hrs
gramme code: 02 gramme: B Tech Electronics Engineering		Class: FY/SY/TY/LY	Semester: I/II/III/IV/V/VI/VII/VII I (SVU 2020)
ne of the Constituent College: . Somaiya College of Engineering		Name of the department: ~~COMP~~/ETRX/~~EXTC/IT/MECH~~	
rse Code: 116U02C404	Name of the Course: Analog and Digital Communication		
ructions: 1)Draw neat diagrams 2)Assume suitable data if necessary			

estion No.		Max. Marks
	Answer any Two	
	(A) A sinusoidal carrier has an amplitude of 20 V and frequency of 200 KHz . It is amplitude modulated by a sinusoidal voltage of amplitude 6V and frequency 1 KHz. Modulated voltage is developed across a 80 Ω resistance. 1. Write the equation of modulated wave. 2. Determine modulation index 3. Draw the spectrum of modulated wave 4. Calculate total average power	(2+2+3 +3)
	(B) Verify AM is a wastage of power and bandwidth, Also draw the spectrum of AM wave and comment on the bandwidth.	(5+5)
	(C) Prove that the balanced modulator produces an output consisting of sidebands only with the carrier removed.	(10)
Q2	**Answer any Two**	
	(A) Explain indirect method of generation of FM signal with the help of neat diagram.	(10)
	(B) Explain the concept of FM noise triangle also explain the concept of pre emphasis and de-emphasis.	(5+5)
	(C) Explain Foster Seeley discriminator with neat diagram	(10)
Q3	**Answer any Two**	
	(A) Explain the following with reference to Radio receivers: i)Fidelity ii) Image frequency iii) Tracking error iv) Selectivity v) Sensitivity	(2+2+2 +2+2)
	(B) Compare	

	i)PAM,PWM and PPM systems ii)PCM and Delta	(5) (5)
	(C) Explain the following i)Quantization noise ii)Inter symbol Interference	(5) (5)
Q4	Answer any Two	
	(A) Explain the transmitter and Receiver block diagram of PCM in detail. (B) Draw and explain block diagram of BPSK transmitter and Receiver. (C) Explain Adaptive delta modulation with suitable diagrams.	(10) (10) (10)
Q5	Answer any Two	
	(A) Draw ASK,PSK and FSK signal for digital data 11010101 also compare all three techniques of modulation. (B) Explain the generation and detection of FSK signal. (C) Explain in detail working principle of M-ary FSK.	(6+4) (10) (10)

SOMAIYA VIDYAVIHAR UNIVERSITY

30/5/2022 (E

Maximum Marks: 100	**Semester: January 2022 – May 2022** **Examination: ESE Examination**		**Duration: 3 Hrs**
Programme code: 75			
Programme: Minor in Computer Engineering		**Class: SY**	**Semester: III(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**		**Name of the department: COMP**	
Course Code: 116m75C301	**Name of the Course: Database Management System**		
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary			

Question No.		Max. Marks
Q1 (a)	i. Explain Data Independence and its types in detail ii. Explain Single-valued, Multi-valued and Derived attributes with the help of examples.	4 6
Q1 (b)	What are the different levels of abstraction in DBMS? Explain each of them with the help of Example.	10
Q2 (a)	Consider the following requirements for a simple database for the National Hockey League (NHL) : 1. The NHL has many teams. 2. Each team has a name, a city, a coach, a captain, and a set of players. 3. Each player belongs to only one team. 4. Each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records. 5. A team captain is also a player. 6. A game is played between two teams and has a date and a score. Construct an E-R diagram for the NHL database. List your assumptions and mention the cardinality mappings. OR Let E1 and E2 be two entities in an E/R diagram with simple single-valued attributes. R1 and R2 are two relationships between E1 and E2, where R1 is one1 to-many and R2 is many-to-many. R1 and R2 do not have any attributes of their own. Calculate the minimum number of tables required to represent this situation in the relational model? And justify your answer.	12
Q2 (b)	Consider the following relational schema: Employee (empno, name, office, age) Books(isbn, title, authors, publisher) Borrowed(empno, isbn, date)	

	Write the following queries in relational algebra: i. Find the names of employees who have borrowed a book Published by McGraw-Hill? ii. For each publisher, find the names of employees and title of the book who have borrowed the books.	4 4
Q3 (a)	Write SQL statements for following: Student(Enrno, name, courseId, emailId, cellno, dept) Course(courseId, course_nm, duration) i. Add a column "city" in student table. ii. Find out list of students who have enrolled in "computer" course. iii. List name of all courses with their duration. iv. List email Id and cell no of all mechanical engineering students. OR Consider the following database schema and write nested queries in SQL for the given case: Supplier (id, name, city) Parts(pno, pname, pdescription) Supply(id, pno, cost) i. Find the names of the parts supplied by "RamRaj" ii. Find the number of the suppliers who supply "Nuts" iii. Find the cost of bolts being supplied by Nagpur suppliers.	12 (3 each) 4 4 4
Q3 (b)	Define the following terms and give examples (any Two) i. Cardinality of Relationship ii. Recursive Relationship iii. Specialization iv. Weak and Strong Entity	8 (4 each)
Q4 (a)	Explain different steps in high level query processing with diagram. OR Explain 1NF, 2NF and 3NF of Database with Example and Justify your answer.	8
Q4 (b)	Explain the following with example: i. Multilevel and Multiple key indexing. ii. Hash based Indexing and Tree based Indexing	12
Q5 (a)	Define transaction and explain desirable properties of transactions with suitable example.	10
Q5 (b)	Explain Concurrency control with locking methods.	10

1/8/2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Examination: ESE Examination AUGUST 2022		
Programme code: 01 Programme: B.TECH	Class: SY	Semester: III (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the Department: COMP	
Course Code: 116U01C301	Name of the Course: Integral Transform and Vector Calculus	
Duration : 1 Hours	Maximum Marks : 50	
Instructions: 1)Draw neat diagrams 2) Assume suitable data if necessary		

Question No.		Max Marks
Q1 (A)	Choose One correct option for the following questions (2 marks each)	10
(i)	Find $L\left(\int_0^t \frac{e^{-u}\sin u}{u} du\right)$ (a) $\frac{\tan^{-1}s}{s}$ (b) $\frac{\cot^{-1}s}{s}$ (c) $\frac{\tan^{-1}(s+1)}{s}$ (d) $\frac{\cot^{-1}(s+1)}{s}$	
(ii)	To represent $f(x) = x^2$ as Fourier series in $(0,2\pi)$,value of b_n is (a) $\frac{2\pi}{n}$ (b) $4\frac{\pi}{n}$ (c) $\frac{2}{n}$ (d) $\frac{4}{n}$	
(iii)	Let $\emptyset = xy + yz + zx$, what is the directional derivative of $\emptyset$ in the direction of the normal to the surface $x^2 + y^2 = z + 4$ at $(1,1,-2)$? (a) -2 (b) 2 (c) 0 (d) -6	
(iv)	Green's theorem states that (a) $\int_c (Pdx + Qdy) = \iint_R \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right) dxdy$ (b) $\int_c (Pdx + Qdy) = \iint_R \left(\frac{\partial P}{\partial y} - \frac{\partial Q}{\partial x}\right) dxdy$ (c) $\int_c (Pdx + Qdy) = \iint_R \left(\frac{\partial Q}{\partial y} - \frac{\partial P}{\partial x}\right) dxdy$ (d) $\int_c (Pdx + Qdy) = \iint_R \left(\frac{\partial P}{\partial x} - \frac{\partial Q}{\partial y}\right) dxdy$	
(v)	In Z – transform of unit impulse function, ROC is (a) $z \neq 0$ (b) $\lvert z\rvert > 1$ (c) $\lvert z\rvert < 1$ (d) entire z – plane	

Q1 (B)	**Attempt all the following questions. (2 marks Each)**	10
(a)	Find $L\left\{\frac{1}{t}(e^{-at}-\cos at)\right\}$	
	OR	
	Find Laplace transform of $tH(t-4)+t^2\delta(t-4)$	
(b)	Let $\emptyset = xy(x-y+2z)$ Find Maximum directional derivative of $\emptyset$ at P(1,1,0).	
	OR	
	If $\emptyset = x^2+y^2+z^2-2xyz$ find div(grad$\emptyset$) and div(curl(grad$\emptyset$))	
(c)	If $\vec{A} = (3x^2+6y)\hat{i} - 14yz\hat{j} + 20xz^2\hat{k}$, evaluate $\oint \vec{A}.\overrightarrow{dr}$ from (0,0,0) to (1,1,1) along the curve $x = t,\ y = t^2,\ z = t^3$	
(d)	If z-transform of a sequence is $\frac{1}{z-5}$, $\lvert z\rvert < 5$ then find the sequence	
(e)	Find C_{-2} in the Complex form of Fourier Series for $f(x) = e^x$ in $(-\pi, \pi)$	
Q. 2	**Attempt the following questions (6 marks Each)**	12
(a)	Obtain the Fourier expansion of $f(x)$ in interval $(-\pi, \pi)$ where $f(x) = cos(px)$, p is not an integer	
	OR	
	Find the Fourier Cosine Transform of $f(x) = e^{-2x} + 4e^{-3x}$	
(b)	Using Convolution Theorem, find Inverse Laplace Transform of $\left(\frac{s^2+s}{(s^2+1)(s^2+2s+2)}\right)$	
Q. 3	**Attempt any ONE questions out of the following (6 marks Each)**	6
(a)	If $f(k) = \sin(5k+\frac{\pi}{2}), k \geq 0$ then find z − transform of f(k)	
(b)	If $F(z) = \frac{1}{(z-3)(z-5)}$, $\lvert z\rvert > 5$ then find inverse z-transform of F(z)	

Q. 4	**Attempt any TWO questions out of the following (6 marks Each)**	12
(a)	Prove that $\nabla\left[\nabla.\frac{\bar{r}}{r}\right]=-\frac{2}{r^3}\bar{r}$	
(b)	Given $\bar{F}=(2xy+z)i+(x^2+2yz^3)j+(3y^2z^2+x)k$, (a) Prove that $\bar{F}$ is conservative (b) Find Scalar potential function $\emptyset$ such that $\bar{F}=\nabla\emptyset$. (c) Find the work done by $\bar{F}$ in moving a particle from $A(1,2,0)$ to $B(2,2,1)$ along the straight line AB.	
(c)	Use Divergence theorem to evaluate $\int\int_s \vec{F}.\overrightarrow{ds}$ where $\vec{F}=4x\hat{\imath}-2y^2\hat{\jmath}+z^2\hat{k}$ and s is the surface of the region $x^2+y^2=4$, $z=3$ above xy plane.	

12

6

1/8/2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Examination: ESE Examination AUGUST 2022		
Programme code: 01 Programme: B.TECH	Class: SY	Semester: III (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the Department: COMP	
Course Code: 116U01C301	Name of the Course: Integral Transform and Vector Calculus	
Duration : 1 Hours	Maximum Marks : 50	
Instructions: 1)Draw neat diagrams 2) Assume suitable data if necessary		

Question No.		Max Marks
Q1 (A)	**Choose One correct option for the following questions (2 marks each)**	10
(i)	Find $L(\int_0^t \frac{e^{-u}\sin u}{u} du)$ (a) $\frac{\tan^{-1} s}{s}$ (b) $\frac{\cot^{-1} s}{s}$ (c) $\frac{\tan^{-1}(s+1)}{s}$ (d) $\frac{\cot^{-1}(s+1)}{s}$	
(ii)	To represent $f(x) = x^2$ as Fourier series in $(0,2\pi)$,value of b_n is (a) $\frac{2\pi}{n}$ (b) $4\frac{\pi}{n}$ (c) $\frac{2}{n}$ (d) $\frac{4}{n}$	
(iii)	Let $\emptyset = xy + yz + zx$, what is the directional derivative of $\emptyset$ in the direction of the normal to the surface $x^2 + y^2 = z + 4$ at $(1,1,-2)$? (a) -2 (b) 2 (c) 0 (d) -6	
(iv)	Green's theorem states that (a) $\int_c (Pdx + Qdy) = \iint_R \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right) dxdy$ (b) $\int_c (Pdx + Qdy) = \iint_R \left(\frac{\partial P}{\partial y} - \frac{\partial Q}{\partial x}\right) dxdy$ (c) $\int_c (Pdx + Qdy) = \iint_R \left(\frac{\partial Q}{\partial y} - \frac{\partial P}{\partial x}\right) dxdy$ (d) $\int_c (Pdx + Qdy) = \iint_R \left(\frac{\partial P}{\partial x} - \frac{\partial Q}{\partial y}\right) dxdy$	
(v)	In Z – transform of unit impulse function, ROC is (a) $z \neq 0$ (b) $\|z\| > 1$ (c) $\|z\| < 1$ (d) entire z – plane	

Q1 (B)	**Attempt all the following questions. (2 marks Each)**	10
(a)	Find $L\left\{\frac{1}{t}(e^{-at}-\cos at)\right\}$ **OR** Find Laplace transform of $tH(t-4)+t^2\delta(t-4)$	
(b)	Let $\emptyset = xy(x-y+2z)$ Find Maximum directional derivative of $\emptyset$ at P(1,1,0). **OR** If $\emptyset = x^2+y^2+z^2-2xyz$ find div(grad$\emptyset$) and div(curl(grad$\emptyset$))	
(c)	If $\vec{A} = (3x^2+6y)\hat{i} - 14yz\hat{j} + 20xz^2\hat{k}$, evaluate $\oint \vec{A}.\overrightarrow{dr}$ from (0,0,0) to (1,1,1) along the curve $x = t,\ y = t^2,\ z = t^3$	
(d)	If z-transform of a sequence is $\frac{1}{z-5}$, $\|z\| < 5$ then find the sequence	
(e)	Find C_{-2} in the Complex form of Fourier Series for $f(x) = e^x$ *in* $(-\pi,\pi)$	
Q. 2	**Attempt the following questions (6 marks Each)**	12
(a)	Obtain the Fourier expansion of $f(x)$ in interval $(-\pi,\pi)$ where $f(x) = cos(px)$, p is not an integer	
	OR	
	Find the Fourier Cosine Transform of $f(x) = e^{-2x} + 4e^{-3x}$	
(b)	Using Convolution Theorem, find Inverse Laplace Transform of $\left(\frac{s^2+s}{(s^2+1)(s^2+2s+2)}\right)$	
Q. 3	**Attempt any ONE questions out of the following (6 marks Each)**	6
(a)	If $f(k) = \sin(5k+\frac{\pi}{2}), k \geq 0$ then find z – transform of f(k)	
(b)	If $F(z) = \frac{1}{(z-3)(z-5)}$, $\|z\| > 5$ then find inverse z-transform of F(z)	

Q. 4	Attempt any TWO questions out of the following (6 marks Each)	12
(a)	Prove that $\nabla\left[\nabla \cdot \frac{\vec{r}}{r^3}\right] = -\frac{3}{r^5}\vec{r}$	
(b)	Given $\vec{F} = (2xy + z)\hat{i} + (x^2 + 2yz^2)\hat{j} + (3y^2z^2 + x)\hat{k}$. (a) Prove that $\vec{F}$ is conservative (b) Find Scalar potential function $\emptyset$ such that $\vec{F} = \nabla\emptyset$. (c) Find the work done by $\vec{F}$ in moving a particle from $A(1,2,0)$ to $B(2,2,1)$ along the straight line AB.	
(c)	Use Divergence theorem to evaluate $\iint_s \vec{f}.\vec{ds}$ where $\vec{f} = 4x\hat{i} - 2y^2\hat{j} + z^2\hat{k}$ and s is the surface of the region $x^2+y^2 = 4$, $z = 3$ above xy plane.	

(M)