SOMAIYA
VIDYAVIHAR UNIVERSITY

	Semester: January 2022 – May 2022		
Maximum Marks: 100	Examination: ESE Examination		Duration: 3hr
Programme code: 03 Programme: B. Tech Electronics and Telecommunication Engineering		Class: SY	Semester:IV(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: EXTC	
Course Code: 116U03C401	Name of the Course: Mathematics for Communication Engineering –II		
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary			

Question No.		Max. Marks
Q1	Attempt any TWO questions out of the following.	14
i)	Express $p(x) = 6 + 11x + 6x^2$, as a linear combination of the following $p_1 = 2 + x + 4x^2, p_2 = 1 - x + 3x^2 , p_3 = 3 + 2x + 5x^2$	
ii)	Construct an orthonormal basis of R^3 applying Gram –Schmidt process to $S = \{(3,0,4), (-1,0,7), (2,9,11)\}$	
iii)	Show that $S = \{(3,1,1), (2,0,-1), (4,2,1)\}$ is linearly independent.	
Q2 A	Evaluate $\oint_C \frac{z+3}{z^2-2z+5}$, where C is $\|z-1\| = 1$	4
Q2 B	Attempt any THREE questions out of the following.	21
i)	Evaluate $\int_C \frac{z+3}{2z^2+3z-2} dz$, Where C is circle (i) $\|z\| = 1/4$ (ii) $\|z - i\| = 2$	
ii)	Find Laurent's series which represents the function $f(z) = \frac{4z+3}{z(z+2)(z-3)}$ when $2 < \|z\| < 3$	
iii)	Using residue theorem evaluate $\int_0^\pi \frac{1}{3+2\cos\theta} d\theta$,	
iv)	Evaluate $\int_0^{1+i} (x^2 + iy)dz$, along the path $y = x^2$.	
v)	Using residue theorem evaluate $\int_C \frac{z^2}{(z-1)^2(z-2)} dz$, where C is $\|z\| = 2.5$	

Q3 A	**Attempt any TWO questions out of the following.**
i)	If $\sum(x-\bar{x})^2 = 136$, $\sum(y-\bar{y})^2 = 138$, $\sum(x-\bar{x})(y-\bar{y}) = 122$ Find correlation coefficients between x and y.
ii)	If X is normal variate with mean 120 and standard deviation 10. Find the C such that $P(X < C) = 0.02$.
iii)	The Probability density function of a random Variables x is represented by the following $\quad f(x) = K(1+x)$, $\quad 2 \leq x \geq 5$ Find K and expection of x

Q3 B	**Attempt any FOUR questions out of the following.**
i)	Find the coefficient of Rank correlation for the following data

X	32	55	49	60	43	37	43	49	10	20
Y	40	30	70	20	30	50	72	60	45	25

ii)	The Marks obtained in mathematics by 1000 students is normally distributed with mean 70 and Standard deviation 5. I) Determine how many students got marks between 60 and 75 II) What was the highest mark obtained by the lowest 10 % of students?

iii) A random variable X has the following probability distrubutaion

X	1	2	3	4	5	6	7
p(x)	k	2k	3k	k^2	k^2+k	$2k^2$	$4k^2$

(i) Find the constant k.
(ii) Find mean & Variance
(iii) Find c.d.f. of random variable X
(iv) Find $p(2 < x \leq 6)$

iv) Find the M.G.F of the following distribution

X	0	1	2
$P(X = x)$	1/3	1/3	1/3

Find first four moments about the origin.

v) Find the equations of line of regression y on x for the following data

x	5	6	7	8	9	10	11
y	11	14	14	15	12	17	16

also find y for x=15.

Q4 A		4
	Find all basic solutions to the below problem. Which of them basic feasible solutions, non-degenerate, infeasible basic and optimal basic feasible solutions?	

maximise $z = x_1 + x_2 + 3x_3$

Subject to $x_1 + 2x_2 + 3x_3 = 9$

$$3x_1 + 2x_2 + 2x_3 = 15$$

Where $x_1, x_2, x_3 \geq 0$

<div align="center">OR</div>

Convert the following L.P.P in the standard form.
Minimise $z = -3x_1 + 2x_2 + x_3$

Subject to $x_1 - 3x_2 + 2x_3 < 13$

$$-4x_1 + 2x_2 + x_3 > 15$$

$$2x_1 - x_3 = -1$$

Where $x_1, x_2 \geq 0$

Q4 B	**Attempt any THREE questions out of the following.**	21
i)		

Solve the following L.P.P. by Simplex method
Maximise $z = 6x_1 - 2x_2 + 3x_3$
Subject to $2x_1 - x_2 + 2x_3 \leq 2$

$$x_1 + 4x_3 \leq 4$$

Where $x_1, x_2, x_3 \geq 0$

ii)		

Using Penalty (Big M) method solve the following LPP

Minimise $z = 2x_1 + 3x_2$

Subject to $x_1 + x_2 \geq 5$

$$x_1 + 2x_2 \geq 6$$

$$x_1, x_2 \geq 0$$

iii)		

Using the method of Lagrange's Multiplier solve the following N.L.P.P.
Optimize $z = 10x_1 + 8x_2 + 6x_3 + 2x_1^2 + x_2^2 + 3x_3^2 - 100$

Subject to $x_1 + x_2 + x_3 = 20$

where $x_1, x_2, x_3 \geq 0$

iv)		

Using the Kuhn-Tucker conditions, solve the following N.L.P.P.
Maximise $z = -x_1^2 - x_2^2 + 8x_1 + 10x_2$
Subject to $3x_1 + 2x_2 \leq 6$

where $x_1, x_2 \geq 0$