* Harmonic analysis + In most of practical egs. what we get is not the funct - fca) but we have the numerical data i.e. the value of the funct of independent variables. The process of finding the foursier series for the available numerical data is called harmonic analysis. Let y= fcx) be periodic funct of period 21 defined in the range [0,21]. Let (æ; y;) i=0,1,2,-.,m-1 be the given set of values where sei are equispaced. the range [0,21] is divided into 'm' equal parts given by pt's 20, 2, 2, --, 2m. interval width = 2L = 26 + 2Li The coefficients as, an, in the Fourier series are obtained by applying trapezoidal rule of approximaté integrat me get, [Trapezoidel rule: j fox) dx = Ax [fox)+2[fox)+ ao = 1 32 y dx = 1 21 [40 + 41 + 42 + ... + 4m+ 2 [mean value of y = fox) in (0,21)]

an= 1 1 y cos(nTree) de = 1 21 mt y; cos(nTzei) - 2 md y; cos(prize) an - 2 [mean value of y cos (nITX) in [0,2] & bn= 1 (y sin(nTx) de = 1 2L & yisin(nITzei). bn = 2 [Mean value of y sin(nTx) in [924] the Fourier series is given by $f(\alpha) = \frac{\alpha_0}{2} + \frac{m}{2} \left[\frac{\alpha_0}{\alpha_0} \left(\frac{\alpha_0}{\alpha_0} \right) + \frac{\beta_0}{\alpha_0} \left(\frac{\alpha_0}{\alpha_0} \right) \right]$ Note - 1] The Fourier series of (x; y;) iz 0, 1, 2, ..., m in the interval [0,21] with period 2T is given by, y = f(x) = ao + 5 [ancosnox + bn sinm] $\frac{1}{2}$ $\frac{1}{2}$ cohere fourier coefficients are a = 2 [Mean value of y=fox) in [0,21] an = 2 [Mean value of y cos(nx) in [0,21] bn = 2 [Mean value of ysinch x) in [0,21]) ay cos(OTR) + b, sin(ITX) is couled fundamental / 1st harmonic. The term on cos(21/1x) + b2 sin(21/1x) 15

	called 2 nd harmonic 4 so on.
3	The amplitude of nth harmonic is + Jan + bn2
	1 1 1 1 1 2 8 C 0 S
4	% of nth harmonic = Amplitude of nth harmonic!
	Amplitude of 1st harmonic
	X 100
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
eg(Dobtain the constant term of the coeffici-
0	ents of 1st cosine & sine terms in the
	expansion of y from the table
1000	2 0 1 2 3 4 5
	J 9 18 24 28 26 20
	Here period = 6 we have,
	$(0,2L) = (0,6) \Rightarrow L=3$
7711	: OTTX = OTTX
	EL 3
	the Fourier series to represent y is
	(0,5) is $y = \frac{1}{2} a_0 + \alpha_1 \cos \alpha_1 \sqrt{x} + b_1 \sin \alpha_2$
Acasers !	+ as cos 2177 + b2 sin(2177)+
- de roi	covie al paipos moste o 30 11 pote 13
(3) -1	a - 2 [mean value of y in (0,5)]
	ay - 2 [mean value of 4 costTx in (0,5)]
2021	1981 001 00 00 100 100 00
	b, = 2 [mean value of y sinnx in (0,5)]
1000	the the south and the set the set
Roll	i.e. ao = 2 <u>Ey</u>
	n of or modern T
	$a_1 = 2 \leq 4 \cos \pi u_3$
	2
	$b_1 = 2 $ $\leq 4 $ $sin(truly)$
	n

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	æ	TT213	y man	y sin(17213)	y · cos(TXI)				
	0	0	9	0	9				
nd+ not +	1	7113	18	15.589	9				
	2	217/3	24	20.785	-12				
harmonie	3	3113=1	28	100000000000000000000000000000000000000	-28				
Hommus 4	4	4 T/3	26	-22.517	-13				
	5	5113	20	-17.321					
			Z=125	2 = -3.404	5 =-25				
sil to a s	n=	6 0 00	Jamoler 10 0		Chra H				
9116			- 2×	125 = 41.66	N/S				
	$a_0 = 229 = 2 \times 125 = 41.66$								
	a1 - 2 & y · cos(Tal3) - 2/x125 - 5/186								
	D 20 400 416 416								
		= 2 × -2	5	- 8.33					
		8 = 16		(18.0)					
	b	2 5 ysi							
	$b_1 = 2 \le y \sin(\pi x l_3) = -3.404 = -1.15$								
zi v l					The second second				
	7	20 80 .	0 3300	3 - 1.15 sin	3				
E	2.167	+ (20 00)		A 81 (5 0	2				
					and the same				

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2	The	followir	g table	giv	es var	ial-"	of be	Moduc	
	curr	ent over	a per	od.	2 20		-		
	t sec) 1	6	T13	T/2	2113	576	
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	The second secon	3 2 1-10 -	CONTRACTOR OF THE PERSON NAMED IN COLUMN 2 IS NOT THE OWNER.	THE RESERVE AND PERSONS NAMED IN	1988th	STREET, STREET			
	Sh	ow that	there i	5 a	direct	cur	ment s	art	
	of o	.75 amp	in voni	able	currer	rt f	obtai	n the	
	amp	litude of	e 1st 1	narr	norric.				
1	Here	n=6	period	T			3 4 4		
	-·. (o	,21) = ((O,T)	>	गाम्भ	. =	OUTE		
	・手が	(= 100			L		T/2		
	ao:	= 2 × M	lean valu	e of	A				
15. 7-300	ay =	2 × 1	Near vo	Jue (of Ax	COS(TI	FIE		
1000	b, =	2x Me	en volue	e of	AKE	sin (r	TE)	1 96	
10011	20112	0 120	05.0 Pa	8 3	140 128	0	172	o t	
	t	211t/T	A	A	cos(Ht/	T/2)	A SINGITE	=/T/2)	
	0	0	1.98		1.98	123.	0		
Smark.	TIE	11/3	1.30	12 (0.65	ort	1.1258		
	T13	21/3	1.05	-	0.525	ruip	0.909		
one group	T/2	Traise	1.30	0) -	1.30	- (3)	40		
	27/3	411/3	-088	0	.44		0.762		
	5716	5T1/3	-0.25	104	0.125	ski	02165		
To	stal	(6)2(9	4.5	10	1.12	ret a	3.0133		
(D(0) (t	o and	1000 \$ 1 A	solice -	100	979 KIS	- 3	n		
	··ans	2 x 2	A	2×4	5 =1	.5			
		nier le 6			2/6		Project l		
	Q = 2 x & A cos(211t/r) = 2 x1 12 = 0.373								
	Kar	her ten	6, 00	514	6	THE SE			
	b, .	= 2× 5	A sincett	E/T)	- 2× 3	0133	= 1.00	24.	
			6		6				
Winn.		BEAT ST	100000000000000000000000000000000000000		A PROPERTY AND A PROP				

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periodelic	Required series representat is
	A = a0 + 01 COS 2 TIL + b, Sin 2 TIL +
3/19/18	TO THE PARTY OF TH
28 (7025	A = 0.75 + 0.373 cos211t + 1.004 sin211+
	where direct current = 0.75 amp
of man	amplitude of 1st harmonic is = Jai+ 6,2
3/47 (310-7	Signature of the Management
	$= \int (0.373)^2 + (1.004)^2$
	HO = NOTE (180) = (18,09 C)
	=1.07.
	A 90, Siden, count & C tob
3	Find 1st two rammonics of the Fourier
	series for y from the data.
20°	30° 60° 90° 120° 150° 180° 210° 240° 270°
7 2.34	3.01 3.69 4.18 3.69 222 0.65
	A 330° THE THE A STATE OF THE S
1.19	1.64 801 Box and Links and box monit
18201	the Fourier series expans upto 2nd harmoni
FOU	is given by,
-	$\frac{4\cos z}{2} = \frac{a_0}{2} + (a_1\cos x + b_1\sin x) + (a_2\cos x + b_3\sin x)$
18 25	We will form the table
1.51	(0,21) = (0,360) 7 -
881	$a_0 = 2 \times \text{mean value of } f(x) \text{ in } (0, 1)$
	2
	b, = 2x mean value of 4 sinx
	az = 2 × mean volve of y cosen
31	b2 = 2x mean value of ysinen
0.00.1	E E SO DE NO DE LA
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1	20		y = f(x)	ycosz	y coszx	ysing ball	y. sinna			
1	00	2	34	2.34	0 40 11-40	0 0	0			
	300	0.00	.01	2.6067	1.505	1.505	2.6067			
1		3	69	1.845	-1.845	3.1955	3.1955			
_	600	415		o prium	1-4.15	4.15	0			
	900			-1.845	1-1.845	3.1955	-3.1955			
	1500	2	-20	1-1.9052	1.1100	sectification	-1.9052			
	1800	0	83	-0.083	0.083	0 to 10	0			
-	1	0:		-0-4417	0-225	-0.255	6.4417			
2	210°		88	-0.44	0-44	-0.7621	0-7621			
	2400	1.0		0	-1.09	-1.09	0			
	2700	1,10		0.595	-0.595	-1.0305	-1:0305			
	3000	1.6		1.4202	0.82	-0.82	-1.4202			
	3300			5=4.092	5=-3.862	5=9.1884	5 = -0:5454			
_	-) = 4	4.473							
-	n		(16 = 2 x 2	fra - 2	x24.473 -4	1.078			
-	n=	1 2	,	6 - 21 2	n	12				
-		- 1			11:042	= 0.683				
	a	7	12	3 900 1 -	<u>-4.092</u>	- 502				
				(10)	~ ~ ~	2: 64:27				
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				12		1.6211				
22)		0, -	2	x Zysin	7 =	,				
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	1	e°	20	300 600	900 1200	150° 180°	210 240			
		cse	7.0	8.0 7.2	5.6 36	17 0.5	0.7			
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	270° 300° 330° 2.5 4.7 6.8									
	2.5 4.1									

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0000		Find the coefficient of sinzx in the Fourier series representat									
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