Part-A

5) Thosperties of correlation coefficients

Correlation coefficient: ... sil contabrios to troisillos soit The correlation coefficient is a statistical measure of strength of the relationship between the relative moments of two variables.

origin of scale of measurement

2) There are 4 types of correlation: 21 nothologico 15-1 100

1) Positive and Negative correlation.

the re-1, correlation is reflect and -ve correlation

2) Simple and multiple correlation.

3 Hartial and total correlation.

4) Linear and non-linear correlation.

@ Geven,

3) Given,

4

Xxy=216 , Xx2=102 , Xy2=441

N=12,  $G_{x}=2.5$ ,  $G_{y}=3.6$ YXXXX Ydoxx 471 Xx4=64

 $8 = \frac{2xy}{n \cdot 6x \cdot 6y} = \frac{64}{12 \times 2.5 \times 3.6}$  FA23P.0 =  $\frac{318}{431 \cdot PEG} = r$ 

 $Y = \frac{64}{108} = 0.59259$ 

N=10 , 6, = 5.4 , 6, = 6.0

Rank correlation =  $f = 1 - \frac{650^2}{}$ 

Where, S = Rank coefficient of correlation

 $D^2 = sum of equares of differences of two ranks = <math>X(x-y)^2$ 334.8 = 0.1971

N = No. of paired observations.

5) Properties of correlation coefficient:

A-Just A

1) The coefficient of correlation lies blo 1 and 1, symbolically we can write it as -1 < x < 1 (or) | | | | | | |

The coefficient of correlation is independent of the change of origin of scale of measurement.

3 If  $Y=\pm$ , correlation is perfect and the correlation.

4) If r=-1, correlation is perfect and -ve correlation

DIF r=0, then there is no relationship between the variable.

9 Given

Dinear and non-linear correlation.

Xxy = 216,  $Xx^2 = 102$ ,  $Xy^2 = 471$ 

 $T = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}} = \frac{216}{\sqrt{102 \times 471}}$  2.8 = 0 1.8 = 0 1.8 = 0

Y = 216 219.184 = 0.98547 AD VXX = 6

F) Given,

 $r = \frac{6H}{300} = 0$  Equation

n=10 ,  $G_x = 5.4$  ,  $G_y = 6.2$ 

 $x = \frac{\sum xy}{n \times G_{x} \times G_{y}} = \frac{66}{10 \times 5.4 \times 6.2}$ 

40 + 200 = 3000 40 + 200 = 30000 = 3000 = 3000 = 3000 = 3000 = 3000 = 3000 = 3000 = 3000 = 3000

properties of rank correlation:

1) The value of 9 lies between -1 and 1 then this is a perfect rank correlation.

2) If J=1, there is complete agreement in the order if the vanks and the direction of the rank is same

3 If f = -1, then there is complete disagreement in the order of ranks and they are in apposite direction.

10) Given,

N=8; Xx = 544 | Xy = 552

Xxy = 37560

Covariance 
$$(x,y) = \frac{1}{n} \left( \sum xy - \left( \sum x \right) \left( \sum y \right) \right)$$

$$Cov(x,y) = \frac{1}{8}(34566 - (544)(552))$$

$$=\frac{1}{8}(37560-37536)$$

1 0-542 0-542 1

d Given, bxy =0.85; bx =0.89, 62=3

$$Y = \pm \sqrt{bxy X byx}$$

Y=0.87

1) 
$$Y = \pm \sqrt{bxy x byx}$$
10)  $byx = r(6y/6x)$ 

$$87 = \sqrt{0.7565}$$

$$\sqrt{2} = \frac{0.89 \times 3}{0.87}$$

"These formulas are based on regression, Which is not yet taught for some sections, so Just remember these formulas for CIE-L

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Mathematics	Statistics	x (Rank of maths)	y (Rank of statistics)	D=x-y  s	1521
85	93	2	. 110/min	NA S	S ve Ar
60	75	4	3	1	1 1 1
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950 m Jn	die 908 m	Complete	a smith	-1	), Ir &
	, T = 1			1	r To

8) Properties of reals correlation:

ZD2=4

$$S = 1 - \frac{6(\Sigma D^2)}{n(n^2 - 1)}$$

$$J = 0.8$$
. Obers =  $VX \vec{X}$ 

Given Coefficient of correlation: is a perfect rank correlation.

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c		V	
6	2		
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these formulas de cietl.

×	У	X=(x-x)	y=(y-\bar{y})	XY	X2	y2
12	(Ma)(	2- 50	73.572 =	7.144	4	12.75
9	8	-1	-2.428	2.428	3	5-895
8	6 6	8 FE 2 - 000	- 4-428	8.856	4	19-60
10	9	0,5	-1-428	(v. jvos	0	2.039
11	11	1	0.532	0.572	1	0.327
13	12	3	1.572	4.716	9 44 .	2.471
717	13	-3 (-3)	2.572	-7-71G	* * 1 +	6-615

Xy = 73 Xxy = 16  $Xx^2 = 88$   $Xy^2 = 49.983$ 

$$\bar{x} = \frac{Xx_1}{n} = \frac{70}{7} = 10$$

$$\overline{y} = \underline{Zy_1} = \frac{73}{7} = 40.438$$

$$\overline{x} = \frac{\overline{X}x_1}{n} = \frac{70}{7} = 10$$

$$\overline{x} = \frac{\overline{X}x_2}{\sqrt{x}} = \frac{16}{\sqrt{x}} = 0.5092$$

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-	
100	ì

A (x)	s (y)	X	У	a xy	X2	y2
45	35	7-16	-31	496	256	961
70	<b>40</b>	9	24	216	81	576
65 Maritalana	70	1519 405 nex	:04	16	16	16
30	401 00%	-31	-26		961	676
90	95	29	29	806		
40 10	40	4) vol. 33 -34	-26		844	11841
5,50	80	-11	-26	546	441	<b>6</b> 76
QA4 <b>7</b> 5	80 3	ाउस्य वद	14	-154	121	196
85	180 a	24	14	196	196	496
60	50	-0-1 ee	-16	336 1G	576 5 1	196 256

$$\frac{2}{N} = \frac{2}{N} = \frac{640}{40} = 64$$

$$\frac{2}{N} = \frac{660}{10} = 66$$

$$\frac{2}{N} = \frac{660}{10} = 66$$

XXV=3316.5 XX = 1032 81 = 5743 5

T= 0.828. : Given correlation coeff is perfect blow two variably

Write Part-A 8th question answer for properties of rank correlation.

4)

adaa.F

 $- PQ = \frac{1}{2S} = \frac{Q}{2S^2} = \frac{2}{2S}$ Write part-A 5th question answer for properties correlation coefficient

_				J. Operaid	Correlation	coefficie
×	y	X	У	e xy	X2	y2
100	98	0.56	2.56	1-43	0.31	6.55
101	99	1.56	3.56	5-55	2.43	12.67
102	99	2.56	3.50	9-11	6.55	12.67
102	97	2.56	1.56	3.99	6.55	2.43
100	95	0.56	-0.44	-0.24	0.31	0.19
99	92	-0.44	-3.44	1.51	0.19	11.83
97	95	-9.44	-0.44	1.07	5.95	0.19
98	94	- 1.44	-1.44	2.07	2.07	2.07
96	90	-3.44	-5.44	18. 71	11.83	29.59

IX= 895 IY= 859

Xxy=43.9 Xx2=36.19 Xy278.2

$$\bar{\chi} = \frac{\chi_1}{n} = \frac{895}{9} = 99.44$$

$$y = \frac{xy_1}{n} = \frac{859}{9} = 95.44$$
  $y = 0.812$ 

$$x = \frac{x}{n} = \frac{895}{9} = 99.44$$
 $y = \frac{x}{\sqrt{x^2 x^2}} = \frac{43.2}{\sqrt{36.19 \times 78.2}} = \frac{43.2}{53.198}$ 

1-Given coefficient of correlation is Perfecte between two Variables.

5) Write part - A 8th question answer for the properties of rank correlation

100	and the state of the		the of	Charte Contract		_
×	У.,	×	У	11 XY	X2	y2_
15	85	-14	-32.25	1451.5	196	1040 0625
18	93	-11	11-24.25	266.75	121	588-0625
20	95 a	-9	-22.25	200.25	81	495 - 0625
24	105	-5	-12. 25	61.25	25 Ot	150.0625
30	120	1	2.75	2.75	1	7.5625
35	130 H 3 P X 01948	- 6. VX	12.75	<b>46.5</b>	OLOG TAKE	162.5625
40	150	11	32.75	360.25	121	1072 5625
50	160	21	42.75	897.75	014417	1827.5625

11000

Fart - 1 gib question ander -for properties of renk conflation.

$$\overline{x} = \frac{xx}{n} = \frac{1xx}{8} = \overline{x}$$

White part A 5th question on some for properties correlation coefficient.

$$\frac{7}{8} \text{ With } \frac{1}{9} = \frac{1}{8} =$$

0.56 2.56 1.43 0.31 . 6.56

$$Y = \frac{\Sigma_{xy}}{\sqrt{\Sigma_{x^2} \Sigma_{y^2}}} = \frac{2316.5}{2336.89} = 0.99127$$

1L0 120 400 - 1000

Age (x)	Mid value (m)	x _m-A	XENOR	Blind x100000 Blind y y2 Xy
0-10	5	(4x)	1 16	55 x100000 = 55 -130.375 16997-64 521.5
10-20	15	-3 1	9	40 x100000 = 67 -118.375 14012.64 355-125
20-30	<b>2</b> 5	-2	4	40 x10000 = 100 - 85.375 7288.89 170.75
30-40	35	-1	1	40 ×100000=111 -74.375 5531.64 74.375
40 - 50	45)A	0	0	36 ×100000= 150 -35.375 1251.39 0
50-60	55	1 8	1	22 ×100000=200 14-625 213-89 14-625
60 - 70	65	2	4	18 ×100000 = 300 114. 625 13138. 89 229. 25
70-80	75	3	9	15 x100000=500 314.625 98988.89 943.875.
1			Z×2=44	Zy=1483 Zy=157423.87

 $y = \frac{y_1}{y_2} = \frac{1483}{8} = 185.375$ 

13

6)

Zxy = 2309.5

$$V = \frac{21 \times y}{\sqrt{2} \times 2} = \frac{2309.5}{\sqrt{44 \times 157423.87}}$$

$$= \frac{21 \times y}{\sqrt{44 \times 157423.87}}$$

Statement Miner to self-open 2631.853 = 0.8775.48 - A- troop skill of

Write part A 5th question Answer for properties of correlation coeff.

No

31

16

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01

3) Write part A 8th	question for prop	erties of rank	c Correl	ation.
2-L - MATHS(x) 2-1-		D(x-y)	- 3	D2 0
		-1 2-		1-01
act to so-chool and AML-		-2	e.	4
ar-011 ps 25 2 2 2 2 2 3 - 0	ot report x coods	2		4
SEE 14 19 14 2 2 2 3 4 - 1	11 re(xxx) - CP. 5 90000	-1		1
10 L511 01 2/2 3 - 0	at 3000tx 80	2	V(3)	4
aca it to 610 250 411	1000 × 1000 P = 200	1 -3		90.08
25 . P. 18 . 18 . 25 ALL O	05 = H00001 . 3L	10 6	39	000
atamir pa saparasa rita	40 0100LX 01	P-2 8	1 2 7	48 0%
A Server Live		3		9
40	8	2		4

 $\int = 1 - \frac{6(\Sigma D^2)}{N(N^2 - 1)} = 1 - \frac{6 \times 400}{990} = \frac{75}{99}$ 15 - ECHT ST ACK 15 TUDE OF

eve 394 - 8814 - 10 XD2 = 40

S=0.7575

10) Write part - A - 8th question Answer for properties of rank correlation.

×	Rank (x)	У	Rank (y)	D = G(+y)	. D211
48	8	13	55	2.5	6.25
33	6	13	5.5	0.5	0.25
40	7	24	10	-3	9
9	1	6	2.5	- 1.5	2.25
16	3	15	7	- 4	16
65	3	4	1	2	4
24		20	9	1	1
16	5	9	4	1	1
	3	6	8.5	0.5	0.25
54	9	19	8	4	1.

Bolemon dans to soft ZD24 AT sousman mother of A - Jean of stall (8

[Rank of 16 inx is 3 because 16 is repeated three times so the ranks 2, 3, 4 average is 3, and it will the rank for 16.

similarly, rank of 6 in y is 2.5 because 6 is repeated two times so, the ranks of 6 are 2 and 3, its average is 2.5.

 $S = 1 - 6 \left[ 2D^2 + \frac{1}{12} (m^3 - m) + \frac{1}{2} (m^3 - m) + \frac{1}{12} (m^3 - m) \right]$   $N(N^2 - 1) = 1$ 

This is just an explination, no need to write in exam.

: 16 is repeated 3 times in x, hence m=3, and 13, 6 are repeated twice in y, hence m=2.

 $\int = 1 - 6 \left[ \frac{141}{12} + \frac{1}{12} (3^3 - 3) + \frac{1}{12} (2^3 - 2) + \frac{1}{12} (2^3 - 2) \right]$ 

 $S = 1 - \frac{6(41 + 2 + 3 + \frac{1}{2})}{990}$ 

 $J = 1 - \frac{6(44)}{990}$  31

20年136

S=1-0.2667

S= 0.733. (≤0) +1 = }

J= 1 - (436)

J= 1 - 816 - L = 2

Write part-A 8#	question answer	for properties of	rank Correlation.
		5 (21.11)	Dr
peated three time so	ecause in is re-	6	8 3031
at the same and the	i kno s ei	8-8	G4
and the tops and a	માત્રન ટહા	y ai o 40 Mar	r , continue
at a see	ove 41, Elemos	50 6 0 0 0 M	10° Osth .os
5	5	0	0
or bad on [Gn_5m) 1 1	(m- °4) + + (m-	1) # + 7 Z Z 3 - T	= 11
ni Hru moxe 7	2 (1-34)	. 5	25
8	6	2	4
50 2 q2 600 , s	ent social. X of	perted 3 times.	b. 1 hospital
40	11		1
44 (e 2e, ) & 1	(5-15) (5-15) (6-15)	1 + 44 0 - L	16
12	9 000	3	9
13	14	1	1
44	(2) + 2 + e +	9=1-6(41	4
15	16	-1	1
16	13	1 = 1 = 6( 44)	9

 $\int = 1 - \frac{G(XD^2)}{n(n^2-1)}$   $\int = 1 - \frac{G(A36)}{16 \times 255}$   $\int = 1 - \frac{816}{4080} = 1 - 0.2$   $\int = 0.8$ 

g Write	Part-A	5#	question	answer	for	propertie	of	correlation	toefficient.

10 - F-169	o is and	off xolina -	molyalarma	D = (x-y)	Dt. 1 ()
65	× 68 ···	8	5.5	2.5	6.25
263	18 66 31	10	18-5	1.5	012.25
67	P# 68 0 6	6	5.5	6.5	0.25
64	1 65	90	10.5	₫.5	3.25
<b>. . . . . . . . . .</b>	€ 69 es	4.5	3.	1.5	2.25
, 62	51 GG 31	11 21	8.5	2.5	6.25
70	120 68 140 -	23-	5.5	<u>1</u> 3.5	19.25
66	× 65	XZ 7	10-5	14 2.5 AL	12.25
68	71	4.5 VXZ =	4 68		12.25
69 =	- 68 - 88 - 68368	3 143	5.5	-2.5	6.25
71	70	1	2 91-3	01 -15 = 1	. 4

JD2=63.5

$$g = 1 - 6\left(20^{2} + \frac{1}{12}(m^{3} - m) + \frac{1}{12}(m^{3} - m) + \frac{1}{12}(m^{3} - m) + \frac{1}{12}(m^{3} - m)\right)$$

$$n(n^{2} - 1)$$

$$J = 1 - 6(63.5 + \frac{1}{12}(93-2 + 43-4 + 23-2 + 23-2))$$

$$J = 1 - 6(63.5 + 6.5)$$

$$11(120)$$

$$J = 1 - 6(63.5 + 6.5)$$

$$1320$$

$$J = 1 - \frac{6(63.5 + 6.5)}{43.20} \pm 1 - 0.31818$$

= 12 0.68182.

1000	5.8.	ax	y 8	хУ	8 ×2	y2
10	·13	3-9	-5 <sub>01</sub>	45	81	25
45	18	-7	00	•0	49	F.Ø
18	12	े त्य	- 6 p	6	701	36
24	25	5	4.64	35	25	49
23	30	248	1211	48	16	144
27	ot	8	-8 %	- 64	64	64

$$\Xi x = 114$$
  $\Xi y = 108$   $\Xi x = 318$ 

$$\bar{x} = \frac{2x_1}{n} = \frac{114}{6} = 19$$

$$\bar{y} = \frac{2x_1}{n} = \frac{408}{6} = 18$$

$$x = \frac{2xy}{\sqrt{2x_2}} = \frac{70}{\sqrt{236x318}} = \frac{70}{273.9489}$$

$$y = \frac{2y_1}{n} = \frac{408}{6} = 18$$

$$y = 0.255$$

For the properties of rank correlation write part A 8th g Answer.

Rank-A (x)	Rank-B	Rank-C (z)	Dxy	Dyz	Dez	Dxy 2	Dyz <sup>2</sup>	Dx2
1	3	6 113	-2	-3	-5	4	9	25
6	5	45,=00	1	and a	2	1	1	4
5	8	95-16	23 8	10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	244	q	1	16
10	4	8	6	-4	g			
3 1	7	1 (11-2	1) 4 · (1)	6	9 + 40 X	36	36	4
2	40	2	-8 (p = 14)	8	0	64	64	0
4	2	1-3-66	1 1 - 11	+ 6-36	1 - 3 ·	0)0 _	1-1	
9	1	10	8 - 8	_9	-1	64	1	1
7	6	5,131	-1 - 1	<b>1</b> (a.	\$ 200	10-1	1 81	3
8	9	7	-1	a	4320	1	4	4

SIA ZD2 = 200 ZD2 = 214 ZD2 = 60

$$\int_{xy} = 1 - \frac{6(2D_{xy}^2)}{n(n^2 - 4)} = 1 - \frac{6(200)}{990} = -\frac{1}{33} = -0.2121$$

$$\int_{XZ} = 1 - \frac{G(ZD_{NZ^2})}{h(h^2 - 1)} = \frac{1}{410} - \frac{6(60)}{410} + \frac{1}{41} = 0.6363.$$

: I'xz is maximum, we conclude that the pair of judges A,c has the nearest approch to common linkings in music

3) For the properties of rank correlation - Write part - A 8th g answer

×	У	x	У	Dd=(474)	d2
68	GQ.	4	5	_4	1
64	4458-148 =	1118+11+	N# Gro	- x X	1
<b>7</b> 5	68	.(141)NG		-1	1
50	45	9	10	sh 3 (v	1 Jus
ताने हिंहर <i>वत</i> <b>ध्य</b>	81 .	6	1 syllaps	5 Tonnot be 1	25 502
80	60	4	6	-5	25
<del>1</del> 5	68	2.5	3.5	-1	1
40	48	10 (A) S	1 - < s	1 8 2019H	1
55	50	8	8	6	0
64,000	COFF OF	10 697 ( E	- 3 3	police cap delig	Similar .

$$J = 1 - \frac{G(XD^2 + \frac{1}{12}(2^3 - 2) + \frac{1}{12}(2^3 - 2)) + \frac{1}{12}(3^2 - 2^3)}{990}$$
975 in x repeated

$$f = 1 - \frac{6(72 + \frac{1}{3} + \frac{1}{3} + \frac{2}{3})}{990} = 1 - \frac{6(75)}{990}$$

2 times so m=2 64 repeated 3times

50 m=3.

68 in repeated 2 they So m=2

4) Proofs- Let x and y be the derivations of x and y series
from their mean.

Let 6x and 6y be their respective standard deviation

Let - 
$$\mathbb{Z}\left(\frac{x}{G_{x}} + \frac{y}{G_{y}}\right)^{2} = \mathbb{Z}\left(\frac{x^{2}}{G_{x}^{2}} + \frac{y^{2}}{G_{y}^{2}} + \frac{\partial xy}{G_{x}G_{y}}\right) = \frac{\mathbb{Z}x^{2}}{G_{x}^{2}} + \frac{\mathbb{Z}y^{2}}{G_{y}^{2}} + \frac{\mathbb{Z}xy}{G_{x}G_{y}} \rightarrow \mathbb{Z}$$

But 
$$\frac{Z_{x^2}}{G_{x^2}} = N$$
. Similarly  $\frac{Z_{y^2}}{G_{y^2}} = N \rightarrow 0$ .

From (1), (2) and (3)

$$Z\left[\frac{x}{G_x} + \frac{y}{G_y}\right]^2 = N + N + 2Nr = 2N + 2Nr$$

$$= 2N(1+r).$$

But  $\left(\frac{x}{G_x} + \frac{y}{G_y}\right)^2$  is the sum of squares of real quantities and as Such it cannot be negative

Hence of cannot be less than -1

Similarly, by expanding  $\mathbb{E}\left(\frac{x}{c_{x}} - \frac{y}{c_{y}}\right)^{2}$  fit can be shown that  $\mathbb{E}\left(\frac{x}{c_{x}} - \frac{y}{c_{y}}\right)^{2} = 2N(1-r)$ , this can't be negative so.  $2N(1-r) \ge 0$ 

:. From ( & 6

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omide bolowing 30

 $-1 \le v \le 1$ , Hence proved.

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В	~	•,,
		_

×	У	D=(x-y)	D2
1	10	-9	81
2	7	-5	25
3	2	1	1
4	G	-2	4
5	4	1	1
G	8	-2	4
7	3	4	16
8	1	7	49
9	11	-2	4
10	15	-5	25
11	9	2	4
12	5	7	49
13	14	-1	1
14	42	2	4
45	13.	2	4

 $\sum D^2 = 272,$ 

$$\int = 1 - \frac{6(\Sigma D^2)}{15(224)} = 1 - \frac{6(272)}{15(224)}$$