 SECOND REVISION TEST - 2025

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STD: XI THIRUVALLUR DISTRICT

SUBJECT: BUSINESS MATHEMATICS AND STATISTICS

part - I

I

1. c) 2
2. b) 0
3. c) 5
4. b) 2^n
5. b) $4x+1=0$
6. a) $\tan^{-1}\left(\frac{\sqrt{33}}{5}\right)$
7. c) $\frac{1}{4}$
8. d) $\sin 50°$
9. b) (0, 0)
10. c) x^2+x+1
11. a) $2xe^{x^2}$
12. c) face value
13. a) An endowment fund to give scholarship the students
14. d) Q_2
15. b) 1
16. d) $\frac{1}{13}$
17. d) Two regression lines
18. d) positive
19. a) Minimize the total project duration
20. d) 15

21.) $\begin{vmatrix} x & x+1 \\ x-1 & x \end{vmatrix} = x^2 - (x-1)(x+1) = x^2 - (x^2-1^2) = \cancel{x^2} - \cancel{x^2} + 1 = 1$

22.) $7P_5 = 7\times6\times5\times4\times3 = 210\times12 = 2520$

23.) $y^2 = 20x$ | $4a = 20$ | Vertex $V(0,0)$

$y^2 = 4ax$ | $\boxed{a=5}$ | Focus $F(a,0) = F(5,0)$

24.) $\lim\limits_{x\to\infty} \frac{2x+5}{x^2+3x+9} = \lim\limits_{x\to\infty} \frac{\cancel{x}\cdot(2+\frac{5}{x})}{x^{\cancel{2}}(1+\frac{3}{x}+\frac{9}{x^2})} = \lim\limits_{x\to\infty} \frac{\frac{1}{x}\cdot(2+\frac{5}{x})}{1+\frac{3}{x}+\frac{9}{x^2}}$

$= \frac{\frac{1}{\infty}\cdot(2+\frac{5}{\infty})}{1+\frac{3}{\infty}+\frac{9}{\infty^2}} = \frac{0.(2+0)}{1+0+0} = \frac{0}{1} = 0$

25.) $C(x) = 50+4x+3\sqrt{x}$

Marginal cost $(M.C) = \frac{d}{dx}(C(x)) = \frac{d}{dx}(50+4x+3x^{1/2})$

$M.C = 0+4(1)+3\left(\frac{1}{2}x^{-1/2}\right) = 4+\frac{3}{2\sqrt{x}}$

Given output $x = 9$ units

$M.C = 4+\frac{3}{2\sqrt{9}} = 4+\frac{\cancel{3}}{2(\cancel{3})} = 4+0.5$

$\boxed{M.C = ₹\ 4.50}$

26.) Given F.V = ₹100

premium = ₹18

M.V. of 1 share = F.V + premium = 100 + 18 = ₹118

M.V. of 325 shares = 325 × ₹118 = ₹

27.) Given n = 4

let a = 100, b = 200, c = 300, d = 400

Average speed $H.M = \dfrac{n}{\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+\frac{1}{d}} = \dfrac{4}{\frac{1}{100}+\frac{1}{200}+\frac{1}{300}+\frac{1}{400}}$

$= \dfrac{4}{\frac{12+6+4+3}{1200}} = \dfrac{4 \times \cancel{1200}^{48}}{\cancel{25}}$

$\boxed{\text{Average speed} = 192 \text{ km/hr}}$

28.) Given $N = 9$, $\Sigma X = 45$, $\Sigma Y = 108$, $\Sigma X^2 = 285$, $\Sigma Y^2 = 1356$,

$\Sigma XY = 597$

Correlation co-efficient $r(x,y) = \dfrac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$

$r(x,y) = \dfrac{9(597) - (45)(108)}{\sqrt{9(285) - (45)^2}\sqrt{9(1356) - (108)^2}}$

$= \dfrac{5373 - 4860}{\sqrt{2565 - 2025}\sqrt{12204 - 11664}}$

$= \dfrac{513}{\sqrt{540}\sqrt{540}}$

$= \dfrac{513}{540}$

$\boxed{r(x,y) = 0.95}$

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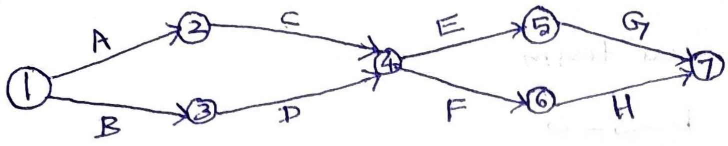
29.)



30.) $\tan 150^\circ = \tan(90^\circ + 60^\circ) = -\cot 60^\circ = -\frac{1}{\sqrt{3}}$

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Part - III

31.) Let $A = \begin{bmatrix} 1 & 1 & 3 \\ 2 & \lambda & 4 \\ 9 & 7 & 11 \end{bmatrix}$

Given no inverse $|A| = 0$

$$\begin{vmatrix} \overset{+}{1} & \overset{-}{1} & \overset{+}{3} \\ 2 & \lambda & 4 \\ 9 & 7 & 11 \end{vmatrix} = 0$$

Expand R_1

$$1(11\lambda - 28) - 1(22-36) + 3(14 - 9\lambda) = 0$$

$$11\lambda - 28 - 1(-14) + 42 - 27\lambda = 0$$

$$-28 + 14 + 42 - 16\lambda = 0$$

$$28 = 16\lambda$$

$$\frac{28}{16} = \lambda$$

$$\boxed{\frac{7}{4} = \lambda}$$

32.)

→	2	3	1	4
	C	H	A	T
	3!	2!	1!	0!
	1	1	0	0

RANK of the word 'CHAT' $= (3! \times 1) + (2! \times 1) + (1! \times 0) + (0! \times 0) + 1$

$= 6 + 2 + 0 + 0 + 1$

$= 9$

33.) Given $(a-2)x^2+by^2+(b-2)xy+4x+4y-1=0$

<u>Circle</u> (i) No "xy" term

i.e., $b-2=0$

$$\boxed{b=2}$$

(ii) coeff. of x^2 = coeff. of y^2

$$a-2=b$$
$$a-2=2$$
$$a=2+2$$
$$\boxed{a=4}$$

∴ The resulting Eqn. of circle

$$\boxed{2x^2+2y^2+4x+4y-1=0}$$

34.) $L.H.S = \tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{2}{11}\right)$

$$\boxed{\text{WKT} \quad \tan^{-1}A+\tan^{-1}B=\tan^{-1}\left[\frac{A+B}{1-AB}\right]}$$

$$=\tan^{-1}\left[\frac{\frac{1}{2}+\frac{2}{11}}{1-\left(\frac{1}{2}\right)\left(\frac{2}{11}\right)}\right]$$

$$=\tan^{-1}\left[\frac{\frac{11+4}{\cancel{22}}}{\frac{22-2}{\cancel{22}}}\right]$$

$$=\tan^{-1}\left[\frac{\overset{3}{\cancel{15}}}{\underset{4}{\cancel{20}}}\right]$$

$$=\tan^{-1}\left[\frac{3}{4}\right]$$

LHS = RHS Hence proved.

35.) T.C $y = 3x\left(\frac{x+7}{x+5}\right)+5$

$$y = \frac{3x^2+21x}{x+5}+5$$

Marginal cost (M.C), $\frac{dy}{dx} = \frac{(x+5)(6x+21)-(3x^2+21x)(1+0)}{(x+5)^2}+0$

$$\frac{dy}{dx} = \frac{6x^2+\cancel{21x}+30x+105-3x^2-\cancel{21x}}{(x+5)^2}$$

$$= \frac{3x^2+30x+105}{(x+5)^2}$$

$$= \frac{3(x^2+10x+35)}{(x+5)^2}$$

$$= \frac{3\cdot(x^2+2\cdot x\cdot 5+5^2+10)}{(x+5)^2}$$

$$= \frac{3\cancel{(x+5)^2}}{\cancel{(x+5)^2}}+\frac{30}{(x+5)^2}$$

$$\frac{dy}{dx} = 3\left[1+\frac{10}{(x+5)^2}\right]$$ ∴ This shows

hence x increases M.C decreases continuously

Hence proved.

36.) Investment in each case ₹ (140 x 70)

Income of 20% stock at ₹140 = $\frac{20}{\cancel{140}} \times (\cancel{140} \times 70)$

$= ₹\,1400$

Income of 10% stock at ₹70 = $\frac{10}{\cancel{70}} \times (140 \times \cancel{70})$

$= ₹\,1400$

Both investment fecthes same income

∴ They are equivalent shares.

37.)

Marks x	No. of students f	c.f
10	4	4
20	7	11
30	15	26
40	8	34
50	7	41
60	2	$N = 43$

$\therefore Q_1 = \text{size of } \left(\frac{N+1}{4}\right)^{th} \text{value}$

$= \text{size of } \left(\frac{43+1}{4}\right)^{th} \text{value}$

$= \text{size of } \left(\frac{44}{4}\right)^{th} \text{value}$

$= \text{size of } 11^{th} \text{value}$

$\boxed{Q_1 = 20}$

$D_2 = \text{Size of } 2\left(\frac{N+1}{10}\right)^{th} \text{value}$

$= \text{size of } 2\left(\frac{43+1}{10}\right)^{th} \text{value}$

$= \text{size of } 2(4.4)^{th} \text{value}$

$= \text{size of } (8.8)^{th} \text{value}$

$\boxed{D_2 = 20}$

(Just greater than 8.8 in c.f is 11) corresponding value of x

$P_{90} = \text{size of } 90\left(\frac{N+1}{100}\right)^{th} \text{value}$

$= \text{Size of } 90\left(\frac{43+1}{100}\right)^{th} \text{value}$

$= \text{Size of } 90(0.44)^{th} \text{value}$

$= \text{Size of } (39.60)^{th} \text{value}$

$\boxed{P_{90} = 50}$

(Just greater 39.60 in c.f is 41 corresponding value of x)

38.)

Commerce R_A	Accountancy R_B	$d = R_A - R_B$	d^2
6	4	2	4
4	1	3	9
3	6	-3	9
1	7	-6	36
2	5	-3	9
7	8	-1	1
9	10	-1	1
8	9	-1	1
10	3	7	49
5	2	3	9
			$\Sigma d^2 = 128$

$N = 10$

Rank Correlation coefficient $r = 1 - \frac{6\Sigma d^2}{N(N^2-1)}$

$= 1 - \frac{6(128)}{10(10^2-1)} = 1 - \frac{768}{10(100-1)}$

$= 1 - \frac{\cancel{768}\ 128}{\cancel{10}(\cancel{99})} = 1 - \frac{128}{165} = 1 - 0.775$

$= 0.2242$

39.) (i) Variables:

Let x_1 & x_2 denote the number of tables & chairs

(ii) Objective function:

Profit on x_1 tables $= 50x_1$

Profit on x_2 chair $= 15x_2$

Total Profit $= 50x_1 + 15x_2$

Let $z = 50x_1 + 15x_2$ Maximize

(iii) Constraints:

Space to store atmost 60 pieces

ie, $x_1 + x_2 \leq 60$

The cost of x_1 tables $= 500x_1$

The cost of x_2 chair $= 200x_2$

Total cost cannot more than 10000

ie., $500x_1 + 200x_2 \leq 10000$

ie, $5x_1 + 2x_2 \leq 100$

(iv) Non-negative restrictions.

Since number of chair & table cann't be negative

ie., $x_1 \geq 0$, $x_2 \geq 0$

L.P.P is

Maximize $z = 50x_1 + 15x_2$

Subject to constraints

$x_1 + x_2 \leq 60$

$5x_1 + 2x_2 \leq 100$

$x_1, x_2 \geq 0$

40.) If $x = a\sec^3\theta$; $y = b\tan^3\theta$

$\frac{dx}{d\theta} = a(3\sec^2\theta \cdot \sec\theta \cdot \tan\theta)$; $\frac{dy}{d\theta} = b(3\tan^2\theta \cdot \sec^2\theta)$

$$\frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \frac{b(\cancel{3}\tan^{\cancel{2}}\theta \cdot \cancel{\sec^2\theta})}{a(\cancel{3}\sec^{\cancel{3}}\theta \cdot \cancel{\tan\theta})} = \frac{b\tan\theta}{a\sec\theta}$$

$$= \frac{b\frac{\sin\theta}{\cancel{\cos\theta}}}{a\frac{1}{\cancel{\cos\theta}}}$$

$$\boxed{\frac{dy}{dx} = \frac{b}{a}\sin\theta}$$

Part - IV

41) a) $AB = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix} \frac{1}{5}\begin{bmatrix} 4 & -2 & -1 \\ -1 & 3 & -1 \\ -1 & -2 & 4 \end{bmatrix}$

$$AB = \frac{1}{5}\begin{bmatrix} 8-2-2 & -4+6-2 & -2-2+4 \\ 4-3-1 & -2+9-2 & -1-3+4 \\ 4-2-2 & -2+6-4 & -1-2+8 \end{bmatrix}$$

$$AB = \frac{1}{5}\begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I_3$$

$$BA = \frac{1}{5}\begin{bmatrix} 4 & -2 & -1 \\ -1 & 3 & -1 \\ -1 & -2 & 4 \end{bmatrix}\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$$

$$BA = \frac{1}{5}\begin{bmatrix} 8-2-1 & 8-6-2 & 4-2-2 \\ -2+3-1 & -2+9-2 & -1+3-2 \\ -2-2+4 & -2-6+8 & -1-2+8 \end{bmatrix}$$

$$BA = \frac{1}{5}\begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I_3$$

$\therefore AB = BA = I_3$

$\therefore$ A & B are inverse of each other

Hence proved.

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6) If $\boxed{\tan\alpha = \frac{1}{3}}$, $\boxed{\tan\beta = \frac{1}{7}}$

WKT $\tan 2\alpha = \frac{2\tan\alpha}{1-\tan^2\alpha} = \frac{2\left(\frac{1}{3}\right)}{1-\left(\frac{1}{3}\right)^2} = \frac{2/3}{1-\frac{1}{9}} = \frac{2/\cancel{3}}{\frac{9-1}{\cancel{9}_3}} = \frac{\cancel{2}\times 3}{\cancel{8}_4}$

$\boxed{\tan 2\alpha = \frac{3}{4}}$

Consider $\tan(2\alpha+\beta) = \frac{\tan 2\alpha + \tan\beta}{1-\tan 2\alpha . \tan\beta} = \frac{\frac{3}{4}+\frac{1}{7}}{1-\left(\frac{3}{4}\right)\left(\frac{1}{7}\right)}$

$\tan(2\alpha+\beta) = \frac{\frac{21+4}{\cancel{28}}}{\frac{28-3}{\cancel{28}}}$

$\tan(2\alpha+\beta) = \frac{\cancel{25}}{\cancel{25}}$

$\tan(2\alpha+\beta) = 1$

$2\alpha+\beta = \tan^{-1}(1)$

$\boxed{2\alpha+\beta = \pi/4}$ Hence proved.

42.) a) $\left(2x^2+\frac{1}{x}\right)^{12}$

General term

$T_{r+1} = {}^nC_r\, x^{n-r} \cdot a^r$

here $x = 2x^2$, $a = 1/x$, $n = 12$

$T_{r+1} = 12C_r\, (2x^2)^{12-r} \cdot \left(\frac{1}{x}\right)^r$

$T_{r+1} = 12C_r\, 2^{12-r} \cdot x^{24-3r}$

term Independent

i.e., $24-3r=0$

$\cancel{24=3r}$

$\boxed{8=r}$

$T_{8+1} = 12C_8\, 2^{12-8} \cdot x^0$

$T_9 = \frac{\cancel{12}^{5}\cdot 11\cdot \cancel{10}\cdot 9}{\cancel{4}\cdot\cancel{3}\cdot\cancel{2}\cdot 1} \times 2^4 \times 1$

$T_9 = 55\times 9\times 8 = 55\times 72$

$$\begin{array}{r} 110 \\ 385 \\ \hline 3960 \\ \hline \end{array}$$

independent term $\boxed{T_9 = 3960}$

b) $q = 5-2P_1+P_2-P_1^2P_2$

$\frac{\partial q}{\partial P_1} = -2-2P_1P_2$

$\frac{\partial q}{\partial P_2} = 1-P_1^2$

$\frac{Eq}{EP_1} = -\frac{P_1}{q}\frac{\partial q}{\partial P_1}$

$= \frac{-P_1}{5-2P_1+P_2-P_1^2P_2}\cdot(-2-2P_1P_2)$

$\boxed{\frac{Eq}{EP_1} = \frac{2P_1+2P_1^2P_2}{5-2P_1+P_2-P_1^2P_2}}$

Given $P_1 = 3$, $P_2 = 7$

$\frac{Eq}{EP_1} = \frac{6+2(9)(7)}{5-6+7-9(7)} = \frac{6+126}{-57} = -\frac{132}{57}$ //

$\frac{Eq}{EP_2} = -\frac{P_2}{q}\frac{\partial q}{\partial P_2}$

$= \frac{-P_2}{5-2P_1+P_2-P_1^2P_2}\cdot(1-P_1^2)$

$\boxed{\frac{Eq}{EP_2} = \frac{-P_2+P_1^2P_2}{5-2P_1+P_2-P_1^2P_2}}$

Given $P_1=3$, $P_2=7$

$\frac{Eq}{EP_2} = \frac{-7+9(7)}{5-6+7-9(7)}$

$= \frac{-7+63}{-57}$

$\boxed{\frac{Eq}{EP_2} = -\frac{56}{57}}$

43) a)

Step:1

Let $p(n): 1+2+3+\cdots+n = \frac{n(n+1)}{2}, \forall n \in N$

put $n=1 \Rightarrow$ $L.H.S = 1$

$R.H.S = \frac{1\cdot(1+1)}{2} = 1$

$LHS = RHS$

$\therefore$ $P(1)$ is true

Step:2 Letus assume that $p(k)$ is also true, for some $n=k$

$P(k): 1+2+3+\cdots+k = \frac{k(k+1)}{2}, \forall k \in N$

Step:3 To prove: $P(k+1)$ is also true.

$P(k+1) = P(k) + t_{k+1}$

$= \frac{k(k+1)}{2} + (k+1)$

$= (k+1)\left[\frac{k}{2}+1\right]$

$= (k+1)\left[\frac{k+2}{2}\right]$

$$\boxed{P(k+1) = \frac{(k+1)\cdot(k+2)}{2}}$$

$\therefore$ $P(k+1)$ is also true

By principle Mathematical induction $p(n)$ is true $\forall n \in N$.

b) $f(x) = \begin{cases} 2-x & ; x<2 \\ 2+x & ; x \geq 2 \end{cases}$ at $x=2$

$f(x) = 2-x$ $f(x) = 2+x$

$- \; 2 \; +$

$L[f(x)]_{at\, x=2} = \lim_{x\to 2^-} f(x) = \lim_{x\to 2^-} (2-x)$ $\left(\begin{array}{l} x = 2-h \\ x\to 2^-, h\to 0 \end{array}\right)$

$= \lim_{h\to 0} 2-(2-h) = \lim_{h\to 0} \cancel{2}-\cancel{2}+h = 0$ //

$R[f(x)]_{at\, x=2} = \lim_{x\to 2^+} f(x) = \lim_{x\to 2^+} 2+x$ $\left(\begin{array}{l} x = 2+h \\ x\to 2^+, h\to 0 \end{array}\right)$

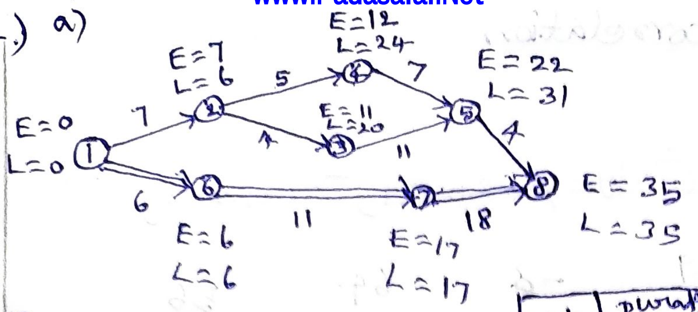
$f(2) = 2+2 = 4$ //

$= \lim_{h\to 0} 2+2+h = \lim_{h\to 0} 4+h = 4+0 = 4$ //

$L[f(x)] \neq R[f(x)] = f(2)$

$\therefore$ $f(x)$ is discontinuous at $x=2$

44.) a)



$E_1 = 0$ $L_8 = 35$

$E_2 = 7$ $L_7 = 17$

$E_3 = 11$ $L_6 = 6$

$E_4 = 12$ $L_5 = 31$

$E_5 = 22$ $L_4 = 24$

$E_6 = 6$ $L_3 = 20$

$E_7 = 17$ $L_2 = 6$

$E_8 = 35$ $L_1 = 0$

Activity	Duration (in days) t_{ij}	E.S.T	E.F.T = E.S.T + t_{ij}	L.S.T = L.F.T − t_{ij}	L.F.T
1-2	7	0	7		6
1-6	6	0	6	0	6
2-3	14	7	21	6	20
2-4	5	7	12	19	24
3-5	11	11	22	20	31
4-5	7	12	19	24	31
6-7	11	6	17	6	17
5-8	4	22	26	31	35
7-8	18	17	35	17	35

critical path 1-6-7-8

project complete duration in 35 days

b) let $y = \sqrt{\dfrac{(x-1)(x-2)}{(x-3)(x^2+x+1)}}$

take log on ~~both~~ sides

$$\log y = \frac{1}{2}\left[\log(x-1) + \log(x-2) - \log(x-3) - \log(x^2+x+1)\right]$$

diff. 'y' w. r. to x

$$\frac{1}{y}\cdot\frac{dy}{dx} = \frac{1}{2}\left[\frac{1}{x-1} + \frac{1}{x-2} - \frac{1}{x-3} - \frac{1\cdot(2x+1)}{x^2+x+1}\right]$$

$$\frac{dy}{dx} = \frac{y}{2}\left[\frac{1}{x-1} + \frac{1}{x-2} - \frac{1}{x-3} - \frac{(2x+1)}{x^2+x+1}\right]$$

$$\boxed{\frac{dy}{dx} = \frac{1}{2}\sqrt{\frac{(x-1)(x-2)}{(x-3)(x^2+x+1)}}\left[\frac{1}{x-1} + \frac{1}{x-2} - \frac{1}{x-3} - \frac{(2x+1)}{x^2+x+1}\right]}$$

45) a) Coefficient of correlation

Age of husbands X	Age of wives Y	$dx = X - 30$	dx^2	$dy = Y - 26$	dy^2	$dx \cdot dy$
23	18	-7	49	-8	64	56
27	22	-3	9	-4	16	12
28	23	-2	4	-3	9	6
29	24	-1	1	-2	4	2
30 A	25	0	0	-1	1	0
31	26 B	1	1	0	0	0
33	28	3	9	2	4	6
35	29	5	25	3	9	15
36	30	6	36	4	16	24
39	32	9	81	6	36	54
$\Sigma X = 311$	$\Sigma Y = 257$	$\Sigma dx = 11$	$\Sigma dx^2 = 215$	$\Sigma dy = -3$	$\Sigma dy^2 = 159$	$\Sigma dx dy = 175$

$N = 10$, $\bar{X} = \frac{\Sigma X}{N} = \frac{311}{10} = 31.1$, $\bar{Y} = \frac{\Sigma Y}{N} = \frac{257}{10} = 25.7$

Assumed Mean Method

Coefficient of correlation

$$r(x,y) = \frac{N\Sigma dx.dy - \Sigma dx.\Sigma dy}{\sqrt{N\Sigma dx^2 - (\Sigma dx)^2}\sqrt{N\Sigma dy^2 - (\Sigma dy)^2}}$$

$$= \frac{10(175) - (11)(-3)}{\sqrt{10(215) - (11)^2}\sqrt{10(159) - (-3)^2}}$$

$$= \frac{1750 + 33}{\sqrt{2150 - 121}\sqrt{1590 - 9}}$$

$$= \frac{1783}{\sqrt{1029}\sqrt{1581}}$$

$$= \frac{1783}{(\quad)(\quad)}$$

$$= \frac{1783}{1790.8}$$

$$\boxed{r(x,y) = 0.996}$$

X and Y are highly positively correlated. The ages of their husband and wives have a high degree of correlation.

45) b) Given **Item A**

Requirement (Annual demand) $\boxed{R = 800}$ units

ordering cost $\boxed{C_3 = ₹5}$

holding cost $C_1 = 10\%$ of unit price

$= 10\%$ of ₹ 0.02

$= \frac{10}{100} \times 0.02$

$\boxed{C_1 = 0.002}$

(i) E.O.Q, $q_0 = \sqrt{\frac{2C_3R}{C_1}}$

$= \sqrt{\frac{2(5)(800)}{0.002}}$

$= \sqrt{\frac{\cancel{2}(5)(800)(1000)}{\cancel{2}}} = \sqrt{4000000}$

$\boxed{q_0 = 2000}$ units

(ii) Minimum inventory cost $= \sqrt{2C_3C_1R}$

$= \sqrt{2(5)(0.002)(800)}$

$= \sqrt{16.000}$

$= \sqrt{16}$

$= ₹4$

(iii) E.O.Q in Rupees $= q_0 \times$ unit price

$= 2000 \times 0.02 = 2000 \times \frac{2}{100}$

$= ₹40$

(iv) E.O.Q in year of supply $= \frac{q_0}{R} = \frac{\cancel{2000}^{5}}{\cancel{800}_{2}} = \frac{5}{2} = 2.5$

(v) Number of order per year $= \frac{R}{q_0} = \frac{\cancel{800}^{2}}{\cancel{2000}_{5}} = \frac{2}{5} = 0.4$

45) a) coefficient of correlation

46) a) let E_1 = Machine A produces the product
E_2 = Machine B produces the product
E_3 = Machine C produces the product
D = defective percentage

Given

$P(E_1) = 25\% = \frac{25}{100}$	$P(D/E_1) = \frac{5}{100}$
$P(E_2) = 30\% = \frac{30}{100}$	$P(D/E_2) = \frac{4}{100}$
$P(E_3) = 50\% = \frac{50}{100}$	$P(D/E_3) = \frac{2}{100}$

Using Bay's theorem

$$P(E_2/D) = \frac{P(E_2) \cdot P(D/E_2)}{P(E_1) \cdot P(D/E_1) + P(E_2) \cdot P(D/E_2) + P(E_3) \cdot P(D/E_3)}$$

$$= \frac{\left(\frac{30}{100}\right)\left(\frac{4}{100}\right)}{\left(\frac{25}{100}\right)\left(\frac{5}{100}\right) + \left(\frac{30}{100}\right)\left(\frac{4}{100}\right) + \left(\frac{50}{100}\right)\left(\frac{2}{100}\right)}$$

$$= \frac{\frac{120}{\cancel{100 \times 100}}}{\frac{125 + 120 + 100}{\cancel{100 \times 100}}}$$

$$= \frac{\overset{8}{\cancel{\overset{40}{\cancel{120}}}}}{\underset{23}{\cancel{\underset{115}{\cancel{345}}}}}$$

$$\boxed{P(E_2/D) = \frac{8}{23}}$$

4

46) b)

Required equation of circle

$$\boxed{x^2+y^2+2gx+2fy+c=0} \rightarrow (1)$$

(1, 0)

$$1+0+2g+0+c=0$$

$$\boxed{2g+c=-1} \rightarrow (2)$$

(0, 1)

$$0+1+0+2f+c=0$$

$$\boxed{2f+c=-1} \rightarrow (3)$$

Centre $c(-g,-f)$ lies on the line $x+y=1$

$$\boxed{-g-f=1} \rightarrow (4)$$

Solve (2) & (3)

$$2g+\cancel{c}=-1$$
$$\underset{(-)}{2f}\ \underset{(-)}{+}\ \cancel{c}=\underset{(+)}{-1}$$

$$2g-2f=0$$

$\div$ by 2 $\boxed{g-f=0} \rightarrow (5)$

Solve (4) & (5)

$$-\cancel{g}-f=1$$
$$\cancel{g}-f=0$$

$$-2f=1$$

$$\boxed{f=-\tfrac{1}{2}}$$ sub (5)

$$g-\left(\frac{-1}{2}\right)=0$$

$$g+\frac{1}{2}=0$$

$$\boxed{g=-\tfrac{1}{2}}$$ sub (2)

$$\cancel{2}\left(\frac{-1}{\cancel{2}}\right)+c=-1$$

$$c=-1+1$$

$$\boxed{c=0}$$ All values sub eqn (1)

Required eqn. of circle

$$x^2+y^2+\cancel{2}\left(\frac{-1}{\cancel{2}}\right)x+\cancel{2}\left(\frac{-1}{\cancel{2}}\right)y+0=0$$

$$\therefore \boxed{x^2+y^2-x-y=0}$$

47.) a)

Given payment $a = ₹ 2000$ (end of every quarter)

number of years $n = 10$ years

$n = 10 \times 4$ quarter

$\boxed{n = 40}$ quarter

$i = 8\%$ per year $= \frac{8}{100} \times \frac{1}{4}$ per quarter

$\boxed{i = 0.02}$

Amount of annuity

$$A = \frac{a}{i}\left[(1+i)^n - 1\right]$$

$$= \frac{2000}{0.02}\left[(1+0.02)^{40} - 1\right]$$

$$= 100000\left[(1.02)^{40} - 1\right]$$

$$= 100000\left[2.2080 - 1\right]$$

$$= 100000\left[1.2080\right]$$

$$= 120800.0000$$

$$\boxed{A = ₹ 1,20,800}$$

47.)

b) Let x, y & z be a cost of per kg of onion, wheat and rice respectively.

Given $4x+3y+2z = 320 \rightarrow (1)$

$2x+4y+6z = 560 \rightarrow (2)$

$6x+2y+3z = 380 \rightarrow (3)$

$$A \quad X = B$$

$$\begin{bmatrix} 4 & 3 & 2 \\ 2 & 4 & 6 \\ 6 & 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 320 \\ 560 \\ 380 \end{bmatrix}$$

$$\boxed{X = A^{-1} B}$$

Inversion Method

$$A^{-1} = \frac{1}{|A|} \cdot adj A$$

$$|A| = \begin{vmatrix} \overset{+}{4} & \overset{-}{3} & \overset{+}{2} \\ 2 & 4 & 6 \\ 6 & 2 & 3 \end{vmatrix} = 4(12-12) - 3(6-36) + 2(4-24)$$

$$= 4(0) - 3(-30) + 2(-20)$$

$$= 0 + 90 - 40$$

$$\boxed{|A| = 50} \neq 0$$

A is non-singular matrix

A^{-1} exist.

$$adj A = \begin{bmatrix} +(12-12) & -(6-36) & +(4-24) \\ -(9-4) & +(12-12) & -(8-18) \\ +(18-8) & -(24-4) & +(16-6) \end{bmatrix}^T$$

45) 47.) a)

$$= \begin{bmatrix} 0 & 30 & -20 \\ -5 & 0 & 10 \\ 10 & -20 & 10 \end{bmatrix}^T$$

$$\text{adj}A = \begin{bmatrix} 0 & -5 & 10 \\ 30 & 0 & -20 \\ -20 & 10 & 10 \end{bmatrix}$$

$$\boxed{A^{-1} = \frac{1}{50}\begin{bmatrix} 0 & -5 & 10 \\ 30 & 0 & -20 \\ -20 & 10 & 10 \end{bmatrix}}$$

$$X = \frac{1}{50}\begin{bmatrix} 0 & -5 & 10 \\ 30 & 0 & -20 \\ -20 & 10 & 10 \end{bmatrix}\begin{bmatrix} 320 \\ 560 \\ 380 \end{bmatrix}$$

$$= \frac{1}{5}\begin{bmatrix} 0 & -5 & 10 \\ 30 & 0 & -20 \\ -20 & 10 & 10 \end{bmatrix}\begin{bmatrix} 32 \\ 56 \\ 38 \end{bmatrix}$$

$$= \begin{bmatrix} 0 & -1 & 2 \\ 6 & 0 & -4 \\ -4 & 2 & 2 \end{bmatrix}\begin{bmatrix} 32 \\ 56 \\ 38 \end{bmatrix}$$

$$= \begin{bmatrix} 0-56+76 \\ 192+0-152 \\ -128+112+76 \end{bmatrix}$$

$$\begin{array}{r} 188 \\ -128 \\ \hline 60 \end{array}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 20 \\ 40 \\ 60 \end{bmatrix}$$

∴ cost of 1kg onion is ₹ 20
cost of 1kg wheat is ₹ 40
cost of 1kg Rice is ₹ 60

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