Calculation for XXZ model

de consider Hamiltonian as-31 = - I IONON - halen - ha Ira in our transverse to midel we will set hn=0 But for sake of generalised calculation we but it for now.

 $\frac{d}{dt} \langle \hat{A} \rangle = - \langle [H, \hat{A}] \rangle$, $\frac{d}{dt} \hat{A} = - [H, \hat{A}]$ neglecting i lt.

Egnetion for Mf $Anf = -\langle \sigma^2 \rangle \sigma^2 - h_2 \sigma^2 - h_2 \sigma^2$

= - < [(- <0 x > 0 x - hx 0 x - hz +2), 5 x]> = - < - < 0 7 82 84 - 4x 12 84 - 47 62 64 + on (07) on + 1 hx onon + h7 ono8)

= - (- 5024 - Kx - Ly 64 + 50x7 + 1/x - 4264)

d (on) MF = 2 h x (or) MF

2.
$$\frac{1}{24} (6^{4}) MF = -\left[\left(-\frac{1}{2} (e^{4}) e^{4} - h_{x} e^{4} e^{4} + h_{x} e^{4} e^{4} - h_{x} e^{4} e^{4} \right]$$

$$= \left((6^{4}) e^{2} + (6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{4} e^{4} \right)$$

$$= \left((6^{4}) e^{2} + (6^{4}) e^{2} + 2h_{x} e^{2} - 2h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - 2h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - 2h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

$$= \left((6^{4}) e^{2} + 2h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} - h_{x} e^{2} \right)$$

 $\frac{d}{dt} = -\left(\left[\left(- \left(\sigma^{x} \right) \sigma^{x} - h_{x} \sigma^{x} - h_{z} \sigma^{z} \right), \sigma^{z} \right] \right)$ $= \left(\left(\left(\sigma^{x} \right) \right) \sigma^{x} \sigma^{z} - \sigma^{z} \left(\sigma^{x} \right) \sigma^{x} + h_{x} \sigma^{x} \sigma^{z} - h_{x} \sigma^{z} \sigma^{z} \right)$ $= \left(- \left(\sigma^{x} \right) \sigma^{y} - \left(\sigma^{x} \right) \sigma^{y} - h_{x} \sigma^{y} - h_{x} \sigma^{y} \right)$ $= \left(- \left(\sigma^{x} \right) \sigma^{y} - \left(\sigma^{x} \right) \sigma^{y} - h_{x} \sigma^{y} - h_{x} \sigma^{y} \right)$ $= \left(- \left(\sigma^{x} \right) \sigma^{y} - \left(\sigma^{x} \right) \sigma^{y} - h_{x} \sigma^{y} - h_{x} \sigma^{y} \right)$ $= \left(- \left(\sigma^{x} \right) \sigma^{y} - \left(\sigma^{x} \right) \sigma^{y} - h_{x} \sigma^{y} - h_{x} \sigma^{y} \right)$ $= \left(- \left(\sigma^{x} \right) \sigma^{y} - \left(\sigma^{x} \right) \sigma^{y} - h_{x} \sigma^{y} - h_{x} \sigma^{y} \right)$ $= \left(- \left(\sigma^{x} \right) \sigma^{y} - \left(\sigma^{x} \right) \sigma^{y} - h_{x} \sigma^{y} - h_{x} \sigma^{y} \right)$

Timescale of initial stage of relatation. $\frac{d}{dt}(s^{n}) = -\left(\begin{bmatrix} H_{7}6^{n} \end{bmatrix}\right)$ $= -\left(\begin{bmatrix} -\int \sigma^{n}\sigma^{n} - h_{x}\sigma^{x} - h_{2}\sigma^{2}, \sigma^{3} \right)$ $= -\left(\begin{bmatrix} -\int \sigma^{n}\sigma^{n} - h_{x}\sigma^{x} - h_{2}\sigma^{2}, \sigma^{3} \right)$ $= \left(\int r^{2}\sigma^{n}\sigma^{n} - \int \sigma^{n}\sigma^{n}\sigma^{n} + h_{x}\sigma^{n}\sigma^{n} - h_{x}\sigma^{n}\sigma^{n} + h_{x}\sigma^{n}\sigma^{n} - h_{x}\sigma^{n}\sigma^{n} \right)$ $+ h_{2}\sigma^{2}\sigma^{n} - h_{2}\sigma^{n}\sigma^{n} - h_{2}\sigma^{n}\sigma^{n} + h_{$

d (64) = - < [(- Jr 1 64 - 42 04 - 42 02), ry) = < JONGNOY - JONEXOX + hx om 14 - hx oyon + 4 + 6 + 01 - 45 016 + > = (Jongt - Joe or + 24x02 + 24204) = (] ((2,)+ ge,) ((25) + 265) -] ((25) + 265) ((2,) + 264) + 2hx 67 + 2h7 04) (J(07)(3) + J (07) 562 + J 867 (02) + J 867 862 - J(02) (07) - J(02) 862 - J 862 (01) - J 862 66 18 + 2hx 67 +2hz 67 < 2 J (6") (02) + 2hx 02 + 2h2 0" + 21 5 2JG) 2J (67) (62) + 24x (67) + 247 (67) + 20 [] 672 d (02) = - < [[- I 646x - 4x6x - 4565), 63]) = ([J6"6" + h20" + h262, 67) = Jougues - Josepan + Hx ox cz - Hx ozex (-2 Johoy - 2 h oy) + 2 kx (04) + 2 kx (04) + 364) 1-2 Jono7/- 2 h 04> - \2] (64>(64) + (6) 564 + 864 (6) + 864 (6) + 21x dy) =+ (- J 6x 6Y + J 6Y 6x + 2hx 6Y) + <-7 ((0))+ 86%) ((0))+ 864) + 7 ((0))+ 864) ((0))+ 863) +2hx64) + (-) ((07)(04) + (04) 564 + 867 (04) + 867 864) + 2 (< 0,) < 0, 1 + < 0,1 > 20,4 + 20,1 < 0,5 + 20,80m) +24x 64> -27 (07) (04) - 2[J GXY - 24x (64) Sir, Sir, Sir are two small Considering to recommo

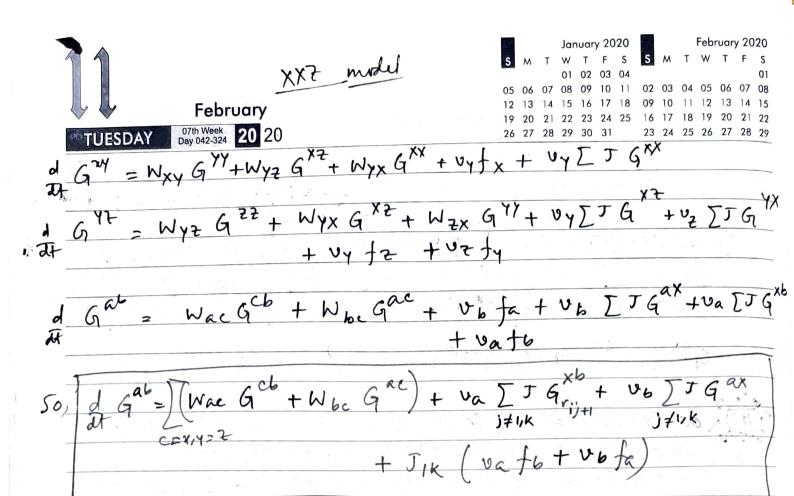
- [(-21,1, 1x1,-1,50,),00,) J 6 4 8 2 56 4 - J SER OR 5 x + hx 5 x 56x - hx 56462 + 4262 56x - 42 56x 62 J ((6x) + 663) ((6x) + 86x) SGN - J SGN ((6x) + 86x) ((6x) + 86x) + hx ((67) + 867) 80x - hx 80x ((0x)+807) + hz ((02) + 802) 802 - hz 80x ((02)+802) J (64) (64) SEX + J (64) SEX. SEX + J SEX (64) SEX + J 56x 5Cx 56x - J 56x (6x) (6x) - J 86x (6x) 56x J Son Son (on) - J Son Son Son + hx (on) son - hx son (or) + hz (62) 86x+ hz 86286x - hz 86x (62) - hz 863862 + hz 507 - hz (-2864) 2 hz 807 - [(- Jox 6x - hx 6x - hz 6x), 864] J 1262 Sol - J Solozoz + Hx 02 Sol- Hx 86702 d 867 = + hz 02 564 - hz 564 02 = I ((67) + SEN) ((17) + SEN) SEY - J SEY ((52) + SEN) (62) + SEN) + hx ((12) + 862) 864 - hx 804 ((64) + 862) + 45 ((==>+ 86) 861 - 45 80 ((6=>+802) J (82) (82) 864+ J (82) SENSEY + J SEN (82) 864 + J 862801861 - J 864 (02) - J 864 (02) 802 - J 864 86x (en) - J 864 86x 86x + 4x (en) 864 + hx 50 2504 - hx 504 (02) - hx 504 50x + 45 (03) 804 + 42 502 867 - 45 801 (03) - 45 801 805 2 J (07) 80,2 + 2 J 802 502 + J 804 (02) 804-J 804 (02) 802 25 (0x) 802 +25 56x 802 +2hx 802 -2hz 80x + 2hx 502 - 2 hz 50x + I sex (ex) (ex- (ex)) - 2 (ex- (ex)) (ex) 8ex 2 J (62) 862 + 2 J[8 +2 862 +2 hx 862 -2 hz 862 # + 2 \$ (627] J 85 x

1 50t = - [H, 80t] Jonon Sot - J Sot Bron + hx on Sot - hx Soton + 42 6 2 2 6 5 - 44 80 50 5 J ((17) + 867) ((0) + 867) 862 - J 862 ((0))+867) ((0))+862 + rx ((21) + 82x) 825- rx 825 ((21)+82x) + 45 ((02) + 8 25) 8 25 - 42 8 25 ((02) + 8 05) 7 (en) (on) 86+ 1 (on) 80,865+1 86, (on) 805 + J Sin Sin 80 g - I 80 g (on) (on) - I 80 g (on) 800 - J 8+2 80x (0x) - J 80 280x80x - JAX (0x) 304 - 2 J (0x) 8 r y - 2 J Z 86x864 - 2hx864 - 2 hx 854 + J Son (on) (oz-cot) - J (oz-(oz))(on) son -25 (64) 864-25 [S6x 867-24x 564+2 J (0)) [S6x

 $W = \begin{pmatrix} 0 & 2hz & 0 \\ -2hz & 0 & 2(464) + hx \end{pmatrix} \begin{pmatrix} 367 \\ 367 \\ 0 & -2(464) + hx \end{pmatrix} \begin{pmatrix} 0 \\ +(62) \\ -(64) \end{pmatrix}$ $d_{i}^{2} = 2 \int_{0}^{1} \int_{0}^{1} \delta \delta^{2} \left(\frac{1}{2} \left(\frac{1}{2} \right) \right) \left(\frac{1}{2} \left(\frac{1}{2} \right) \right)$

a 6 x1 = < (\$4867) 364) + < 86x \$4864) = (2 hz 5 64 5 64) + ((56x)(27 (6x) 562 + 27 96x865 + 2 hx 802-2hz 80x + 28 (62) [J 80x) = (2hz 864864) + (2J (64) 86x 862 + 2 J 80x86x862 +2hx 56x 802 - 2hz 80x 86x + 2 1 (07)] J 86 7 86x) Wxy GYY + Wyz Gxz + 2 J (80 862 8 62) + WYX GXX + 2 (57) [5 862 SCR WXY GYY + W/2 GX7 + 25 (862 862 863) + Wyx Gxx + by I J Gax Now) 25 \$ 557 657 852 = 25(02) fx = 25 (1, - (0x)) (0x - (0x)) (02 - (02)) = 25 (1- (03)2) (03- (03)) Wxy GYY + Wyz GXE + wyfx + Wyx GXX + Uy[JGXX :. | fx = 1- (rx)2 \$ G17 = (1504 817) + (804 11 808) = (25/04) 567 567+27 I 56x 567 867+2 hx 867 867 2 h2 8 x x 8 x + 2 < 547 [] 8 x x 8 0 2 > + <-27 864 <0x> 864- 27 864 864 - 21x 864 864 + 2 J (64) [86 486x) = 25 (07) 927 + 25 (867 5678 02) +2hx Gt2 - 2hz Gx2 -2 (02) IJG X2-2 J (0x) GYT-25 (80 \$64 864 864) - 2 h x G YY + 2 J (07) [G yx = Wyz GZZ+ Wyx GXZ+ WZX GYY + vy IJGXZ+vZIJGYX +25 (867867867) -25 (864864)

<.86480886€> ((e,- (e,)) (e,- (e,)) (e,- (e,))) (exeses - exes (es) - ex (es) es + ex (es)(es) -(01) 07 67 + (01) 07 (07) + (01) (02) 02 (03)(03) () - (02 07) (07) - (3/07 07) + (07) (02) (07) (02) + (02) (07) (07) + (01) + (01) (07) - (01) (07) + (04) (07) + (07) (07) +2 (07) (03) (03) (0x) - (0x) + 2 (0x) (627602) 2 (0x) (0x) (0x) And, 2 - (564 504 50 4) $= -\left\langle (\sigma_{\lambda} - \langle \sigma_{\lambda} \rangle) (\sigma_{\lambda} - \langle \sigma_{\lambda} \rangle) (\sigma_{\lambda} - \langle \sigma_{\lambda} \rangle) \right\rangle$ = - (542464 - 040x (645 - 04 (64) 61+64 (64) 64) - (07> (64) + (0x) + 2(64) (64) = -2 (04) (on) (04) Comparing we get - 2(02) (02) fz = (57) (62) 2 (04) fy = - 2 (04) (04) guel, fy = (07) (04)



$$\begin{cases}
50, & \int = \left(\frac{1 - \langle \sigma^{\eta} \rangle^2}{-\langle \sigma^{\eta} \rangle \langle \sigma^{\eta} \rangle} \right) \\
& - \langle \sigma^{\eta} \rangle \langle \sigma^{\eta} \rangle
\end{cases}$$

$$\frac{\chi \chi Z}{df} G_{K} (b) = \left\langle \begin{array}{c} d(S \sigma^{a}) S \sigma^{b} \\ \overline{df} \end{array} \right\rangle + \left\langle \begin{array}{c} S \sigma^{a} \\ \overline{df} \end{array} \right\rangle \left\langle \begin{array}{c} S \sigma^{b} \\ \overline{df} \end{array} \right\rangle \left\langle \begin{array}{c} G \sigma^{b} \\ \overline{df} \end{array} \right\rangle \left\langle \begin{array}$$

$$\frac{1}{J} = \begin{pmatrix} -\langle 6^{n} \rangle \langle 6^{2} \rangle \\ -\langle 6^{n} \rangle \langle 6^{2} \rangle \\ -\langle 6^{n} \rangle \langle 6^{2} \rangle \end{pmatrix}$$

$$\frac{1}{J} = \begin{pmatrix} -\langle 6^{n} \rangle \langle 6^{2} \rangle \\ -\langle 6^{n} \rangle \rangle \\ -\langle 6^{n} \rangle \end{pmatrix}$$

$$W = \begin{pmatrix} 0 & 2 (\langle \sigma^2 \rangle + h_2) & 0 \\ -2(\langle \sigma^2 \rangle + h_2) & 0 & 2h_X \\ 0 & -2h_X & 0 \end{pmatrix}$$