2. [2 + 2 + 3 = 7 marks]

(a)

→ decision (boundary) region for part (c)

$1\frac{1}{2}$ marks

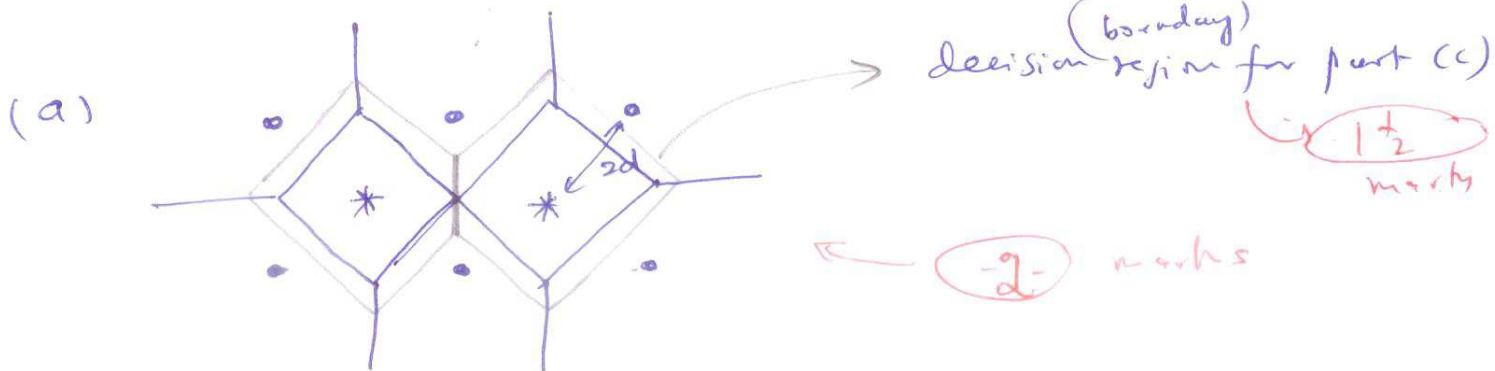-2- marks

(b) For the points marked "*"

Prob. of Correct decision

$$P_C = \left(\int_{-d}^{-d} f_N(x) \, dx \right)^2 = (1 - 2q)^2$$

$$\therefore \quad P\left(\substack{symbol \\ error}\right) = 1 - P_C = \boxed{\begin{array}{l} 1 - (1 - 2q)^2 \; ; \\ = 4q(1-q) \; ; \end{array}}$$

-2-

Note: The average Prob. of symbol error is different !

$$q = Q\left(\frac{d}{\sqrt{N_0/2}}\right) ;$$

(c)
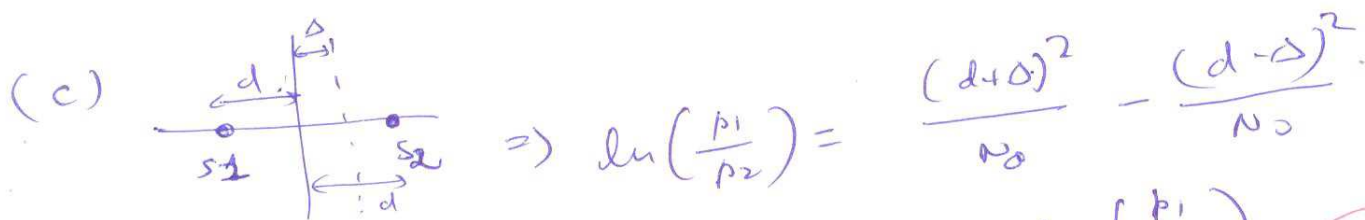
$p_1 > p_2$

$$\Rightarrow \ln\left(\frac{p_1}{p_2}\right) = \frac{(d+\Delta)^2}{N_0} - \frac{(d-\Delta)^2}{N_0}$$

$$\Rightarrow \quad \Delta = \frac{N_0}{4d} \ln\left(\frac{p_1}{p_2}\right)$$

$$\boxed{\Delta = (-)\frac{N_0}{4d} \ln(3)}$$

$1\frac{1}{2}$

if 2d, then only $\frac{1}{2}$ mark!!

New decision regions
↳ See "pencil" marks on the above