Exam 120309 solutions

2.1 $$T(r) = \begin{cases} 0 & r < 0.1 \\ 0.2 & 0.1 \le r \le 0.2 \\ r & 0.2 \le r \le 0.8 \\ 0.8 & 0.8 \le r < 0.9 \\ 1 & 0.9 \le r \le 1 \end{cases}$$

2.2 $h(0,0,0) = 2;\ h(1,1,1) = 2;\ h(2,2,2) = 1;\ h(3,2,2) = 1;\ h(3,3,3) = 3;$
otherwise $h(i,j,k) = 0$

3. (1-i), (2-c), (3-j), (4-e), (5-g)

4.1 DP – The final solution will depend on $C_1(p)$ cost matrix. For properly chosen cost matrix the detected line may look like:

0	0	4	4
0	1	3	4
2	2	5	2
0	0	4	4

4.2 Starting value $y_0 = 1$, after first iteration $y_1 = 1.18$, after second iteration $y_2 = 1.23$

5.1 line 1 : y=1 (2 votes), line 2: y=2x-1 (2 votes)
5.2 4 (four) lines
5.3 highest – (c), lowest – (b)

6.1
(a) $T_{opt} = 0.237 \approx 0.24$
(b) $f_2(T) = 4 - 20 \cdot |T - 0.4|$ $f_1(T) = -50T \cdot (T - 0.3)$

Error area $E2 = (T - 0.2) \cdot f_2(T)$
Error area $E1 = \int_T^{0.3} f_1(x)dx$
A2 = total background area
A1 = total object area
Minimum error = $(E1 + E2)/(A1 + A2)$, for $T = T_{opt}$

(e) $T = 0.15$ (f) specificity ≤ 0.875

6.2 e.g. gaze detection, liver segmentation, fluorescence imaging, ...
Note: sausage packaging was not presented this year :)