

4.1

$$a) t_{\text{trans}} = \frac{5000_{\text{sect}} \cdot 512 \text{ B/sect}}{256 \cdot 10^6 \text{ B/s}} = 0.01 \text{ s} = \boxed{10 \text{ ms}}$$

$$b) t_{\text{TOTAL}} = \underset{5000}{\text{seektime}} + \text{latency} + t_{\text{TRANS}} = 2 + 8 + 10 = \boxed{20 \text{ ms}}$$

$$c) \frac{5000_{\text{sect}} \cdot 512 \text{ B/sect}}{20 \cdot 10^{-3} \text{ s}} = \boxed{128 \text{ MB/s}}$$

$$d) T_{\text{TOTAL}} = 8 \cdot \underset{5000}{t_{\text{TOTAL}}} + 0.4 \cdot T_{\text{TOTAL}} + 4 \cdot \underset{5000}{t_{\text{TOTAL}}}$$

$$T_{\text{TOTAL}} = 8 \cdot 20 + 0.4 \cdot T_{\text{TOTAL}} + 4 \cdot 20 \rightarrow T_{\text{TOTAL}} = 400 \text{ ms}$$

$$T_{\text{MAX}} = 0.4 \cdot t_{\text{TOTAL}} = 0.4 \cdot 400 = \boxed{160 \text{ ms}}$$

$$e) \underset{(8 \text{ discs})}{AB_{\text{ef}}} = \underset{(1 \text{ disco})}{AB_{\text{ef}}} \cdot 8 = 128 \cdot 8 = \boxed{1024 \text{ MB/s}}$$

$$f) \underset{(4 \text{ discs})}{AB_{\text{ef}}} = \underset{(1 \text{ disco})}{AB_{\text{ef}}} \cdot 4 = 128 \cdot 4 = \boxed{512 \text{ MB/s}}$$

$$g) \frac{1024}{128} = \times 8 \rightarrow +700\%$$

$$h) \frac{512}{128} = \times 4 \rightarrow +300\%$$

$$i) \frac{240 + 160}{20 + 20 + 160} = \frac{400}{200} = \times 2 \rightarrow +100\%$$

4.2

a)

- RAID 6 = $300 \cdot (60-2) = 17400 \text{ GB}$
- RAID 10 = $300 \cdot \left(\frac{60}{2}\right) = 9000 \text{ GB}$
- RAID 50 = $300 \cdot (60-6) = 16200 \text{ GB}$
- RAID 51 = $300 \cdot \left(\frac{60}{2} - 1\right) = 8700 \text{ GB}$

b)

$$60 \text{ discos} \cdot \frac{100 \text{ MB/s}}{1 \text{ disco}} = 6 \text{ GB/s}$$

c)

- RAID 6 = $100 \cdot (60-2) = 5800 \text{ MB/s}$
- RAID 10 = $100 \cdot \left(\frac{60}{2}\right) = 3000 \text{ MB/s}$
- RAID 50 = $100 \cdot (60-6) = 5400 \text{ MB/s}$
- RAID 51 = $100 \cdot \left(\frac{60}{2} - 1\right) = 2900 \text{ MB/s}$

d)

$$60 \text{ discos} \cdot \frac{100 \text{ MB/s}}{1 \text{ disco}} = 6 \text{ GB/s}$$

e)

- RAID 6 = $100 \cdot (60-2) = 5800 \text{ MB/s}$
- RAID 10 = $100 \cdot \left(\frac{60}{2}\right) = 3000 \text{ MB/s}$
- RAID 50 = $100 \cdot (60-6) = 5400 \text{ MB/s}$
- RAID 51 = $100 \cdot \left(\frac{60}{2} - 1\right) = 2900 \text{ MB/s}$

4.3

a)

$$\frac{MTTF^2}{N \cdot (N-1) \cdot MTTR}$$

b)

$$\frac{MTTF^2}{(\frac{N}{2} \cdot G \cdot MTTR)}$$

c)

$$d) \frac{MTTF^4}{4 \cdot MTTR} \cdot \left(\frac{1}{2}\right)^2 \cdot \frac{1}{N-1}$$

e)

$MTTF_6$

$MTTF_{10}$

$MTTF_{50}$

$MTTF_{51}$

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Tema 4

1/a) $t = \frac{500 \times 10^{-6} \times 10^{-4}}{2.24} + \frac{2.56}{2.56} \times 60012 = 20 \text{ ms}$

b) $T_{\text{turn}} = t_1 + t_{\text{over}} + t_{\text{in}} = 10 + 1 + 1 = 12 \text{ ms}$

c) $AG = \frac{2.56 \times 10^6}{0.02} = 128 \text{ Mbits}$

d) $AG = \frac{2.56 \times 10^6}{0.02} = 128 \text{ Mbits}$

e) $\text{Spindle} = \frac{3600}{1} = 3600 \text{ RPM}$

f) $\text{Spindle} = \frac{3600}{1} = 3600 \text{ RPM}$

2/a) RAID 0: 1100 GB ; RAID 10: 9000 GB ; RAID 50: 46700 GB ; RAID 51: 1700 GB

b) RAID 0: 6 GB ; RAID 10: 6 GB ; RAID 50: 6 GB ; RAID 51: 6 GB

c) RAID 0: 6 GB ; RAID 10: 6 GB ; RAID 50: 6 GB ; RAID 51: 6 GB

d) RAID 0: 5.8 GB ; RAID 10: 3 GB ; RAID 50: 5.5 GB ; RAID 51: 2.9 GB

e) RAID 0: 1 GB ; RAID 10: 3 GB ; RAID 50: 4.5 GB ; RAID 51: 0.35 GB

3/a) Das ist die Multiplikation $\frac{MTTF^2}{N(N-1) \cdot MTTR}$

b) Das ist die Multiplikation $\frac{MTTF^2}{N(N-1) \cdot MTTR}$

c) $MTTF_{\text{avg}} = \frac{MTTF_{\text{max}}^2}{N \cdot (N-1) \cdot (N-1) \cdot MTTR}$

d) Fall für 2 $\frac{MTTF^2}{30 \cdot MTTR}$ — $\frac{MTTF^4}{N \cdot \left(\frac{N}{2}\right) \cdot \left(\frac{N}{2}\right) \cdot \left(\frac{N}{2}\right) \cdot MTTR^3}$

e) RAID 0: $33.9 \cdot 10^3 \text{ h}$
RAID 10: $67.79 \cdot 10^6 \text{ h}$
RAID 50: $16 \cdot 10^3$