

$$T(n) = 1 + n + 2T\left(\frac{n}{2}\right) \quad \xrightarrow{\frac{n}{2}}$$

$$T\left(\frac{n}{2}\right) = 1 + \frac{n}{2} + 2T\left(\frac{n}{4}\right)$$

$$T(?) = 1 + ? + 2T\left(\frac{?}{2}\right)$$

$$T\left(\frac{n}{4}\right) = 1 + \frac{n}{4} + 2T\left(\frac{n}{8}\right)$$

$$T\left(\frac{n}{8}\right) = 1 + \frac{n}{8} + 2T\left(\frac{n}{16}\right)$$

$$T(n) = 1 + n + 2T\left(\frac{n}{2}\right)$$

$$= 1 + n + 2\left(1 + \frac{n}{2} + 2T\left(\frac{n}{4}\right)\right)$$

$$= 1 + n + 2 + n + 4T\left(\frac{n}{4}\right)$$

$$= 2n + 4T\left(\frac{n}{4}\right) + 1 + 2$$

$$= 2n + 4\left(1 + \frac{n}{4} + 2T\left(\frac{n}{8}\right)\right) + 1 + 2$$

$$= 2n + 4 + n + 8T\left(\frac{n}{8}\right) + 1 + 2$$

$$T(n) = 8T\left(\frac{n}{8}\right) + 3n + 1 + 2 + 4$$

$$T(n) = 2T\left(\frac{n}{2^k}\right) + n + (2^0 + 2^1 + 2^2 + \dots + 2^{k-1})$$

$\log_2 n$ $\log_2 n$ $\log_2 n$

$$\frac{n}{2^k} = 1 \Rightarrow k = \log_2 n$$

NOT TO BE TAKEN AWAY

Do not write in this margin

Course Code

Seat No.

Question No.

Student No.

ms

Merge Sort (data, 0, 4)

ms (data, 0, 2)

✓ ms(data, 0, 1)

8 5 9 6 3

ms (data, 0, 0) ✓

ms (data, 1, 1)

merge(0, 0, 1)

0 1 2 3 4
5 8

ms (data, 2, 2)

merge(0, 1, 2)

5 8 9 6 3

ms (data, 3, 4)

ms (data, 3, 3)

ms (data, 4, 4)

merge(data, 3, 4, 4)

5 8 9 3 6

merge(data, 0, 2, 4)

3 5 6 8 9