Week 2 solution

(1). Master's theorem is used for solving recurrences.

Ans → (a)

(2) The recurrence relation for matrix multiplication using divide and conquer method is

$$T(n) = 8T(n/2) + O(n^2)$$

using Master's theorem $T(n) = O(n^3)$

Ans → (c)

(3) middle = $[(0+9)/2] = 4$.

∴ 4th element is 6.
left most element is 8 & right most element is 0

∴ $[6, 8, 0] \xrightarrow[\text{sorting}]{\text{after}} [0, 6, 8]$
↑ median of three partitioning.

∴ pivot = 6

Ans (c)

(4) For binary search $T(n) = T(n/2) + O(1)$.

∴ $f(n) = 1$, $n^{\log_2 1} = 1$ ∴ $f(n) = n^{\log_2 1}$.
$[a = 1, b = 2]$

∴ case 2 of master's theorem.

Ans → (b)

(5) It follows the pattern of fibonacci series

$n = 1$. # of strings = 2 (0, 1)
$n = 2$ # " " = 3 (00, 01, 10)
$n = 3$ # " " = 5 (000, 001, 010, 100, 101)
so on

∴ $a_n = a_{n-1} + a_{n-2}$

Ans → (b)

(6) 62, 15, 21, 77, 112, 61, 80

77 is not a pivote since 61 is at right of 77 but 61 < 77

112 can be a pivote for same reason.

Ans → (d)

(7) In strassen's matrix multiplication method the second row, third colum is $P_3 + P_4$.

R_3 →

$P_5+P_4-P_2+P_6$	P_1+P_2
P_3+P_4	$P_1+P_5-P_3-P_7$

Ans → (d)

(8) we can solve recurrence relation of the form

$T(n) = a\,T(n/b) + f(n)$ where $a \geq 1$, $b \geq 1$

f is assymptotically positive

Ans → (b) False.

(9) Initially (13), 18, 8, 10, 21, 7, 2, 32, 6, 19
Pivot

after partitioning 6, 8, 10, 7, 2, 13, 21, 32, 18, 19

Ans → (d)

(10) ~~result of~~ 1st case of Master's theorem in

$T(n) = O(n^{\log_b a})$.

Ans → (a)