1) $T(n) = 3T(n/2) + n^2$

$\quad a = 3, b = 2$

$\quad n^{\log_b a} = n^{\log_2 3}$

$\quad n^2 > n^{\log_2 3}$

$\quad \therefore T(n) = \Theta(n^2)$

2) $T(n) = 4T(n/2) + n^2$

$\quad a = 4, b = 2$

$\quad n^{\log_b a} = n^{\log_2 4} = n^2$

$\quad n^2 = n^2$

$\quad \therefore T(n) = \Theta(n^2 \log n)$

3) $T(n) = T(n/2) + 2^n$

$\quad a = 1, b = 2$

$\quad n^{\log_b a} = n^{\log_2 1} = 1$

$\quad 1 < 2^n$

$\quad \therefore T(n) = \Theta(2^n)$

4) $T(n) = 2^n T(n/2) + n^2$

   Master th. not applicable as a is func of n

5) $T(n) = 16T(n/4) + n$

   $a = 16, b = 4, f(n) = n$

   $n^{\log_b a} = n^2$

   $n^2 > n$

   $\therefore \Theta(n^2)$

6) $T(n) = 2T(n/2) + n\log n$

   $a = 2, b = 2, f(n) = n\log n$

   $n^{\log_b a} = n^{\log_2 2} = n$

   $f(n) > n$

   $\therefore T(n) = \Theta(n\log n)$

7) $T(n) = 2T(n/2) + n/\log n$

   $a = 2, b = 2$

   $n^{\log_b a} = n$

   $n > f(n)$

   $\therefore T(n) = \Theta(n)$

8) $T(n) = 2T(n/4) + n^{0.51}$

   $a = 2, b = 4, f(n) = n^{0.51}$

   $n^{\log_b a} = n^{\log_4 2} = n^{0.5}$

   $n^{0.51} > n^{0.5}$

   $T(n) = \Theta(n^{0.51})$

9) $T(n) = 0.5 \, T(n/2) + 1/n$

    Master's not applicable $\because a < 1$

10) $T(n) = 16 \, T(n/4) + n!$

    $a = 16, \; b = 4, \; f(n) = n!$

    $n^{\log_b a} = n^2$

    $n! > n^2$

    $T(n) = \Theta(n!)$

11) $T(n) = 4 \, T(n/2) + \log n$

    $a = 4, \; b = 2$

    $n^{\log_b a} = n^2$

    $n^2 > f(n)$

    $\therefore T(n) = \Theta(n^2)$

12) $T(n) = sqrt(n) + n/2 + \log n$

    Master's not applicable as a is not constant

13) $T(n) = 3 \, T(n/2) + n$

    $a = 3, \; b = 2$

    $n^{\log_b a} = n^{\log_2 3} = n^{1.58}$

    $n^{1.58} > f(n)$

    $\therefore T(n) = \Theta(n^{\log_2 3})$

14) $T(n) = 3T(n/3) + \sqrt{n}$

　　$a = 3, b = 3$

　　$n^{\log_b a} = n$

　　$n > \sqrt{n}$

　　$\therefore T(n) = \Theta(n)$

15) $T(n) = 4T(n/2) + cn$

　　$a = 4, b = 2$

　　$n^{\log_b a} = n^2$

　　$n^2 > cn$

　　$\therefore T(n) = \Theta(n^2)$

16) $T(n) = 3T(n/4) + n\log n$

　　$a = 3, b = 4$

　　$n^{\log_b a} = n^{0.79}$

　　$n^{0.79} < n\log n$

　　$\therefore T(n) = \Theta(n\log n)$

17) $T(n) = 3T(n/3) + n/2$

　　$n^{\log_b a} = n$

　　$n > n/2$

　　$\therefore T(n) = \Theta(n^{\frac{3}{2}} \log n)$

　　$\therefore \Theta(n) = \Theta(n/2)$

$$a = 6, \quad b = 3$$

$$n^{\log_b a} = n^{\log_3 6} = n^{1.63}$$

$$n^{1.63} < n^2 \log n$$

$$\therefore \; \Theta(n^2 \log n)$$

19) $T(n) = 4T(n/2) + n/\log n$

$$a = 4, \quad b = 2$$

$$n^{\log_b a} = n^2$$

$$n^2 > n/\log n$$

$$\therefore \; T(n) = \Theta(n^2)$$

20) $T(n) = 64 T(n/8) - n^2 \log n$

Master's not applicable as $f(n)$ is not increa

21) $T(n) = 7T(n/3) + n^2$

$$n^{\log_b a} = n^{1.7}$$

$$n^{1.7} < n^2$$

$$\therefore \; T(n) = \Theta(n^2)$$

22) $T(n) = T(n/2) + n(2 - \cos n)$

Master's theorem isn't applicable since

condition is isolated in case 3.