**1.Find the time complexity of the below functions in Θ form. Write NA if the function does not apply to any case.**

**a) T (n) = 3T (n/2) + n**

**Solution**:

We compare the given function with T(n) = aT(n/b) + θ (nklogpn).

Then, we have

a = 3, b = 2, k = 1, p = 0.

Now, a = 3, bk = 21 = 2

Clearly, a > bk

So we follow case 1.

So, we have T(n) = θ (nlogba)

T(n) = θ (nlog23)

Thus,

**T(n) = θ (nlog3)**

**b) T (n) = 64T (n/8) − n^2(log n)**

**Solution**:

The given function does not correspond to the general form of Master’s Theorem.

So, it cannot be solved using Master’s Theorem

Thus,

**T(n) = NA**

**c) T (n) = 2nT (n/2) + n^n**

**Solution:**

We compare the given function with T(n) = aT(n/b) + θ (nklogpn).

Then, we have

a = 2n, b = 2, k = n, p = 0.

Here ‘a’ is not constant,

So, it cannot be solved using Master’s Theorem.

Thus,

**T(n) = NA**

**d) T (n) = 3T (n/3) + n/2**

**Solution:**

We write the given function as T(n) = 3T(n/3) + n.

This is because in the general form, we have θ for function f(n) which hides constants in it.

Now, we can easily apply Master’s theorem

We compare the given function with T(n) = aT(n/b) + θ (nklogpn).

Then, we have

a = 3, b = 3, k = 1, p = 0.

Now, a = 3, bk = 31 = 3.

Clearly, a = bk

So, we follow case 2.

Since p = 0, so we have

T(n) = θ (nlogbalogp+1n)

T(n) = θ (nlog33log0+1n)

T(n) = θ (n1log1n)

Thus,

**T(n) = θ (nlogn)**

**e) T (n) = 7T (n/3) + n^2**

**Solution:**

We compare the given function with T(n) = aT(n/b) + θ (nklogpn).

Then, we have

a = 7, b = 3, k = 2, p = 0.

Now, a = 7, bk = 32 = 9.

Clearly, a < bk

So, we follow case 3.

Since p = 0, so we have

T(n) = θ (nklogpn)

T(n) = θ (n2log0n)

Thus,

**T(n) = θ (n2)**