(1.)

A V/f controlled drive is running a 400 V, 50 Hz, 1480 rpm delta connected induction motor while the motor is developing rated torque. The machine is found to be running at a speed of 430 rpm. The stator impedance and rotor reactance of the machine may be neglected. The frequency in Hz of the applied voltage is

- a. 15
- b. 25
- c. 50
- d. 14.33 ×

$\tau_{ind} \propto (N_s - N_r)\left(\frac{V_1}{f}\right)^2$ (τ_{load} = const assumption ∵ nothing is given)

The correct answer is: 15

Sol: Variable voltage Variable frequency control of speed. (VVF)

$\therefore \frac{V}{f} = \text{const}$ & $N_s - N_r = \text{const}$ ⇒

(for core not to saturate) [for $\tau_{ind} = \tau_{load}$ (Assumed to be a constant τ demanding load)]

at $\tau_{fL} \Rightarrow N_r = 1480$ rpm $\quad N_s = \frac{120 f_e}{P}$

∵ N_s is slightly higher than N_r at working conditions

$\therefore$ chosing $P=4 \Rightarrow N_s = \frac{120}{4} \times 50 = 1500$ rpm

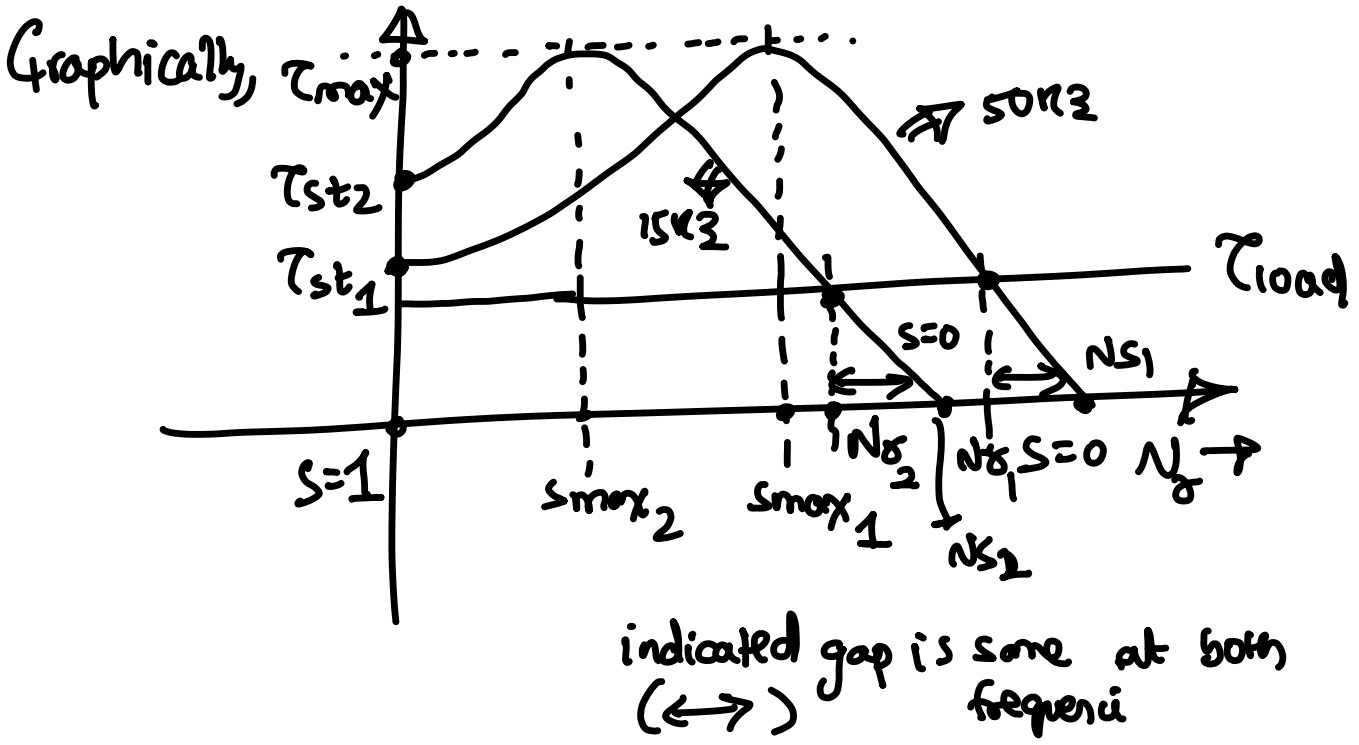
$\therefore N_s - N_r = 20$ rpm

Now, for $N_r' = 430$ rpm ⇒ ∴ frequency is to be reduced

∴ N_s is changed in this process

$N_s' - N_r' = 20$ rpm

$\therefore N_s' = 450$ rpm $= \frac{120 f_e'}{4} \Rightarrow \therefore$ $\boxed{f_e' = 15 \text{ Hz}}$



indicated gap is same at both frequencies ($\leftrightarrow$)

(2.)

A V/f controlled drive is running a 400 V, 50 Hz, 1480 rpm delta connected induction motor. The machine is applied with a frequency of 20 Hz, and is developing the rated torque. The stator impedance and rotor reactance of the machine may be neglected. The speed of the machine in rpm is

- a. 570
- b. 580
- c. 600 ×
- d. 590

The correct answer is: 580

As mentioned in above question, (one of the condition)
same (VVVf) $\therefore N_s - N_r = \text{constant}$

$P=4,\ N_s = \frac{120}{4} \times 50 = 1500\text{ rpm}$ @ 1480 rpm

$N_s' = \frac{120}{4} \times 20 = 600\text{ rpm}$ @ N_r' rpm

$\Rightarrow 1500 - 1480 = 600 - N_r'$

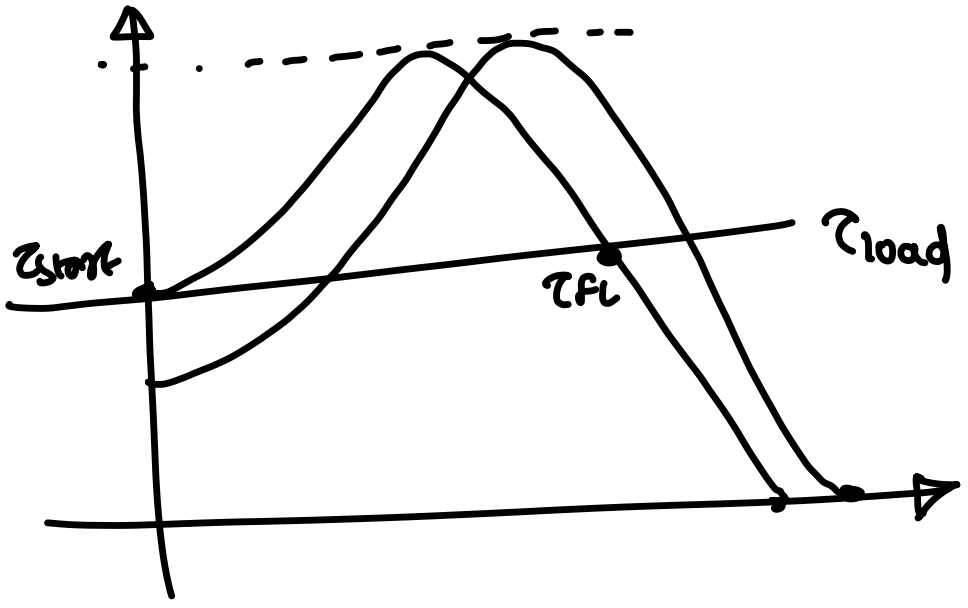
$\therefore \boxed{N_r' = 580\text{ rpm}}$

3.

Consider a V/f controlled 400 V, 50 Hz, 1480 rpm delta connected induction motor. The stator impedance and the rotor reactance of the machine may be neglected. If the machine is required to develop starting torque which is approximately equal to the rated torque of the machine, the frequency (in Hz) of the applied voltage needs to be

- a. 0.33
- b. 0.66
- c. 1.32
- d. 50 ×

The correct answer is: 0.66



$\tau_{start} \Rightarrow N_s' = 0 \Rightarrow$ Applying the same v/f logic,

$$\Rightarrow \frac{120}{4} \times 50 - 1480 = \frac{120}{4} \times f - 0$$

$$\therefore \boxed{f = \frac{20}{30} = 0.66 \text{ Hz}}$$