02. Ans

Given:- $I_L = 2A$, $Ra = 0.2\Omega$, $I_{fg} = 2.5A$, $I_{fm} = 2A$

To find:- Efficiency of Motar, n_m and efficiency of generator, n_g

1) Generatar armature current.

$$I_{aga} = I_g + I_{fg}$$
$$= 60 + 2.5$$
$$= 62.5\ A$$

2) Input Motar current

$$I_m = I_l + I_g$$
$$= 15 + 60$$
$$= 75\ A$$

3) Motar armature current.

$$I_{ma} = 75 - 2$$
$$= 73\ A$$

4) Copper loss in Motar armature.

$$I_{ma}^2 \times Ra = (73)^2 \times 0.2$$
$$= 1065.8\ W$$

5) Copper loss in generator armature.

$$I_{ga}^2 \times Ra = (62.5)^2 \times 0.2$$
$$= 781.25\ W$$

6) Total armature copper Loss of set
$= 1065.8 + 781.25$
$= 1847.05$

7) Total Stray loss of set = Input - Total losses in armature
$= 2500 - 1847.05$
$= 652.95$

8) Stray loss per machine $= \frac{652.95}{2}$
$= 326.47\ W.$

Motor efficiency :-

1) Input Power $= VI_m = 250 \times 75$
$= 18750\ W$

2) Armature copper loss $= 1065.8\ W$

3) Field copper loss $= 250 \times 2$
$= 500\ W$

4) Stray loss $= 326.47\ W$

5) Total loss $= 1065.8 + 500 + 326.47 = 1892.27\ W$

6) $\eta_m = \frac{\text{Input} - \text{Losses}}{\text{Input}} \times 100$

$\frac{18750 - 1892.27}{18750} \times 100 =$

$$= \frac{16857.73 \times 10}{.1875}$$

$$= \frac{168577.3}{1875} = 89.90\%$$

Generator efficiency :-

1) Output Power = 250×62.5
$= 15625$

2) Armature copper loss = 781.25 W

3) Field copper loss = $250 \times 2.5 = 625$ W

4) Stray loss = 326.47 W

5) Total loss = $781.25 + 625 + 326.47$
$= 1732.72$ W

6) Generator efficiency = $\eta = \frac{\text{Output}}{\text{O/P + Losses}} \times 100$

$= \frac{15625}{15625 + 1732.72} \times 100$

$= \frac{1562500}{17357.72}$

$= 90.01\%$