

DEPARTMENT OF EDUCATION
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
ELECTROTECHNICS N5
TIME: 3 HOURS
MARKS: 100

QUESTION 1

1.1 By reversing either the field $\checkmark$ or armature connections. $\checkmark$ (2)

1.2 They are placed in slots in the pole shoes. $\checkmark$ They are connected in series with the armature windings. $\checkmark$ (2)

1.3 $V = 550 \text{ V}$ $P = 44 \text{ kW}$ $N = 1500 \text{ rpm}$ $\eta = 85\% = 0.85$
 $R_a = 0.32$ $I_f = 1.8 \text{ A}$ $I_a R_b = 3.5 \text{ V}$

1.3.1 $\text{Input} = \frac{\text{Output}}{\eta} = 44 / 0.85 = 51.765 \text{ kW} \checkmark$

$I_L = P / V = 51765 / 550 \checkmark = 94.12 \text{ A} \checkmark$ (3)

1.3.2 $\text{Output} = \frac{2 \pi N T}{60}$

$44000 = \frac{2 \pi 1500 T}{60} \checkmark$

$T = \frac{44000 \times 60}{2 \pi 1500} \checkmark$

$= 280.25 \text{ Nm} \checkmark$ (3)

1.3.3 $\text{Starting current} = 1.75 \text{ (full load)} = 1.75 \times 94.12 = 164.7 \text{ A} \checkmark$

$I_a = I - I_f = 164.7 - 1.8 = 162.9 \text{ A} \checkmark$

$V = E + V_b + V_a \text{ (at start)} \quad E = 0 \quad V_a = I_a (R_a + x)$

$550 = 0 + 3.5 + 162.9 (0.32 + x) \checkmark$

$x = \frac{550 - 55.63}{16.9}$

$= 2.035 \text{ ohms} \checkmark$

(4)

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Thomas Strang



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