

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

*al*

**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  $\text{Starting current} = 1.75 \text{ (full load)} = 1.75 \times 94.12 = 164.7 \text{ A } \checkmark$   
 $I_a = I - I_f = 164.7 - 1.8 = 162.9 \text{ A } \checkmark$   
 $V = E + V_b + V_a \text{ (at start)} \quad E = 0 \quad V_a = I_a (R_a + x)$   
 $550 = 0 + 3.5 + 162.9 (0.32 + x) \checkmark$   
 $x = \frac{550 - 55.63}{16.9} \checkmark$   
 $= 2.035 \text{ ohms } \checkmark$  (4)

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**Tao Wei**



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